

MOBY[®] U

Configuration, Installation and Service

Manual

Preliminary Version

Table of Contents

General	1
Introduction, MOBY U	2
Configuration and Installation Guidelines	3
Mobile Data Memories	4
Read/Write Devices	5
Interfaces	6
Accessories	7
Documentation	A
Error Messages	B
ASCII Table	C

6GT2 597-4BA00-0EA2

Published in December, 2001

Notes on safety

This manual contains notes which must be adhered to for your own personal safety and to prevent property damage. The notes are highlighted with a warning triangle and graduated by amount of danger.



Danger

Means that death, severe injury or substantial property damage **will** occur if these precautions are not taken.



Warning

Means that death, severe injury or substantial property damage **may** occur if these precautions are not taken.



Caution

Means that injury or property damage may occur if these precautions are not taken.

Note

Is an important piece of information on the product, its handling or a particular part of the documentation which requires special attention.

Qualified personnel

A device may only be commissioned and operated by **qualified personnel**. For the purpose of the safety notes in this manual, qualified personnel are those persons who are authorized to commission, ground and tag devices, systems and current circuits in accordance with applicable safety standards.

Intended use

Comply with the following.



Warning

The product may only be used for the applications described in the catalog and the technical description and only in connection with Siemens equipment or devices and components of other manufacturers recommended by Siemens.

Correct and safe operation of the product is based on correct transportation, correct storage, setup and installation as well as careful operator control and maintenance.

Brand names

SIMATIC® and MOBY® and SINEC ® are registered brand names of SIEMENS AG.

The other designations in this publication may be brand names whose use by third parties for their own purposes may violate the rights of the owner.

Copyright Siemens AG 2001 All rights reserved

Reproduction, utilization and revelation of the contents of this manual is prohibited unless express permission is obtained. Violations will be prosecuted. All rights reserved particularly when a patent is granted or a utility model is registered.

Siemens AG
Bereich Automatisierungs- und Antriebstechnik (A&D)
Geschäftsgebiet Systems Engineering
Postfach 2355, D-90713 Fuerth

Disclaimer of liability

Although we have checked this publication for agreement with the actual hardware and software, we cannot fully exclude differences and do not accept liability for full agreement. The information in this publication is checked at regular intervals and necessary changes included in the next release. Your suggestions and ideas are welcome (use the form at the end of this manual).

© Siemens AG 2001
Subject to technical change without prior notice

Table of Contents

1	General	1-1
2	Introduction – MOBY U	2-1
3	Configuration and Installation Guidelines	3-1
3.1	The Fundamentals	3-2
3.1.1	Transmission Window	3-3
3.2	Basic Requirements	3-5
3.3	EMC Guidelines	3-6
3.3.1	Preface	3-6
3.3.2	General	3-7
3.3.3	Spreading of Interference	3-8
3.3.4	Cabinet Layout	3-11
3.3.5	Avoiding Sources of Interference	3-14
3.3.6	Equipotential Bonding	3-15
3.3.7	Shielding the Cables	3-16
3.3.8	Basic EMC Rules	3-18
3.4	MOBY Shielding Concept	3-20
3.4.1	SLG Cable between ASM 475 and SLG U92 with RS 422	3-20
3.5	SLG Cable and Plug Connector Allocations (RS 422)	3-21
3.5.1	Cable Configuration	3-21
3.5.2	Plug Connector Allocations	3-22
3.5.3	Connection Cables	3-24
3.6	SLG Cable and Plug Allocations (RS 232)	3-26
3.6.1	Cable Configuration	3-26
3.6.2	Connection Cables with Lengths	3-27
3.7	Service Cable and Plug Allocations	3-29
3.7.1	Cable Configuration	3-29
3.7.2	Plug Allocations	3-29
3.7.3	Connection Cables with Lengths	3-29
4	Mobile Data Memories	4-1
4.1	Introduction	4-2
4.2	MDS U313	4-6
4.3	MDS U524	4-9
4.4	MDS U589	4-12
5	Read/Write Devices	5-1
5.1	SLG U92	5-2

6	Interfaces	6-1
6.1	Introduction	6-2
6.2	ASM 452	6-3
6.3	ASM 473	6-11
6.4	ASM 475	6-18
7	Accessories	7-1
7.1	MOBY Software	7-2
7.2	MOBY Wide-Range Power Pack	7-4
A	Documentation	A-1
B	Error Messages	B-1
B.1	General Errors	B-2
B.2	ASM-Specific Errors	B-7
B.2.1	Error Indicators in FC 45	B-7
B.3	Filehandler Error Messages for ASM 452/475	B-10
C	ASCII Table	C-1

Figures

2-1	Overview of the MOBY U components	2-4
3-1	Status zones for MDS in transmission field of SLG U92	3-3
3-2	Spreading of interference	3-8
3-3	Possible interference coupling	3-10
3-4	Shielding by the housing	3-11
3-5	Avoidance of interference with optimal layout	3-12
3-6	Filtering the voltage	3-13
3-7	Suppression of inductivity	3-14
3-8	Equipotential bonding	3-15
3-9	Shielding the cables	3-16
3-10	Connecting the shield bar	3-17
3-11	Interruption of shielded cables	3-17
3-12	Layout of the ASM 475 with shield connecting element	3-20
3-13	SLG with extra power pack	3-22
3-14	Drawing of how to mount the SLG plug connector	3-23
3-15	Connection cable ASM 452/473 ↔ SLG U92 with RS 422	3-24
3-16	Connection cable ASM 475 ↔ SLG U92 with RS 422	3-25
3-17	Wide-range power pack for SLG U92	3-26
3-18	Connection cable for PC ↔ SLG U92	3-27
4-1	Status zones for MDS in transmission field of SLG U92	4-2
4-2	MDS U313	4-6
4-3	Metal-free space, MDS U313	4-8
4-4	Dimensions, MDS U313	4-8
4-5	MDS U524	4-9
4-6	Metal-free space, MDS U524	4-11
4-7	Dimensions of MDS U524	4-11
4-8	MDS U589	4-12
4-9	Metal-free space, MDS U589	4-14
4-10	Dimensions of the MDS U589	4-15
5-1	Read/write device SLG U92	5-4
5-2	Transmission window of the SLG U92	5-7
5-3	Metal-free space of SLG U92	5-7
5-4	Distance D: SLG U92	5-8
5-5	Dimensional drawing of the SLG U92	5-8
6-1	Interface ASM 452	6-3
6-2	Configurator – ASM 452	6-6
6-3	Connection plug for ASM 452, 473 ↔ SLG U92 with RS 422 (6GT2 090-0BC00)	6-7
6-4	Connection cable for ASM 452, 473 ↔ SLG U92 with RS 422 (6GT2 091-1CH20)	6-7
6-5	Dimensional drawing of the ASM 452	6-8
6-6	Pin allocation and LEDs of the ASM 452	6-9
6-7	Length of bared cable for PROFIBUS cable	6-10
6-8	Setting PROFIBUS address/turning on terminating resistance	6-10
6-9	Interface ASM 473	6-11
6-10	Configurator for an ASM 473	6-14
6-11	Maximum configuration of ASM 473s on one ET 200X	6-15
6-12	Pin allocation and LEDs of the ASM 473	6-16
6-13	Dimensions for mounting holes for basic and expansion modules	6-17
6-14	Interface ASM 475	6-18
6-15	Configurator for an ASM 475	6-19

6-16	Front plate and inside of the front door of the ASM 475	6-22
6-17	Wiring of the ASM 475 to the SLG U92 with RS 422 (6GT2 091-0E...) ..	6-24
6-18	Baring of the cable shield for customer-fabricated cable	6-24
6-19	ASM 475 directory in the hardware catalog	6-25
7-1	Program directories of "MOBY Software," release V 3.0	7-3
7-2	MOBY wide-range power pack	7-4
7-3	Plug allocation of 24 V output	7-6
7-4	Dimensions of MOBY wide-range power pack	7-6

Tables

2-1	Technical data of MOBY U (field components)	2-3
3-1	Sources of interference: Origin and effects	3-9
3-2	Causes of coupling paths	3-10
3-3	Cable configuration	3-21
3-4	Plug connector allocation of the SLG connector	3-22
3-5	Cable lengths of ASM 475 ↔ SLG U92 with RS 422	3-24
3-6	Cable lengths of ASM 475 ↔ SLG U92 with RS 422	3-25
3-7	Plug allocation of SLG plug and submin D plug	3-27
3-8	Cable lengths for PC ↔ SLG U92 with RS 232	3-27
3-9	Components for individually fabricated cables	3-28
4-1	Overview of the MDS	4-4
4-2	Operational/ambient conditions of the MDS	4-4
4-3	Ordering data for the MDS U313	4-6
4-4	Technical data of the MDS U313	4-6
4-5	Field data of the MDS U313	4-7
4-6	Ordering data of the MDS 524	4-9
4-7	Technical data of the MDS U524	4-9
4-8	Field data of the MDS U524	4-10
4-9	Ordering data of the MDS U589	4-12
4-10	Technical data of the MDS U589	4-13
4-11	Field data of the MDS U589	4-14
4-12	Cycles of the MDS U589at its utmost limits	4-14
5-1	Ordering data of the SLG U92	5-4
5-2	Technical data of the SLG U92	5-5
5-3	Technical data of the SLG U92	5-7
6-1	Overview of the interfaces	6-2
6-2	Ordering data of the ASM 452	6-4
6-3	Technical data of ASM 452	6-5
6-4	Ordering data of the ASM 473	6-12
6-5	Technical data of the ASM 473	6-12
6-6	Ordering data for ASM 475	6-19
6-7	Technical data of the ASM 475	6-20
6-8	Function of the LEDs on the ASM 475	6-23
6-9	Operating states shown by LEDs on the ASM 475	6-23
7-1	Ordering data for MOBY Software	7-3
7-2	Ordering data for MOBY wide-range power pack	7-4
7-3	Technical data of the MOBY wide-range power pack	7-5
A-1	Ordering data for descriptions	A-1
B-1	General errors	B-3
B-2	error_FCerror variable	B-7
B-3	Error variable error_Bus	B-8

General

1

This manual on configuration, installation and service will help you to plan and configure your MOBY U system. It contains the configuration and installation guidelines and all technical data on the individual components.

MOBY hotline

We have set up the MOBY hotline so that we can give our MOBY customers optimum advice and service.

We are available from 8:30 to 11:30 AM and 1:00 to 4:00 PM Mondays through Fridays under the following telephone number.

++49(0)911/750-2859

++49(0)911/750-2861

On so-called "bridge" days (i.e., the Friday after or the Monday before a holiday) our hotline is not available.

Of course, you can also fax or e-mail us your questions.

Fax: ++49(0)911/750-2800 or 750-2960

E-mail address: MOBY-HOTLINE@fthw.siemens.de

Internet

General news on MOBY U or an overview of our other identification systems can be found on the Internet under the following address.

<http://www.ad.siemens.de/moby>

E-mail

We can also answer special questions on products, give you a list of Siemens representatives in your area, clarify customer-specific requirements, and so on under the following e-mail address.

moby@fthw.siemens.de

Introduction – MOBY U

MOBY U is the RF identification system which is especially designed for long-range applications in industry and logistics. It uses the transmission frequency in the ISM frequency band of 2.4 GHz in the UHF range (ultra high frequency). This ISM frequency band is recognized around the world. It unites the power of innovative HF technologies and, at the same time, ensures continuity at the customer's by being almost totally compatible with the proven MOBY I system. Robust housing and power-saving circuiting technology give you years of maintenance-free operation even under the most rugged of industrial conditions.

MOBY U covers all transmission ranges up to three meters which means that it meets the prerequisites for a transparent identification solution in the automotive industry, for instance. It offers the communication distances (much longer than one meter) required to design optimized working processes and ensure necessary safety zones during automobile production.

The transmission frequency and the robust modulation not only give you transmission ranges of several meters but also ensure sufficient distance to the typical sources of electromagnetic interference in industrial production plants. With MOBY U, you can forget the old sources of interference such as welding devices and power switches, pulsed DC drives and switching power packs and all the time-consuming interference suppression measures which were needed.

Familiar sources of interference during UHF transmission such as reflection, interference and over-ranging are handled with appropriate technical measures on the MOBY U. In addition, special coding procedures ensure that data transmission is correct and data integrity is preserved. Proven methods and algorithms of mobile radio technology (GSM, UMTS) have been used for this purpose by the identification system. Specially designed antennas ensure a homogenous transmission field so that the mobile data memories (MDSs) are detected reliably even in difficult locations.

Conflicts with other users of the 2.4 GHz frequency band are avoided by using very low sending power (less than 50 mV per meter at 3-m intervals) and automatic selection of free and interference-free frequency channels.

With its 32-Kbyte mobile data memories (MDS U524 and MDS U589 – up to +220 °C cyclically), MOBY U offers a transparent solution for the automotive industry.

Like the MDSs of MOBY U, UHF transponders with selective read/write functions always require their own energy (battery) for data communication. This power-saving circuiting technology guarantees years of maintenance-free service.

Simple and flexible installation of the read/write devices (SLGs) and the mobile data memories (MDSs) in particular are two common requirements of all assembly and production lines.

The SLG U92 offers easy system integration via coupling to:

- Reliable MOBY interface modules (ASMs) for PROFIBUS-DPV1 and SIMATIC S7
 - ASM 452
 - ASM 473
 - ASM 475
- Directly on a standard PC, SICOMP or PC-PLC

Software tools such as SIMATIC S7 functions (FC) and C library MOBY API for applications under Windows 98/2000/NT make implementation in specific applications easy.

As with the other MOBY identification systems, the MDSs can be operated with direct byte addressing or with the filehandler.

The convenient and powerful filehandler of MOBY I with its file addressing is directly integrated on the SLG U92 with expanded functions. The MOVE and LOAD commands of the MOBY I filehandler are a thing of the past. The SLG always fetches the file management information it needs directly from the MDS.

MOBY U can be used in three different ways.

1. For existing system solutions with MOBY I compatibility (no bunch/multitag)
 - MOBY U with standard settings
 - Range of up to 1.5 m (fixed setting)
 - Byte addressing via absolute addresses
 - Filehandler: With unmodified functions and without MOVE and LOAD commands
2. For existing system solutions with MOBY I compatibility plus expansions (no bunch/multitag)
 - Just a few expanded commands for changing the standard settings and requesting diagnostic data
 - Range up to 3 m (to be limited in increments)
3. Full use of MOBY U performance (with bunch/multitag)
 - Commands and/or user data with clear allocation due to the MDS number for bunch/multitag
 - Range up to 3 m (to be limited in increments)

With MOBY U, a service and diagnostic interface is installed directly on the read/write device (SLG) to make commissioning easier. Not only current transmission parameters can be analysed here but data communication can also be logged. Additional statistical functions are available for quantitative and qualitative evaluation of data communication.

Primary applications

MOBY U is primarily used for applications in which objects must be quickly and reliably identified inductively over long distances (up to three meters) and the objects are to carry extra production and manufacturing parameters along with them.

- Automobile industry, particularly main assembly lines (raw product manufacturing, surface treatment and assembly)
- Industrial production plants
- Container/pallet identification for transportation logistics and distribution
- Vehicle identification, vehicle parks, etc.
- Traffic control technology
- Assembly lines

Technical data

Table 2-1 Technical data of MOBY U (field components)

Fixed code memory	MDS ID number (32 bits)	
Read-only memory	128 bits, to be written once by the user	
Application memory Memory technology Memory size Memory organization	RAM 2 Kbytes or 32 Kbytes File or address-oriented	
Protection rating	IP 67 to IP 68	
Operational temperature	–25 °C to +70/85 °C, 200 °C (cyclical), 220 °C (briefly)	
Data transmission speed, SLG-MDS (net) Write Read	Without bunch	With bunch size = 2
	Approx. 16.0 Kbyte/sec Approx. 14.4 Kbyte/sec	Approx. 8.0 Kbyte/sec Approx. 7.2 Kbyte/sec
Read/write distance	150 mm to 3000 mm	
Can be connected to	SIMATIC S7, PC, computer, other PLC, PROFIBUS	

Overview of the MOBY U components

- MDS: Mobile data memory
- SLG: Read and write device
- ASM: Interface module

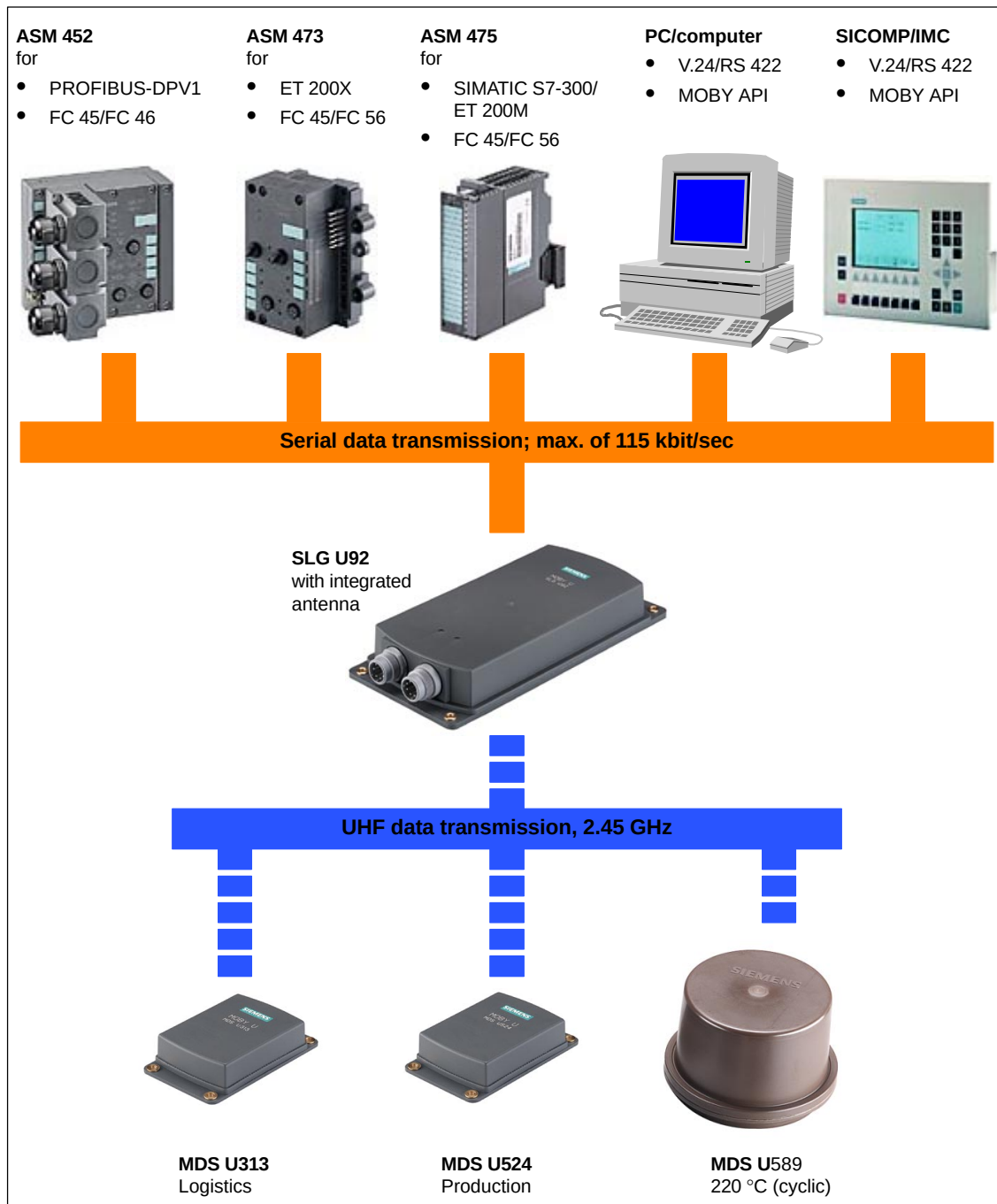


Figure 2-1 Overview of the MOBY U components

Configuration and Installation Guidelines

3

3.1 The Fundamentals

MOBY U is a UHF system with powerful features. This makes it much easier to configure and handle the system.

- The range (read/write distance) and communication speed are the same for all data carriers. However, they do differ in memory size, operational temperature and lifespan.
- Reliable communication due to a homogenous transmission field with circular polarization in dynamic and static operation. There is no fading (i.e., temporary "holes" in the field).
- The range (0.15 m to 3 m) permits use throughout production.
- The range of the transmission field can be limited (in increments) from 0.5 m to 3 m. This limitation prevents over-ranging and the communication range is clearly specified.
- Familiar sources of interference during UHF transmissions such as reflection and interference have been removed with appropriate technical measures.
- Due to the transmission frequency and the robust modulation procedures, electromagnetic sources of interference can be disregarded.
- Simple and flexible installation and customized system integration with standard hardware and standard function blocks make commissioning fast and easy.
- The robust housing and the power-saving circuiting technology make for years of maintenance-free operation even under the most rugged of production environments.
- Conflicts with other users of the 2.4 GHz frequency band are avoided by using very low sending power (less than 50 mV per meter at 3-m intervals) and automatic selection of free and interference-free frequency channels.

Optimum utilization does require adherence to certain criteria.

- Transmission window
- Time that MDS is in the field (speed and amount of data) during dynamic transmission
- Metal-free space and metallic environment around MDS and SLG
- Ambient conditions such as humidity, temperature, chemicals, and so on
- Other users of the frequency band at 2.4 GHz
- Readiness to communicate: Sleep-time, standby mode, antenna on/off
- Bunch size for bunch/multitag
- System interface performance
- SLG synchronization
- Proximity switches

3.1.1 Transmission Window

MOBY U is a UHF system. UHF systems have a relatively wide range despite their low emission power. However, the emission field has a directional characteristic which depends on the antenna construction. MOBY U has various function zones which depend on direction and distance to keep the MDS's power requirements low and to make localization reproducible. The states and reactions of the affected components vary with the three different zones of the transmission field (see figure 3-1).

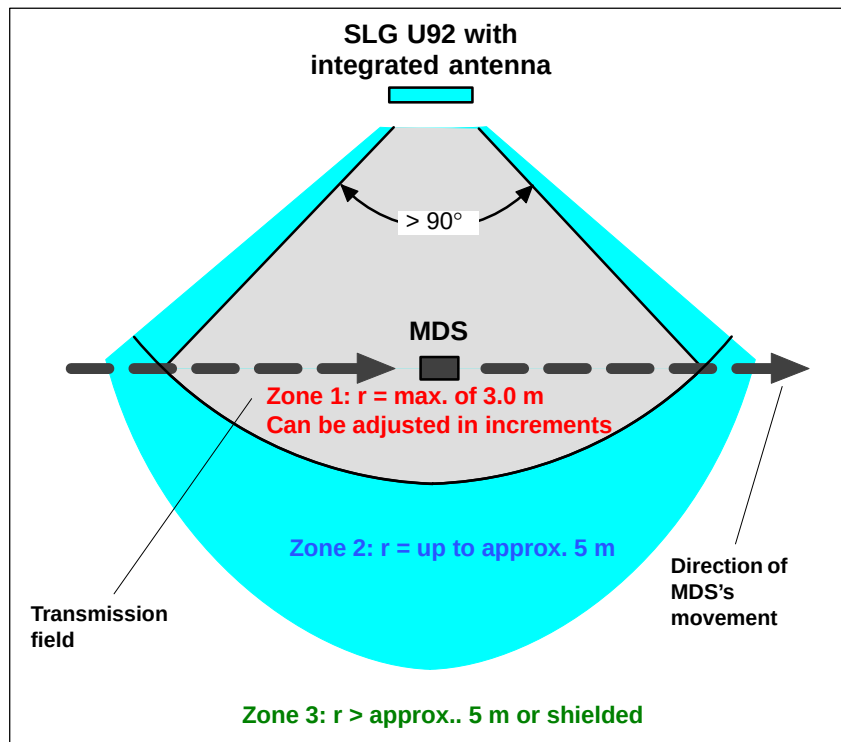


Figure 3-1 Status zones for MDS in transmission field of SLG U92

- **Zone 3:**
In simplified terms, zone 3 is the UHF-free area. The MDS is asleep and only wakes up once every < 0.5 sec to listen for an SLG. Power consumption is very low. If other UHF users are in the vicinity and they are using the same frequency range, this does not shorten the battery life of the MDS since it does not wake up until it receives a special code.

- **Zone 2:**
If the MDS receives this special code in the vicinity of an active SLG, it enters zone 2 (see figure 3-1). Starting immediately it accepts the SLG and responds briefly with its own ID. However, the SLG ignores all MDSs which are not in zone 1 (radius can be parameterized on the SLG in increments). Power consumption in zone 2 is a little higher than in zone 3.
- **Zone 1:**
When an MDS enters zone 1, it is registered by the SLG and can begin exchanging data. All read and write functions can now be performed. The power consumption of the MDS increases briefly during communication. Since transmission through the air is very fast, total communication time is very short. The entire 32-Kbyte data memory can be read in less than four seconds. This means that data communication hardly uses the battery.
As long as the MDS is located in zone 1, it is ready to exchange data when requested by the SLG. When no command for the MDS is queued, it still reports at regular parameterizable intervals with its ID when requested by the SLG. Its behavior corresponds to that of zone 2. Current consumption drops again accordingly.

General configuration rules

- With MOBY U as a UHF system, the following physical characteristics must be considered when you configure the system.
- The waves in the UHF range spread out in straight lines.
- The transmission field (zones 1 and 2) is shaped like an ellipse.
- The range of the transmission ellipse up to 3 m can be adjusted in increments for better identification of the MDS.
- In simplified terms, the transmission field can be thought of as a cone and the midpoint of the antenna is located at the peak of this cone. The angle of opening is approx. 90°. A primarily homogenous field is then assumed within this parameterized area. Fading (temporary "holes" in the field) in this area is offset by technical measures.
- Ideally the MDS should penetrate the transmission cone of its basic surface and exit through the surface area so that the MDS remains as long as possible in the defined recording field.
- Since metallic surfaces reflect the waves, they can also be used for shielding or even deflection. Particularly in typical production environments, the wealth of metallic objects ensures a relatively uniform dispersion of the transmission waves.
- For optimum data communication, metal should be avoided at least in the vicinity of the vertical waves.
- Both the MDS and the SLG can be mounted directly on metal.

3.2 Basic Requirements

FCC Compliance Statement

This device complies with part 15 of the FCC Rules.
Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

Note

Changes or modifications of this unit may void the user's authority to operate the equipment.

3.3 EMC Guidelines

3.3.1 Preface

These EMC guidelines give you information on the following topics.

- Why are EMC guidelines necessary?
- What outside interference affects the controller?
- How can this interference be prevented?
- How can this interference be corrected?
- Which standards apply to EMC?
- Examples of interference-immune plant setup

This description is only meant for "qualified personnel."

- Project engineers and planners who are responsible for the plant configuration with the MOBY modules and have to adhere to the applicable guidelines
- Technicians and service engineers who have to install the connection cables based on this description or correct malfunctions covered by these guidelines



Warning

Non-adherence to the highlighted information may cause hazardous states in the plant. Individual components or the entire plant may be destroyed as a result.

3.3.2 General

Increasing use of electrical and electronic devices creates the following situation.

- Increasing density of the components
- Increasing power electronics
- Increasing switching speeds
- Lower power consumption of the components

The more automation, the greater the danger of the devices interfering with each other.

Electromagnetic compatibility (EMC) means the ability of an electrical or electronic device to function correctly in an electromagnetic environment without bothering its surroundings up to a certain degree.

EMC can be divided into three areas.

- Own interference immunity
Immunity against internal (i.e., own) electrical interference
- Free interference immunity
Immunity against outside electromagnetic interference
- Degree of interference emission
Interference emission and influence of the electrical environment

All three areas must be considered when checking an electrical device.

The MOBY modules are checked for adherence to certain limit values. Since the MOBY modules are only part of a total system and sources of interference can be created just by combining different components, the setup of a plant must adhere to certain guidelines.

EMC measures usually comprise a whole package of measures which must all be taken to obtain an interference-immune plant.

Note

- The constructor of the plant is responsible for adherence to the EMC guidelines whereas the operator of the plant is responsible for radio interference suppression for the entire system.
 - All measures taken while the plant is being set up prevent expensive modifications and removal of interference later on.
 - Naturally, the country-specific rules and regulations must be adhered to. They are not part of this documentation.
-

3.3.3 Spreading of Interference

The following three components must be present before interference can occur in a plant.

- Source of interference
- Coupling path
- Potentially susceptible equipment

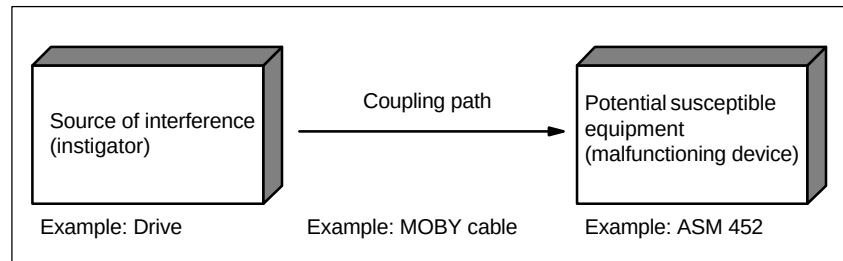


Figure 3-2 Spreading of interference

If one of these components is missing (e.g., the coupling path between interference source and potentially susceptible equipment), the susceptible device is not affected even when the source is emitting strong interference.

EMC measures affect all three components to prevent malfunctions caused by interference. When setting up a plant, the constructor must take all possible precautions to prevent the creation of interference.

- Only devices which meet limit value class A of VDE 0871 may be used in a plant.
- All interference-producing devices must be corrected. This includes all coils and windings.
- The cabinet must be designed to prevent mutual interference of the individual components or keep this as low as possible.
- Precautions must be taken to eliminate external interference.

The next few sections give you tips and hints on good plant setup.

Sources of interference

To obtain a high degree of electromagnetic compatibility and thus a plant with low interference, you must know the most frequent sources of interference. These sources of interference must then be removed.

Table 3-1 Sources of interference: Origin and effects

Interference Source	Interference Generator	Effect on Susceptible Equipment
Contactor, electronic valves	Contacts	Network interference
	Coils	Magnetic field
Electric motor	Collector	Electrical field
	Winding	Magnetic field
Electric welding device	Contacts	Electrical field
	Transformer	Magnetic field, network interference, equalizing current
Power pack, pulsed	Circuit	Electrical and magnetic field, network interference
High-frequency devices	Circuit	Electromagnetic field
Transmitter (e.g., plant radio)	Antenna	Electromagnetic field
Grounding or reference potential difference	Voltage difference	Equalizing current
Operator	Static charging	Electrical discharge current, electrical field
High-voltage cable	Current flow	Electrical and magnetic field, network interference
High-voltage cable	Voltage difference	Electrical field

Coupling paths

Before a source of interference can create actual interference, a coupling path is needed. There are four types of interference coupling.

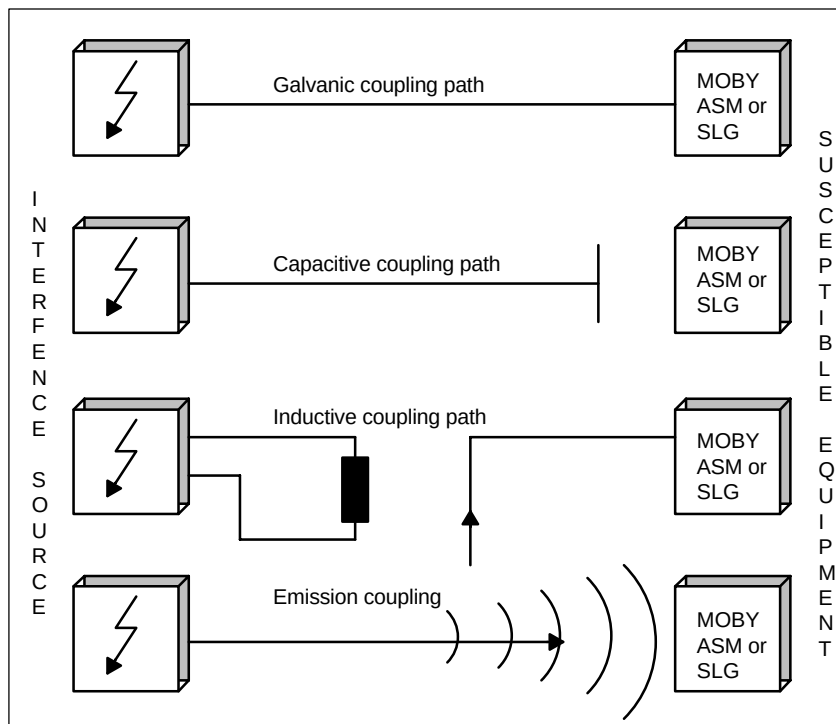


Figure 3-3 Possible interference coupling

When MOBY modules are used, various components of the total system can act as coupling paths.

Table 3-2 Causes of coupling paths

Coupling Path	Caused by
Cables and lines	Wrong or poor installation
	Shield missing or connected incorrectly
	Poor location of the cables
Switching cabinet or SI-MATIC housing	Equalizing line missing or incorrectly wired
	Grounding missing or faulty
	Unsuitable location
	Mounted modules not secure
	Poor cabinet layout

3.3.4 Cabinet Layout

User responsibility for the configuration of an interference-immune plant covers cabinet layout, cable installation, grounding connections and correct shielding of the cables.

Note

Information on EMC-proof cabinet layout can be taken from the setup guidelines of the SIMATIC controller.

Shielding by housing

Magnetic and electrical fields as well as electromagnetic waves can be kept away from susceptible equipment by providing a metallic housing. The better induced interference current is able to flow, the weaker the interference field becomes. For this reason all housing plates or plates in the cabinet must be connected with each other and good conductivity ensured.

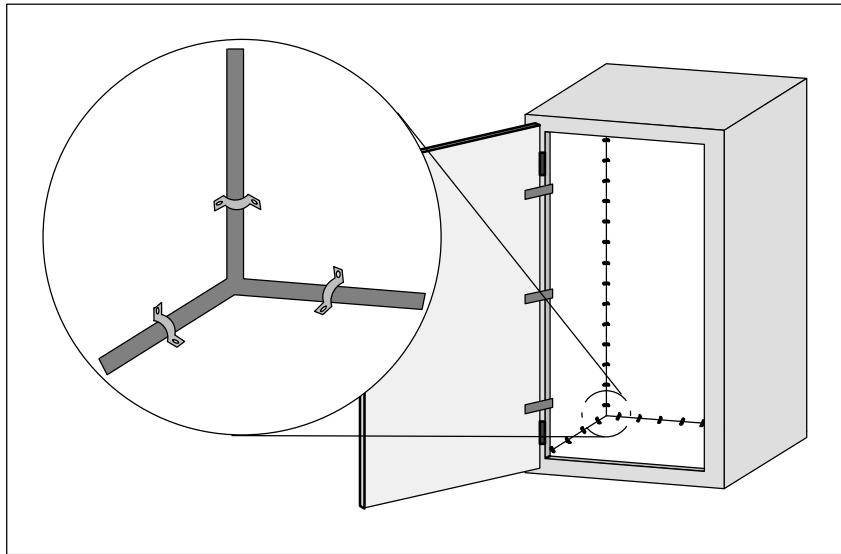


Figure 3-4 Shielding by the housing

When the plates of the switching cabinet are insulated against each other, this may create a high-frequency-conducting connection with ribbon cables and high-frequency terminals or HF conductive paste. The larger the connection surface, the better the high-frequency conductivity. Connection of simple wires cannot handle this task.

Avoidance of interference with optimized layout

Installation of SIMATIC controllers on conductive mounting plates (not painted) is a good way to get rid of interference. Adhering to the guidelines when laying out the switching cabinet is a simple way to avoid interference. Power components (transformers, drives, load power packs) should not be located in the same room with controller components (relay control parts, SIMATIC S5).

The following principles apply.

1. The effects of interference decrease the greater the distance between source of interference and susceptible equipment.
2. Interference can be decreased even more by installing shielding plates.
3. Power lines and high-voltage cables must be installed separately at least 10 cm away from signal lines.

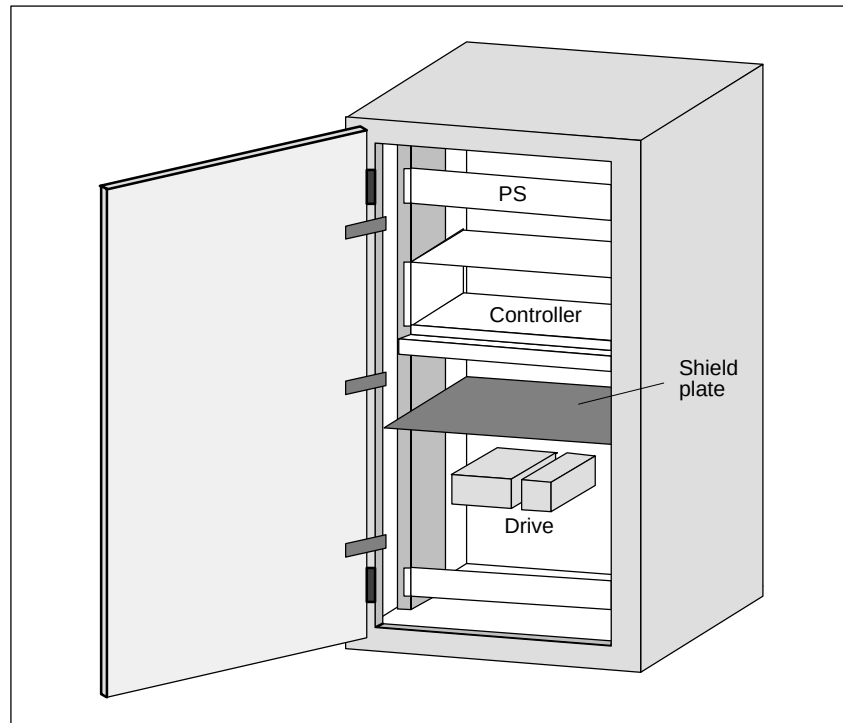


Figure 3-5 Avoidance of interference with optimal layout

Filtering the voltage

Power filters can be used to combat external interference over the power network. In addition to correct dimensioning, proper installation is very important. It is essential that the power filter be mounted directly on the cabinet leadin. This keeps interference current from entering the cabinet by filtering it out from the beginning.

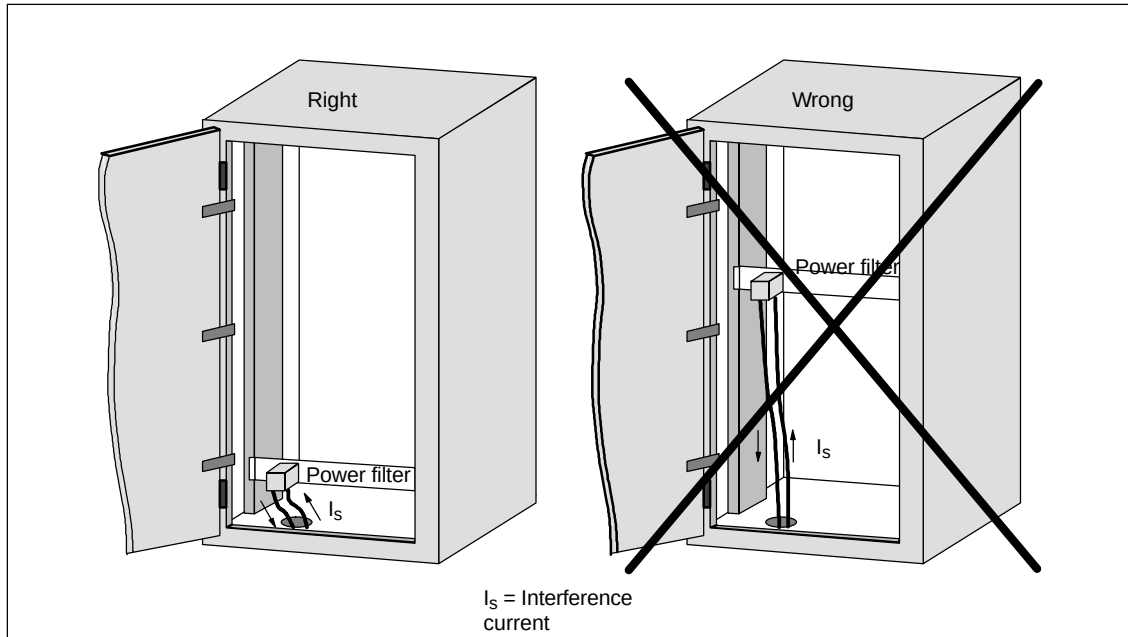


Figure 3-6 Filtering the voltage

3.3.5 Avoiding Sources of Interference

Inclusion of interference sources in a plant must be avoided to achieve a higher degree of interference immunity. All switched inductivity is frequently a source of interference in plants.

Suppression of inductivity

Relays, contactors, etc. generate interference voltages which must be suppressed with one of the following circuits.

24 V coils create up to 800 V even with small relays and 220 V coils generate interference voltages of several kV when the coil is switched. Free wheeling diodes or RC circuits can be used to prevent interference voltage and thus also inductivity in lines which must be installed parallel to the coil line.

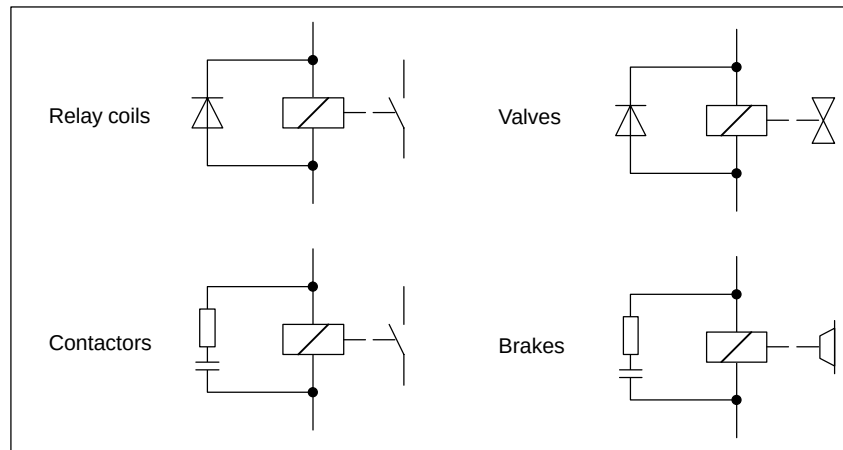


Figure 3-7 Suppression of inductivity

Note

All coils in the cabinet must be interference-suppressed. Don't forget the valves and motor brakes. A special check must be made for neon lamps in the switching cabinet.

3.3.6 Equipotential Bonding

Differences in potential may be created between the parts of the plant by differing layout of plant parts and differing voltage levels. When the parts of the plant are connected with signal lines, equalizing currents flow over the signal lines. These equalizing currents may distort the signals.

This makes it very important to provide correct equipotential bonding.

- The cross section of the equipotential bonding line must be large enough (at least 10 mm²).
- The distance between signal cable and equipotential bonding line must be as short as possible (effects of antenna).
- A fine-wire line must be used (better high-frequency conductivity).
- When the equipotential bonding lines are connected to the central equipotential bonding rail, power components and non-power components must be combined.

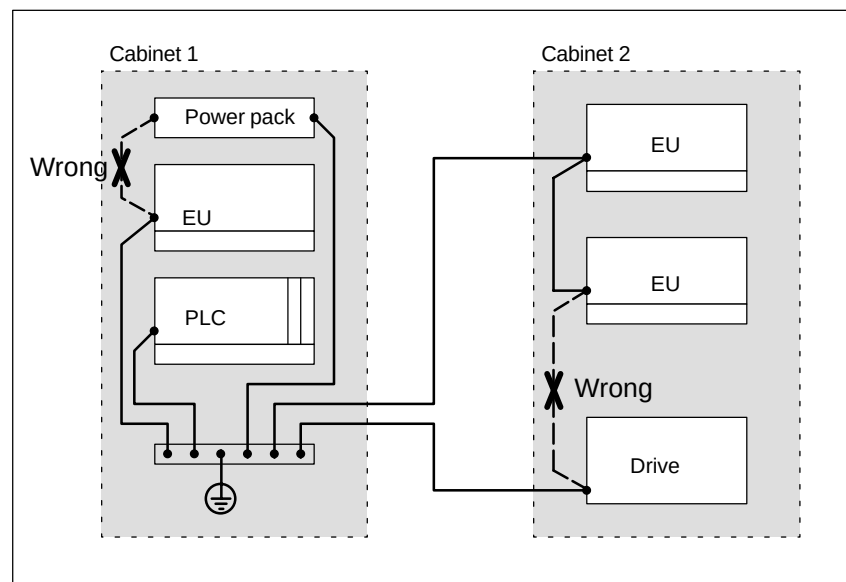


Figure 3-8 Equipotential bonding

The better the equipotential bonding in a plant, the less interference is created by potential fluctuations.

Don't confuse equipotential bonding with the protective ground of a plant. Protective ground prevents the creation of high touch voltages on defective devices.

3.3.7 Shielding the Cables

To suppress interference coupling in the signal cables, these cables must be shielded.

The best shielding is achieved by installation in steel tubing. However, this is only required when the signal line has to be led through high interference. Use of cables with braided shields is usually sufficient. In both cases, correct connection is decisive for shielding.

Note

A shield which is not connected or is not connected correctly is not a shield.

The following principles apply.

- With analog signals, the shield is connected on one side to the receiver side.
- With digital signals, the shield is applied on both sides to the housing.
- Since interference signals are frequently in the HF range (> 10 kHz), a large-surface shield which meets HF requirements is needed.

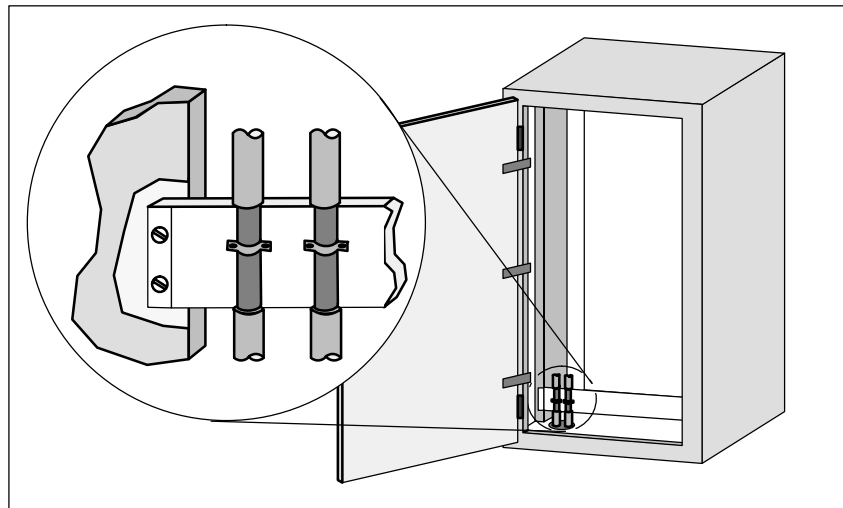


Figure 3-9 Shielding the cables

The shield bar must be connected (over a large surface for good conductivity) to the switching cabinet housing. It must be located as close as possible to the cable lead-in. The cables are bared and then clamped to the shield bar (high-frequency clamps) or bound with cable binders. Make sure that the connection is very conductive.

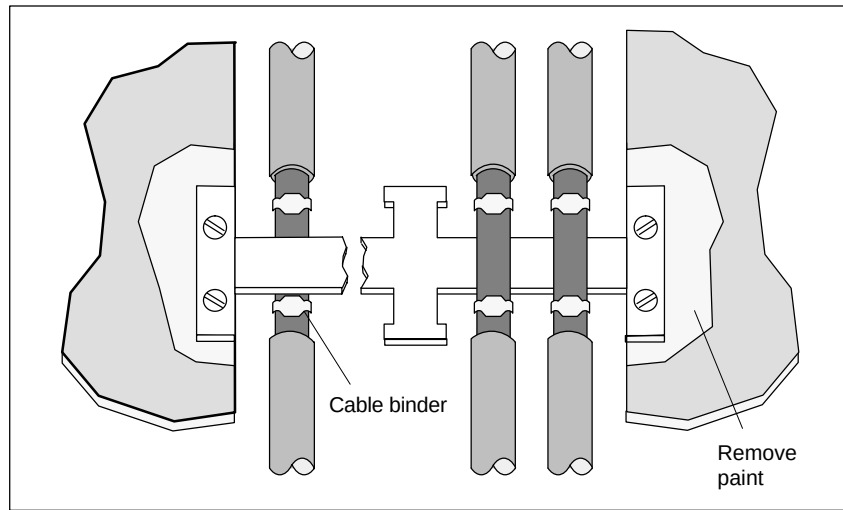


Figure 3-10 Connecting the shield bar

The shield bar must be connected with the PE bar.

If shielded cables have to be interrupted, the shield must be continued on the plug case. Only suitable plug connectors may be used.

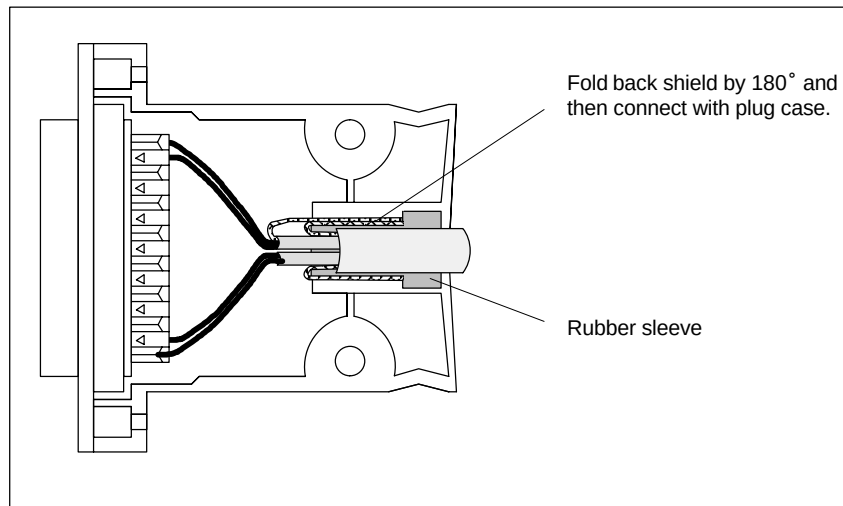


Figure 3-11 Interruption of shielded cables

If intermediate plug connectors which have no shield connection are used, the shield must be continued with cable clamps at the point of interruption. This gives you a large-surface, HF conductive connection.

3.3.8 Basic EMC Rules

Often the adherence to a few elementary rules is sufficient to ensure electromagnetic compatibility (EMC). The following rules should be observed when setting up the switching cabinet.

Shielding by the housing

- Protect the programmable controller from external interference by installing it in a cabinet or housing. The cabinet or housing must be included in the grounding concept.
- Shield the programmable controller from electromagnetic fields of inductivity by using divider plates.
- Use metallic plug connector cases for shielded data transmission lines.

Surface-shaped grounding connection

- Connect all inactive metallic parts over a large surface with low ohmic HF.
- Make a large-surface connection between the inactive metallic parts and the central grounding point.
- Don't forget to include the shield bar in the grounding concept. This means that the shield bar itself must be connected over a large surface with ground.
- Do not use aluminum parts for grounding connections.

Planning the cable installation

- Divide the cables into groups and install the groups separately.
- Always install high-voltage cables and signal lines in separate ducts or bundles.
- Always have the entire cabling enter the cabinet on only one side and at only one level.
- Install the signal lines as close as possible to grounding surfaces.
- Twist the "to" and "from" conductors of individual cables in pairs.

Shielding the cables

- Shield the data transmission cables and apply the shield on both sides.
- Shield the analog cables and apply the shield on one side (e.g., on the drive).
- Always apply the cable shields over a large surface on the cabinet leading on the shield bar and affix these with clamps.
- Continue the applied shield without interruption up to the module.
- Use braided shields and not foil shields.

Power and signal filters

- Use only power filters with metal housing.
- Connect the filter housing (over a large surface and with low ohmic HF) to cabinet ground.
- Never secure the filter housing on painted surfaces.
- Secure the filter on the cabinet's entry point or in the direction of the source of interference.

3.4 MOBY Shielding Concept

With MOBY U, the data are transferred between ASM and SLG at a speed of 19200, 38400, 57600 or 115200 Baud over an RS 422 interface. The distance between ASM and SLG can be up to 1000 m. With respect to cabling, MOBY should be handled like a data processing system. Special attention should be paid to shield installation for all data cables. The following figures shows the primary factors needed for a reliable setup.

3.4.1 SLG Cable between ASM 475 and SLG U92 with RS 422

Layout of an S7-300 with MOBY

When the SLG U92 is connected to the ASM 475, it is essential to use a shield connection terminal for the cable shield. Shield connection terminals and holder brackets are standard components of the S7-300 product family.

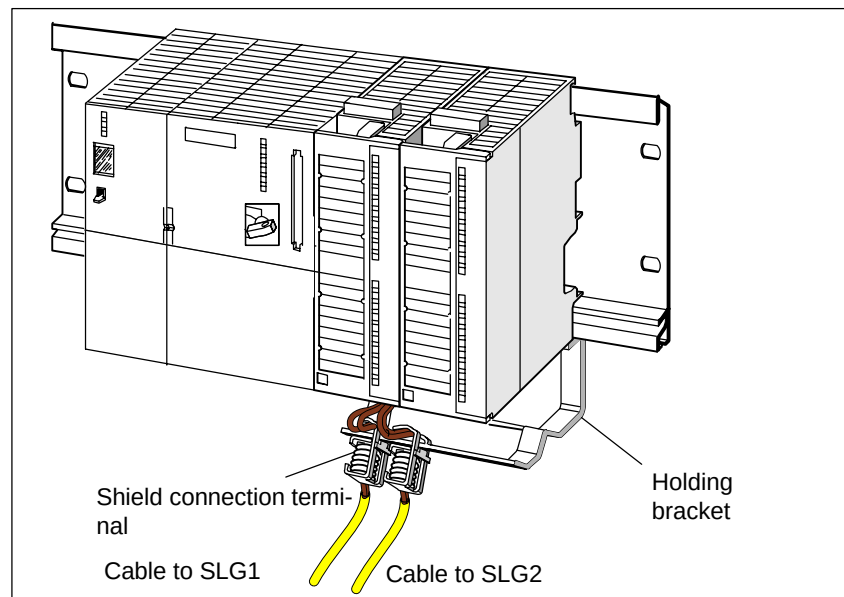


Figure 3-12 Layout of the ASM 475 with shield connecting element

3.5 SLG Cable and Plug Connector Allocations (RS 422)

The jacket used for MOBY SLG connection cables is made of polyurethane (PUR in acc. w. VDE 0250). This gives the cables very good resistance to oil, acid, lye and hydraulic fluid.

3.5.1 Cable Configuration

The cable between ASM and SLG has six cores plus shield. Four of these cores are allocated to the serial data interface. The power supply of the SLG requires two cores. Regardless of the wire diameter, data can usually be transmitted up to a distance of 1000 m.

The voltage on the connection cable drops due to the power consumption of the SLG. For this reason, the permitted cable length is usually shorter than 1000 m. It depends on the current consumption of the SLG and the ohmic resistance of the connection cable. The following table gives you an overview of the permitted cable lengths.

Table 3-3 Cable configuration

Conductor Cross Section in mm ²	Conductor Cross Section in mm	Resistance Ω/km ¹	SLG U92 with RS 422 (I = 300 mA) Max. Cable Length in m for	
			U _V = 24 V	U _V = 30 V
0.07 ²	0.3 ²	550	30	70
0.2	0.5	185	85	210
0.5	0.8	70	230	570
0.8 ²	1.0 ²	50	320	800
1.5 ²	1.4 ²	24	660	1000

- 1 The resistance values are average values. They refer to the "to" and "from" conductors. A single wire has half the specified resistance.
- 2 When these conductor cross sections are used, crimp contacts must be used in the SLG connection plug. These crimp contacts are not included with the connection plugs.

Field highlighted in gray:

Standard cable recommended by Siemens (LiYC11Y, 6 x 0.25, shielded). The cable is available from SIEMENS under the order number "6GT2 090-0A...".

Grounding of the SLG cable

We recommend always grounding the shield of the SLG cable over a large surface to the grounding rail.

Extra power pack for SLG

When an extra power pack is installed in the vicinity of the SLG, you can always use the maximum cable length of 1000 m between ASM and SLG.

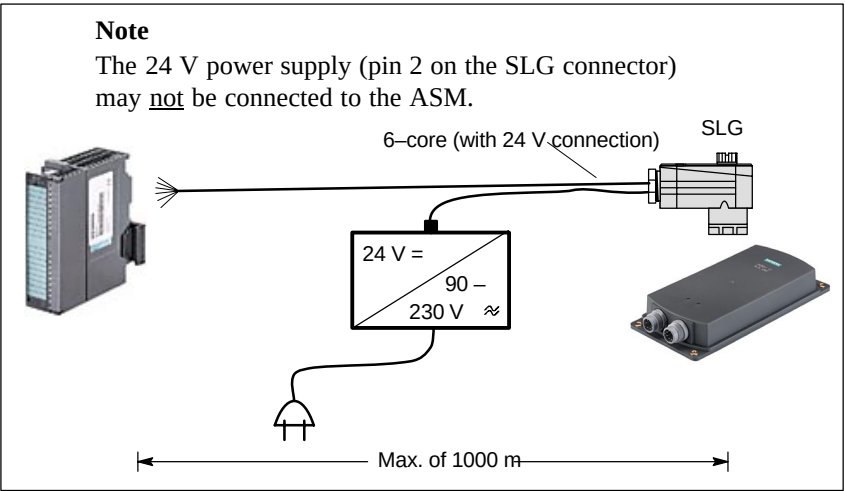


Figure 3-13 SLG with extra power pack

The power pack in our drawing can be obtained from Siemens under the number 6GT2 494-0AA00 (see chapter 7.2).

The cable from the extra power pack to the SLG must be provided by the customer.

3.5.2 Plug Connector Allocations

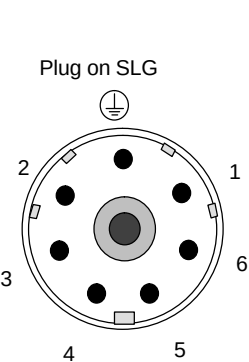


Table 3-4 Plug connector allocation of the SLG connector

Pin	Name
1	- Receive
2	+24 Volt
3	Ground (0 V)
4	+ Send
5	- Send
6	+ Receive
	Cable shield



Caution

When the extra power pack is used in the vicinity of the SLG, do not wire the +24 V pin to the ASM. (Cf. table 3-4.)

Installing the SLG plug connector

If the user has to turn the SLG plug of a prefabricated cable in a different direction, follow the diagram below and position the contact carrier differently. The plug connector on the SLG cannot be turned.

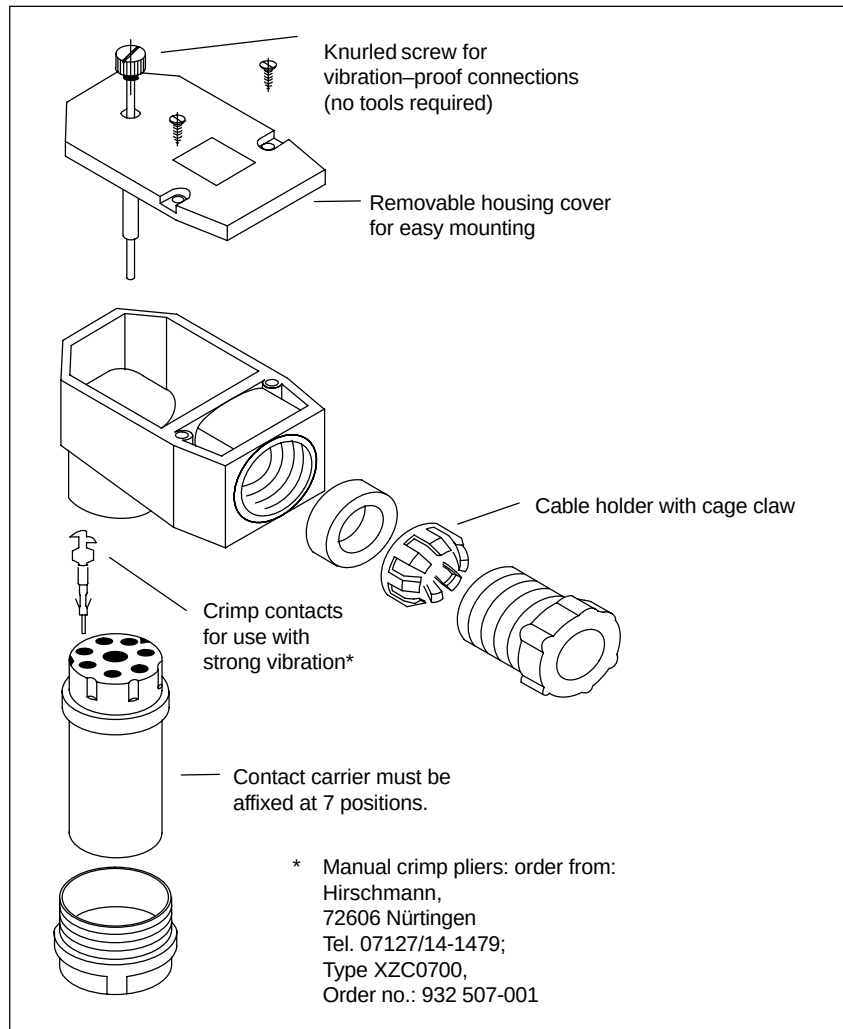


Figure 3-14 Drawing of how to mount the SLG plug connector

3.5.3 Connection Cables

Connection cable
ASM 452/473 ↔
SLG U92 with
RS 422
6GT2 091-1C...

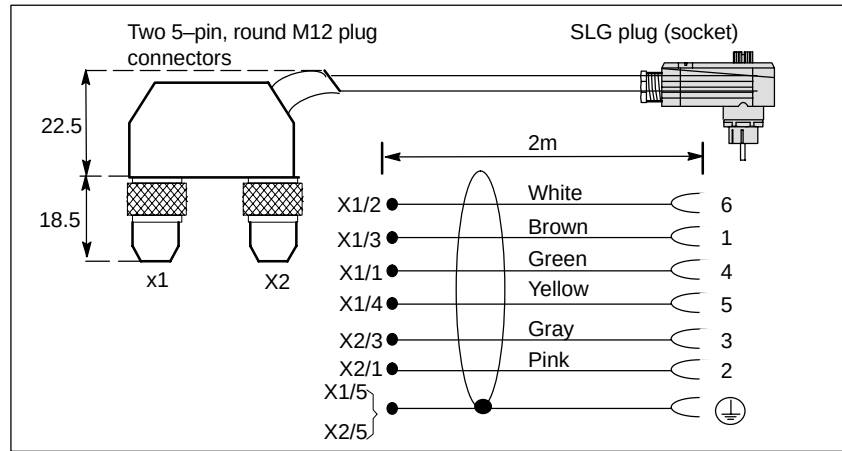


Figure 3-15 Connection cable ASM 452/473 ↔ SLG U92 with RS 422

The connection cable can be ordered in the following lengths.

Table 3-5 Cable lengths of ASM 475 ↔ SLG U92 with RS 422

Length of Stub Line in m	Order Number
2 ¹	6GT2 091-1CH20
5	6GT2 091-1CH50
10	6GT2 091-1CN10
20	6GT2 091-1CN20
50	6GT2 091-1CN50
2 ²	6GT2 091-2CH20

- 1 Inexpensive standard length
- 2 Connection cable with straight SLG plug

Connection cable
ASM 475 ↔
SLG U92 with
RS 422
6GT2 091-0E...

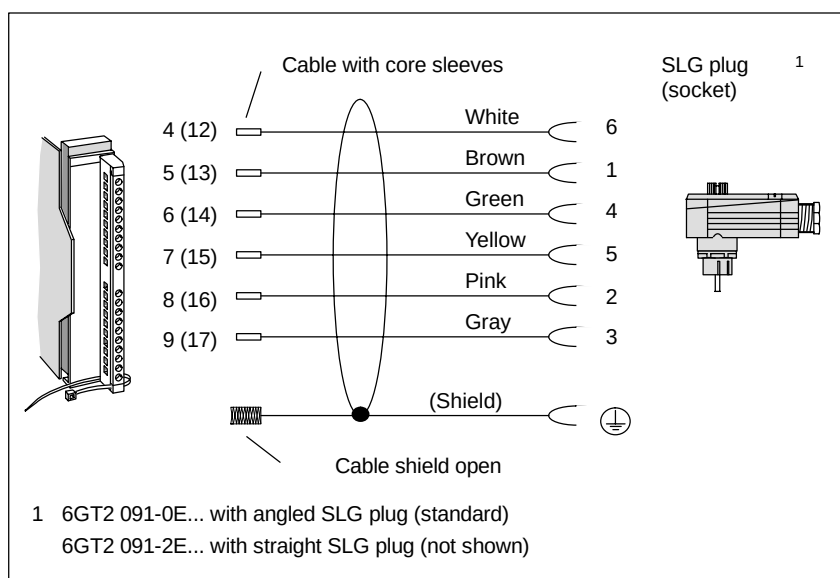


Figure 3-16 Connection cable ASM 475 ↔ SLG U92 with RS 422

The connection cable can be ordered in the following lengths.

Table 3-6 Cable lengths of ASM 475 ↔ SLG U92 with RS 422

Length of Stub Line in m	Order Number
2	6GT2 091-0EH20
5	6GT2 091-0EH50
10	6GT2 091-0EN10
20	6GT2 091-0EN20
50	6GT2 091-0EN50
2 ¹	6GT2 091-2EH20
5 ¹	6GT2 091-2EH50
10 ¹	6GT2 091-2EN10
50 ¹	6GT2 091-2EN50

1 With straight SLG plug

3.6 SLG Cable and Plug Allocations (RS 232)

With MOBY U, the data are transferred between PC and SLG at a speed of 19200, 38400, 57600 or 115200 Baud over an RS 232 interface. The distance between PC and SLG can be up to 32 m.

The SLG cable is comprised of a stub line between PC and SLG and a connection line for the 24 V power supply of the SLG from a standard power pack (see chapter 7.2).

- The connection line for the power supply has a fixed length of 5 m.
- The stub line between PC and SLG is available in two lengths (5 m and 20 m).

The connection cable for the power supply can be extended with a stub line (order number 6GT2494-0AA0).

The jacket used for MOBY SLG connection cables is made of polyurethane (PUR in acc. w. VDE 0250). This gives the cables very good resistance to oil, acid, lye and hydraulic fluid.

3.6.1 Cable Configuration

The RS 232 cable between PC and SLG has three cores plus shield. The cable for the power supply of the SLG requires two cores.

Grounding of the SLG cable

We recommend always grounding the shield of the SLG cable over a large surface to the grounding rail.

Power pack for SLG U92

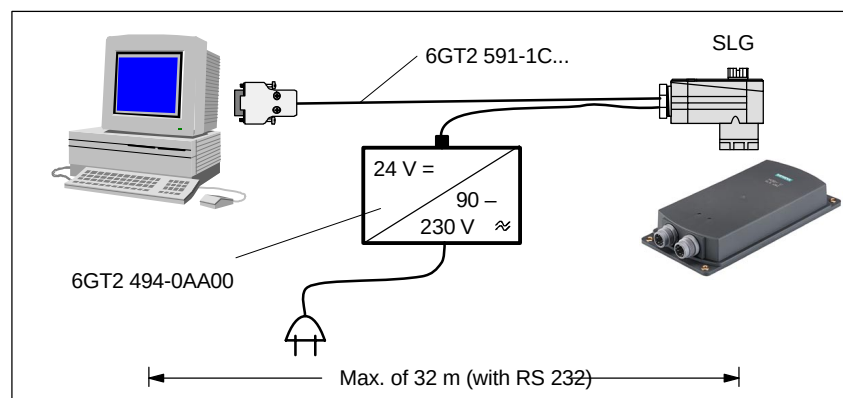


Figure 3-17 Wide-range power pack for SLG U92

The power pack in our drawing can be obtained from Siemens under the number 6GT2 494-0AA00 (see chapter 7.2).

3.6.2 Connection Cables with Lengths

Connection cable
for PC ↔ SLG U92
with RS 232
6GT2 591-1C...

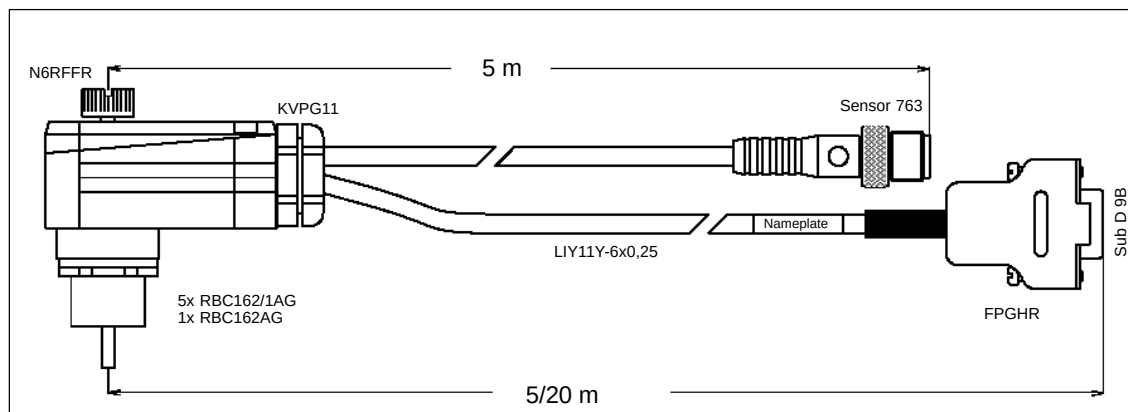


Figure 3-18 Connection cable for PC ↔ SLG U92

Table 3-7 Plug allocation of SLG plug and submin D plug

SLG (RS 232)	N6RFFR	Sensor 763 (Pin)	LIYC11Y	Sub D 9B
GND	1		Green	5 (GND)
Vdc+ (power +)	2	2 (24 V DC) white		
Vdc- (power -)	3	1 (GND) brown		
TxD (send data)	4		White	2 (RxD)
n.c.	5			
RxD (receive data)	6		Brown	3 (TxD)
Shield	GND		Shield	Housing

The connection cable can be ordered in the following lengths.

Table 3-8 Cable lengths for PC ↔ SLG U92 with RS 232

Length of Stub Line in m	Order Number
5	6GT2 591-1CH50
20	6GT2 591-1CN20

Non prefabricated cables

Users who want to make their own cables can order the following components from the MOBY catalog.

Table 3-9 Components for individually fabricated cables

Component	Order Number
SLG connection plug with screw terminals with angled output	6GT2 090-0BA00
SLG stub line; Type: 6 x 0.25 mm ²	6GT2 090-0AN50 (50 m) 6GT2 090-0AT12 (120 m) 6GT2 090-0AT80 (800 m)
M12 socket for extension of the 24 V cable	6GT2 390-1AB00

3.7 Service Cable and Plug Allocations

3.7.1 Cable Configuration

3.7.2 Plug Allocations

3.7.3 Connection Cables with Lengths

Mobile Data Memories

4

4.1 Introduction

Application area

MOBY identification systems ensure that a product is accompanied by meaningful data from the beginning to the end.

First, mobile data memories are affixed to the product or its carrier or its packaging, then conductively written, changed and read. All information on production and material flow control is located right on the product. Its robust construction permits use in rugged environments and makes the MDS insensitive to many chemical substances.

Construction and functions

The primary components of mobile data memories (MDSs) are logic, an antenna, a data memory and a battery.

To keep the MDS's power consumption low and make localization reproducible, MOBY U has different function zones based on direction and distance. The three different zones of the transmission field (see figure 4-1) represent different states and reactions of the affected components.

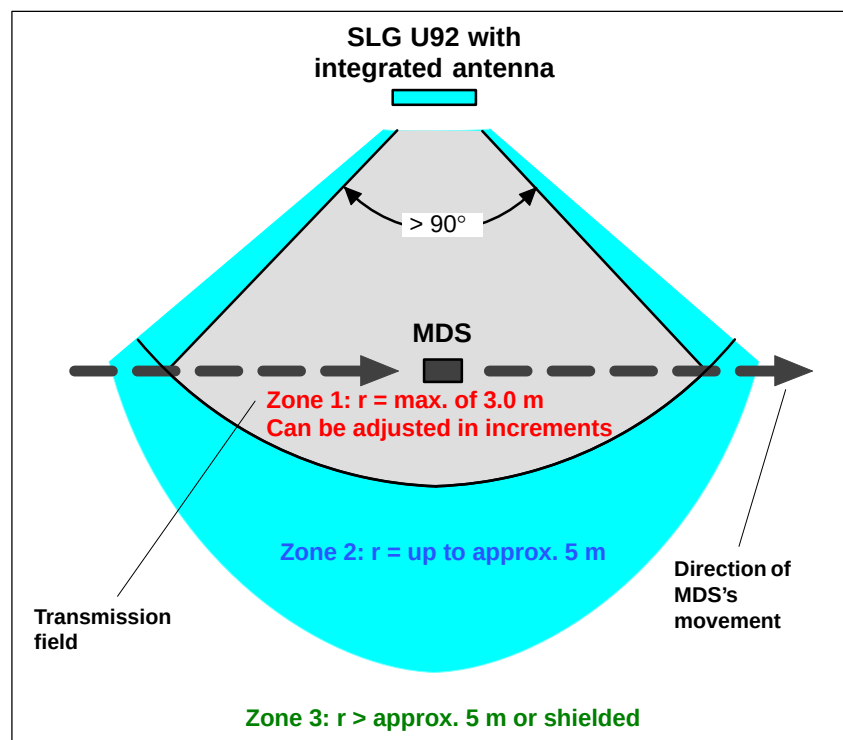


Figure 4-1 Status zones for MDS in transmission field of SLG U92

- **Zone 3:**
In simplified terms, zone 3 is the UHF-free area. The MDS is asleep and only wakes up to listen for an SLG once every < 0.5 sec. Power consumption is very low. If other UHF users are in the vicinity and they are using the same frequency range, this does not shorten the battery life of the MDS since it does not wake up until it receives a special code.
- **Zone 2:**
If the MDS receives this special code in the vicinity of an active SLG, it enters zone 2 (see figure 4-1). Starting immediately it accepts the SLG and responds briefly with its own ID. However, the SLG ignores all MDSs which are not in zone 1 (radius can be parameterized on the SLG in increments). Power consumption in zone 2 is a little higher than in zone 3.
- **Zone 1:**
When an MDS enters zone 1, it is registered by the SLG and can begin exchanging data. All read and write functions can now be performed. The power consumption of the MDS increases briefly during communication. Since transmission through the air is very fast, total communication time is very short. The entire 32-Kbyte data memory can be read in less than four seconds. This means that data communication hardly uses the battery.
As long as the MDS is located in zone 1, it is ready to exchange data when requested by the SLG. When no command for the MDS is queued, it still reports at regular parameterizable intervals with its ID (sleep-time, similar to $t\text{-ABTAST}$ with MOBY I) when requested by the SLG. Its behavior corresponds to that of zone 2. Current consumption drops again accordingly.

Overview

Table 4-1 Overview of the MDS

MDS Type	Memory Size	Temperature Range (during Operation)	Dimensions L x W x H (in mm)	Protection Rating
MDS U313	2-Kbyte RAM 32-bit fixed code 128-bit read-only memory	–25 to +70 °C	111 x 67 x 23.5	IP 67
MDS U524	32-Kbyte RAM 32-bit fixed code 128-bit read-only memory	–25 to +85 °C	111 x 67 x 23.5	IP 68
MDS U589	32-Kbyte RAM 32-bit fixed code 128-bit read-only memory	–25 to +220 °C (cyclic)	Ø 30 x 10	IP 68

Operational/ambient conditions

Table 4-2 Operational/ambient conditions of the MDS

	MDS U313	MDS U524	MDS U589
Proof of the physical strength is provided by the vibration test in acc. w. DIN EN 721-3-7, class 7 M3 Test conditions • Frequency range • Amplitude of the displacement • Acceleration • Test duration per axis • Speed of passage			
Proof of the physical strength is provided by the continuous shock test in acc. w. DIN EN 721-3-7, class 7 M3 Test conditions • Acceleration • Duration • Test duration per axis			
Torsion and bending stress	Not permitted		
Protection rating in acc. w. EN 60529	IP 67	IP 68	

Table 4-2 Operational/ambient conditions of the MDS

	MDS U313	MDS U524	MDS U589
Ambient temperature			
- During operation in acc. w. EN 60 721-3-7, class 7 K4 - During transportation and storage in acc. w. EN 60 721-3-7, class 7 K3	-25 to +70 °C -40 to +85 °C	-25 to +85 °C -40 to +85 °C	-25 to +220 °C (cyclic) -40 to +85 °C
Temperature gradient over storage temperature range, in acc. w. DIN IEC 68, part 2-14	3 °C/min		
Temperature gradient with fast temperature change in acc. w. DIN IEC 68, part 2-14	Change from 0 °C to 70 °C (85 °C) in 10 sec; Duration: 30 min; Change from 70 °C (85 °C) to 0 °C in 15 sec; 100 cycles		
Cleaning with water jet	–		Max. of 5 min at max. of 2 bar
Chemical resistance			

Definition of IP 67

- Protection against penetration of dust (dustproof)
- Total protection against accidental touch
- Protection against stream of water

Definition of IP 68:

- Protection against penetration of dust (dustproof)
- Total protection against accidental touch
- The MDS can be continuously submerged in water. Ask manufacturer for conditions.

4.2 MDS U313

The MDS U313 is a mobile data memory (MDS) with a storage capacity of 2 Kbytes for use in transportation and logistics. The particularly low current consumption guarantees a long life of 5 years. The interference-immune and robust MDS can be read and written at a maximum distance of 3 m. The MDS U313 is addressed directly with byte memory accesses. The transmission frequency in the ISM frequency band at 2.4 GHz makes the MDS's net data transmission speed very fast (up to 16 Kbyte/sec without multitaging and up to 8 Kbyte/sec with multitaging of two MDSs).



Figure 4-2 MDS U313

Ordering data

Table 4-3 Ordering data for the MDS U313

	Order No.
MDS U313 mobile data memory with 2-Kbyte RAM, MDS ID number (32 bits), read-only memory (128 bits)	6GT2500-3BD10

Technical data

Table 4-4 Technical data of the MDS U313

Fixed code memory	MDS ID number (32 bits)
Read-only memory	128 bits, to be written once by user
Application memory	
Memory technology	RAM
Memory size	2 Kbytes
Memory organization	Byte access
Data retention time	10 years
MTBF (at +40°C)	2.5 x 10 ⁶ hours (without considering battery)
Read/write distance	0.15 m up to 3 m
Depends on direction	No
Multitaging capability	Yes
Power supply	Battery

Table 4-4 Technical data of the MDS U313

Battery lifespan	≥ 5 years at 25°C ¹⁾ ; no replacement
Shock, vibration in acc. w. DIN EN 721-3-7, class 7 M3	50 g/10 g
Free fall	1 m
Mounting	4 M4screws
Tightening moment (at room temperature)	≤ 0.8 Nm
Recommended distance from metal	Can be mounted directly on metal
Protection rating in acc. w. EN 60529	IP 67
Chemical resistance	See table 4-2.
Housing	
Dimensions (L x W x H) in mm	111 x 67 x 23.5
Color/material	Anthracite/plastic, PA 12 GF 25
Ambient temperature	
Operation	–25 to +70 °C
Transportation and storage	–40 to +85 °C
Weight, approx.	100 g

- 1) Lifespan depends on temperature, time MDS is in the SLG's antenna field (zones 1 and 2) and the amount of read/written data (see chapter LEERER MERKER).

Field data (in mm)

Table 4-5 Field data of the MDS U313

	Standard	Minimal	Maximal
Working distance (S _a)	1400	350	
Limit distance (S _g)	2000	500	
Transmission window (L)	2800	700	
Transmission window (W)	2800	700	
Minimum distance of MDS to MDS with	Directly adjacent The minimum distance must be such that only one MDS can be inside the range limit.		
Bunch > 1			
Bunch = 1			

The field data apply to reading and writing the MDS. Overranging can be actively limited by the SLG (in increments of 0.5 m).

**Metal-free space
(in mm)**

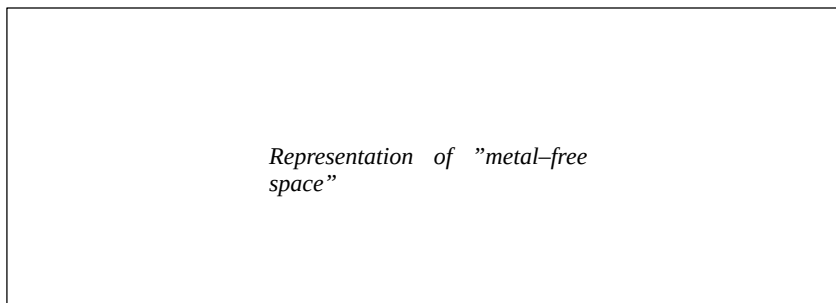


Figure 4-3 Metal-free space, MDS U313

**Dimensions (in
mm)**

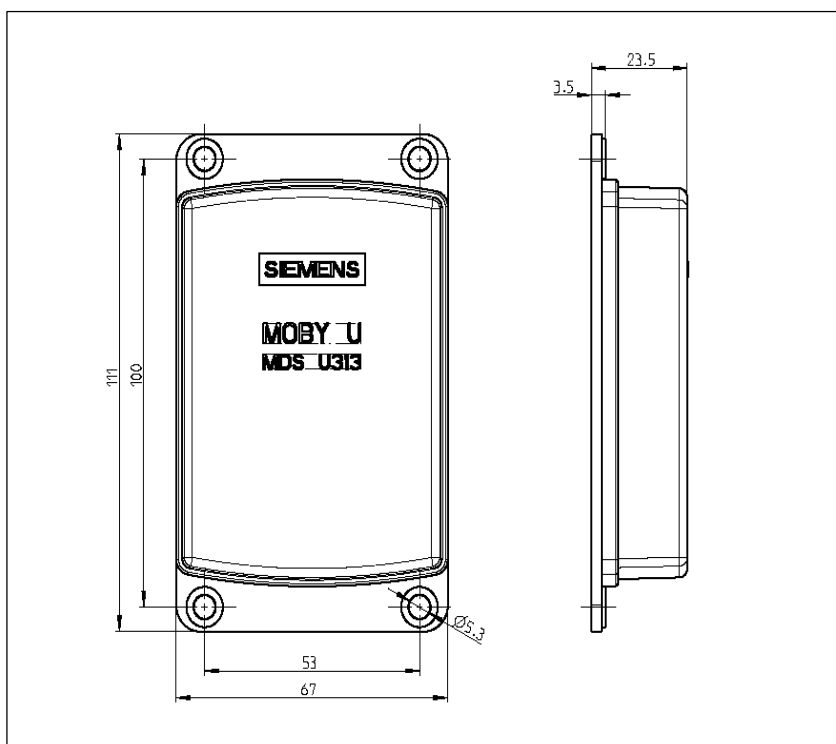


Figure 4-4 Dimensions, MDS U313

4.3 MDS U524

The MDS U524 is a mobile data memory (MDS) with a large, 32-Kbyte storage capacity for use in the automotive industry and other industrial production plants with similar requirements. The particularly low current consumption guarantees a long life of 8 years. The interference-immune and robust MDS can be read and written at a maximum distance of 3 m. Addressing the MDS U524 is easy with the filehandler (from MOBY I) which uses logical file addresses. In addition, the MDS can also be used with direct memory accessing. The transmission frequency in the ISM frequency band at 2.4 GHz makes the MDS's net data transmission speed very fast (up to 16 Kbyte/sec without multitasking and up to 8 Kbyte/sec with multitasking of two MDSs).



Figure 4-5 MDS U524

Ordering data

Table 4-6 Ordering data of the MDS 524

	Order No.
Mobile data memory MDS U524 With 32-Kbyte RAM MDS ID number (32 bits) Read-only memory (128 bits)	6GT2500-5CE10

Technical data

Table 4-7 Technical data of the MDS U524

Fixed code memory	MDS ID number (32 bits)
Read-only memory	128 bits, to be written once by user
Application memory Memory technology Memory size Memory organization	RAM 32 Kbytes Byte access; filehandler mode
Data retention time	10 years
MTBF (at +40°C)	2.5 x 10 ⁶ hours (without considering battery)
Read/write distance	0.15 m up to 3 m

Table 4-7 Technical data of the MDS U524

Depends on direction	No
Multitagging capability	Yes
Power supply	Battery
Battery lifespan	≥ 8 years at +25°C ¹ ; No replacement
Shock, vibration in acc. w. DIN EN 721-3-7, class 7 M3	50 g/10 g
Free fall	1 m
Mounting	4 M4screws
Tightening moment (at room temperature)	≤ 0.8 Nm
Recommended distance from metal	Can be mounted directly on metal
Protection rating in acc. w. EN 60529	IP 68
Chemical resistance	See table 4-2.
Housing	
Dimensions L x W x H (in mm)	111 x 67 x 23,5
Color	Anthracite
Material	Plastic, PA 12 GF 25
Ambient temperature	
Operation	–25 to +85 °C
Transportation and storage	–40 to +85 °C
Weight, approx.	100 g

- 1 Lifespan depends on temperature, time MDS is in the SLG's antenna field (zones 1 and 2) and the amount of read/written data (see chapter LEERER MERKER).

Field data (in mm)

Table 4-8 Field data of the MDS U524

	Standard	Minimal	Maximal
Working distance (S_a)	1400	350	
Limit distance (S_g)	2000	500	
Transmission window (L)	2800	700	
Transmission window (W)	2800	700	
Minimum distance of MDS to MDS with			
Bunch > 1	Directly adjacent		
Bunch = 1	The minimum distance must be such that only one MDS can be inside the range limit.		

The field data apply to reading and writing the MDS. Overranging can be actively limited by the SLG (in increments of 0.5 m).

**Metal-free space
(in mm)**

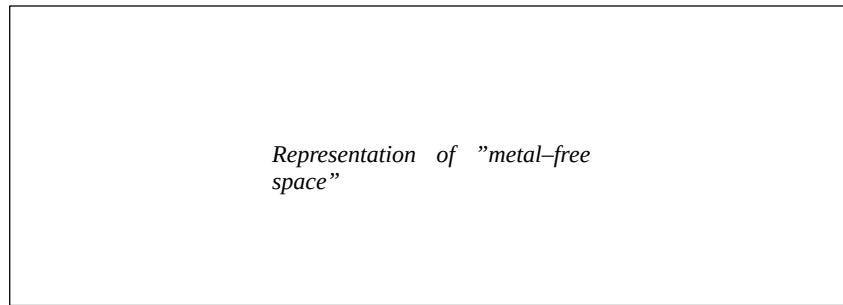


Figure 4-6 Metal-free space, MDS U524

**Dimensions (in
mm)**

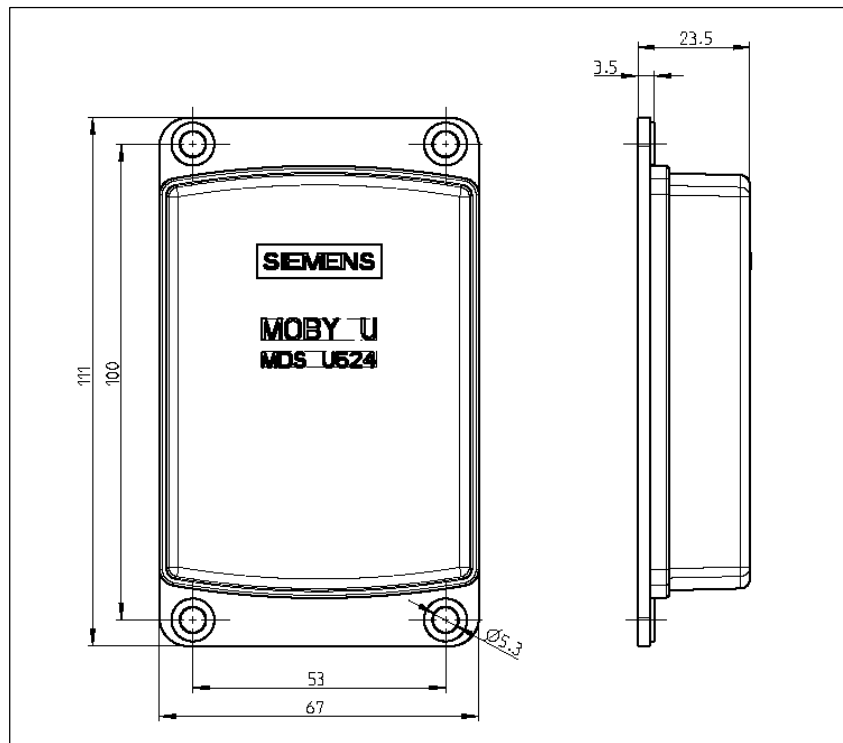


Figure 4-7 Dimensions of MDS U524

4.4 MDS U589

The MDS U589 is a mobile data memory (MDS) with a large, 32-Kbyte storage capacity. It is designed for use at high temperature ranges (up to +220 °C, cyclically) especially in the paint shops of the automotive industry. The size of the MDS permits it to be attached to a skid or directly to a chassis. The particularly low current consumption guarantees a long life of 5 years. The interference-immune and robust MDS can be read and written at a maximum distance of 3 m. Addressing the MDS U589 is easy with the filehandler (from MOBY I) which uses logical file addresses. In addition, the MDS can also be used with direct memory accessing. The transmission frequency in the ISM frequency band at 2.4 GHz makes the MDS's net data transmission speed very fast (up to 16 Kbyte/sec without multitaging and up to 8 Kbyte/sec with multitaging of two MDSs).

Some typical applications are listed below.

- Basic coat, KTL area, cataphoresis with drying chambers
- Covering coat
- Washing at temperatures > 85 °C
- Other applications with high temperatures



Figure 4-8 MDS U589

Ordering data

Table 4-9 Ordering data of the MDS U589

	Order No.
Mobile data memory MDS U589 With 32-Kbyte RAM MDS ID number (32 bits) Read-only memory (128 bits)	6GT2 500-5JK10
Accessories: Holder Standard model for MDS U589 Short model for MDS 439E/U589 Long model for MDS 439E/U589 Covering hood for MDS 439E/U589	6GT2 590-0QA00 6GT2 090-0QA00 6GT2 090-0QA00-ZA31 6GT2 090-0QB00

Technical data

Table 4-10 Technical data of the MDS U589

Fixed code memory	MDS ID number (32 bits)
Read-only memory	128 bits, to be written once by user
Application memory Memory technology Memory size Memory organization	RAM 32 Kbytes Byte access; filehandler mode
Data retention time	10 years
MTBF (at +40°C)	2.5 x 10 ⁶ hours (without considering battery)
Read/write distance	0.15 m up to 3 m
Depends on direction	No
Multitagging capability	Yes
Power supply	Battery
Battery lifespan	≥ 5 years at +25°C ¹ ; No replacement
Shock, vibration in acc. w. DIN EN 721-3-7, class 7 M3	50 g/5 g ²
Free fall	1 m
Mounting	With holder
Recommended distance from metal	Can be mounted directly on metal
Protection rating in acc. w. EN 60529	IP 68
Chemical resistance	See table 4-2.
Housing Dimensions (Ø x H) in mm Color/material	114 x 83 Brown/PPS
Ambient temperature Operation Transportation and storage	–25 to +220 °C (cyclic) –40 to +85 °C
Weight, approx.	600 g

- 1 Lifespan depends on temperature, time MDS is in the SLG's antenna field (zones 1 and 2) and the amount of read/written data (see chapter LEERER MERKER).
- 2 Only applies to original holder

Field data (in mm)

Table 4-11 Field data of the MDS U589

	Standard	Minimal	Maximal
Working distance (L_a)	1400	350	
Limit distance (L_g)	2000	500	
Transmission window (L)	2800	700	
Transmission window (W)	2800	700	
Minimum distance of MDS to MDS with Bunch > 1 Bunch = 1	Directly adjacent The minimum distance must be such that only one MDS can be inside the range limit.		

The field data apply to reading and writing the MDS. Overranging can be actively limited by the SLG (in increments of 0.5 m).

Cyclic operation of MDS at temperatures > 85 °C

At temperatures between 85 °C and 200 °C (briefly at 220 °C), the interior temperature of the MDS must never be allowed to exceed the critical threshold of 85 °C. Every heating up phase must be followed by a cooling off phase. The following tables lists several cycles of the MDS U589 at its utmost limits.

Table 4-12 Cycles of the MDS U589 at its utmost limits

T_u (Heating Up)	Heating Up	T_u (Cooling Off)	Cooling Off
200°C	1 h	25 °C	> ? h
		25 °C	> ? h
		25 °C	> ? h
		25 °C	> ? h

Siemens will calculate a temperature profile on request.

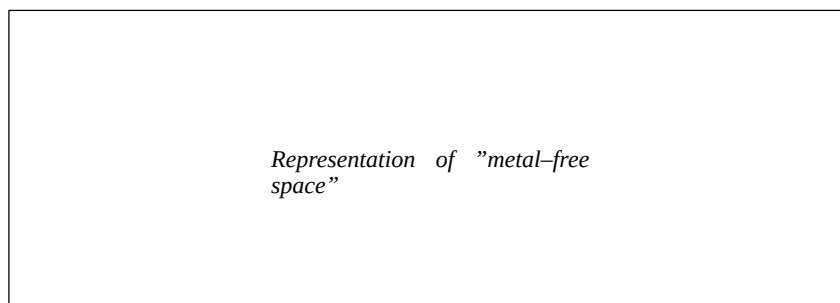
Metal-free space (in mm)

Figure 4-9 Metal-free space, MDS U589

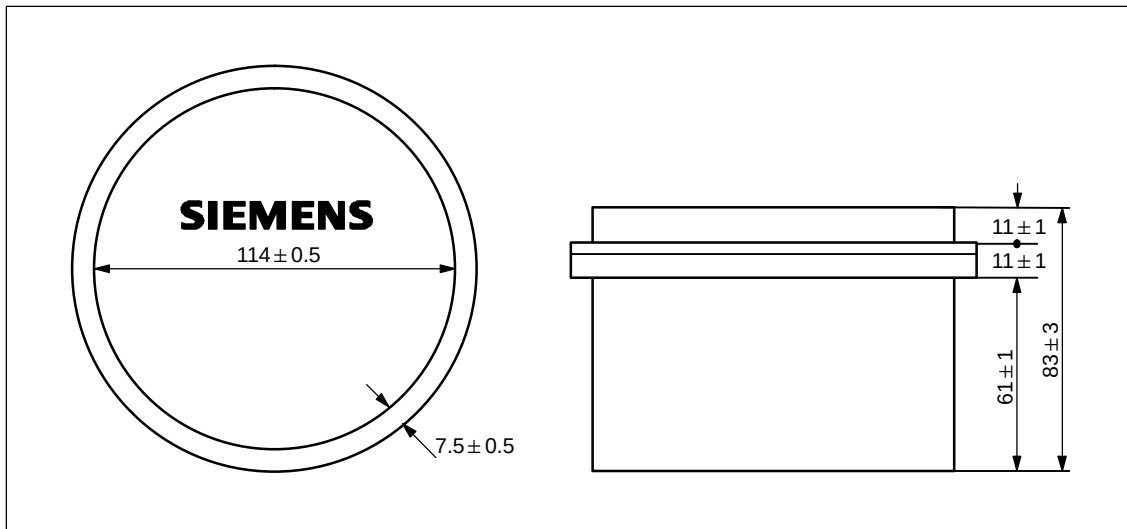
**Dimensions
(in mm)**

Figure 4-10 Dimensions of the MDS U589

Read/Write Devices

5

5.1 SLG U92

Application area

The MOBY U identification system was designed especially for applications in automotive production, logistics and similar where high demands are placed on interference immunity, long read/write distances with moving data memories, quick and reliable data transmission, easy installation, and reliable function even in rugged environments. It uses the ISM frequency band of 2.4 GHz (familiar world-wide). Its emission strength is way below the values recommended by well-known health authorities from all over the world.

MOBY U covers a transmission range **of up to three meters** and thus provides the prerequisites for a transparent identification solution. The SLG is available for every situation with 2 interface versions.

The **primary application areas** for MOBY U are listed below.

- Main assembly lines of the automotive industry (raw product manufacturing, surface treatment and assembly)
- Vehicle identification/entry check for moving companies, vehicle parks, and so on
- Container/pallet identification for transportation logistics and distribution
- Traffic control technology
- Assembly lines

Setup and functions

The SLG U92 handles the commands received from the interface or PC/PLC. The commands with the data to be read or written are converted into appropriate communication commands via the HF interface between SLG and MDS. The amount of data that can be transferred between SLG and MDS depends on the following factors.

- The speed at which the MDS moves through the SLG's transmission window
- The length of the transmission window
- The number of MDSs in the transmission window (bunch/multitag)
- The time during which the MDS is ready for communication (depends on sleep time and standby time)

The SLG U92 is available in two hardware versions for connection to different systems.

- System interface with RS 232
for serial connection to any system
(PC/PLC/communications processors)
- System interface with RS 422
for serial connection to MOBY interfaces (ASM 475, ASM 473, ASM 452) for integration in SIMATIC S7 or PROFIBUS or any system (PC/PLC/communications processors)

Except for the system interface, the hardware and firmware of both hardware versions are identical.

Software tools such as SIMATIC S7 functions (FC 45/FC 46) and the MOBY API library for applications under Windows 98/NT/2000 make implementation in specific applications easy.

The integrated file management system (compatible with the familiar MOBY I filehandler and supplemented with multitag commands) ensures simple, convenient administration of data on the mobile data memories.

The SLG U92 works with a transmission frequency in the ISM band between 2.4 and 2.4835 GHz. This makes transmission distances of up to three meters possible with a very low sending strength (less than 50 mV per meter at 3-m intervals) and high net transmission speeds of up to 16 Kbyte/sec. By selection of the transmission frequency, use of robust modulation procedures and appropriate check routines, sources of electromagnetic interference can be disregarded and you are still assured of correct data transmission and integrity. MOBY U technology eliminates familiar interference during UHF transmissions such as reflection, interference and overranging. Specially designed antennas ensure a homogenous transmission field in which mobile data memories (MDSs) are always (100%) detected. This means expensive shielding and antenna directing can be omitted. The antenna field of the SLG can be activated and deactivated for communication with an MDS with a function call or automatically by triggering a digital input. There are two ways to manage the data on the mobile data memory.

- Byte addressing via **absolute addresses** (start address, length)
- Conveniently with a **file management system** (compatible with the MOBY I filehandler)

When the filehandler is used, the MOBY U read/write device always fetches its file management information directly from the MDS.

The SLG U92 can be run at three levels.

1. MOBY U can be used for existing system solutions with MOBY I with standard settings, unchanged filehandler functions but without the MOVE and LOAD commands which used to be required.
2. Only a few extra commands are required for changes in the standard settings and requesting diagnostic data.
3. Utilization of all features including multitaging. At this level, the commands and/or user data can also be clearly related to the MDS number.

Two LEDs show the current status (e.g., communication) and make commissioning easier.

A separate service and diagnostic interface (RS 232) is available for easy commissioning and diagnosis later during regular operation. In addition, the service function "load software to SLG" can be used to load future function expansions via this interface without having to exchange the SLG in existing applications.



Figure 5-1 Read/write device SLG U92

Ordering data

Table 5-1 Ordering data of the SLG U92

SLG U92 read/write device with RS 422	6GT2501-0CA00
SLG U92 read/write device with RS 232	6GT2501-1CA00

Technical data

Table 5-2 Technical data of the SLG U92

Air interface		
Transmission frequency	2.4 to 2.4835 GHz	
Band width	2 x 1 MHz within 83 MHz	
Gross bit rate of radio channel	384 kbit/sec	
Data transmission speed (net)	Without bunch	With bunch size of 2
Write	Approx. 16.0 Kbyte/sec	Approx. 8.0 Kbyte/s
Read	Approx. 14.4 Kbyte/sec	Approx. 7.2 Kbyte/sec
Range (read/write)	0.15 m up to 3 m	
Limit distance (L _g)	Adjustable via range limitation	
Maximal	3.0 m	
Minimal	0.5 m	
Default	1.5 m	
Location resolution	Range limitation, adjustable in 0.5 m increments	
Working distance (L _a)	Approx. 75% of limit distance L _g	
Field length/width at L _g = 1.5 m	2 m	
Read/write device (SLG)		
Functions	MOBY filehandler Direct read/write access	
Multi-identification capability	Up to 12 MDSs	
MDS recording time	< 1 sec for 12 MDSs	
Object speed	< 2 m/sec at L _a = 1.5 m and ≤ 2.5 Kbytes of data read/written	
Power supply	24 V DC (nominal value), 20 V DC to 30 V DC Limited Power Source according EN 60 950 / IEC 60 950	
Current consumption (send)	< 300 mA	
Operating modes (SLG)	Standby Search Communication	
Synchronization, SLG - SLG	By semaphore control with 2nd interface; max. of 3 SLGs together	
Minimum distance between two SLGs	> 6 m Directly adjacent with synchronization SLG - SLG	

Table 5-2 Technical data of the SLG U92

ASM/PC Interface	6-pin SLG plug in acc. w. EN 175201-804 RS 232 or RS 422 (SLG U92 version)
Transmission speed	Automatic baud rate recognition, 19.2 to 115.2 KBaud (depends on ASM/PC and/or line length) 3964 R
Transmission protocol	Max. of 1000 m (RS 422; shielded)
Line length, SLG - ASM	Max. of 30 m (RS 232; shielded)
Line length, SLG - PC	
Service interface	11-pin plug in acc. w. EN 175201-804
Interface for service	RS 232
Transmission speed	19.2 KBaud
Line length, SLG - PC	Max. of 30 m
Transmission protocol	Terminal, ASCII characters
2 DIs for proximity switch	
DI 1/DI 2	Proximity switch for trigger antenna field, on/off
DI 1 (or DI 2)	Proximity switch for antenna field duration, on
Line length, SLG - proximity switch	Max. of 50 m
Interface for SLG synchronization	
Line length, SLG - SLG	Max. of 30 m
Indicator elements	2 LEDs
Housing	
Dimensions [L x W x H]	290 x 135 x 42 without plug
Color	Anthracite
Material	Plastic, PA 12 GF 25
Mounting	4 M6screws
Tightening moment (at room temperature)	≤ 2 Nm
Shock, vibration in acc. w. DIN EN 721-3-7, class 7 M3	30 g/1.5 g
MTBF (at +40 °C)	2 x 10 ⁶ hours
Protection rating in acc. w. EN 60529	IP 65
Ambient temperature	
Operation	–25 to +70 °C
Transportation and storage	–40 to +85 °C
Weight, approx.	900 g

Table 5-2 Technical data of the SLG U92

Antenna	Integrated in the SLG
Emission	< 50 mV per meter at 3-m intervals
Emission density	< 0.5 mW/cm ² (at distance of 1 m)
Angle of opening	Approx. 90 ° horizontal/vertical
Polarization	Circular
Certifications	BAPT (ETS 300 440), FCC (15.249) CE (ETS 300 683), UL, CSA Safe for pacemakers

Field data

The field data are the same regardless of MDS type.

Table 5-3 Technical data of the SLG U92

Working distance (L _a)	150 to
Limit distance (L _g)	
Transmission window L	
Minimum distance D from SLG to SLG	

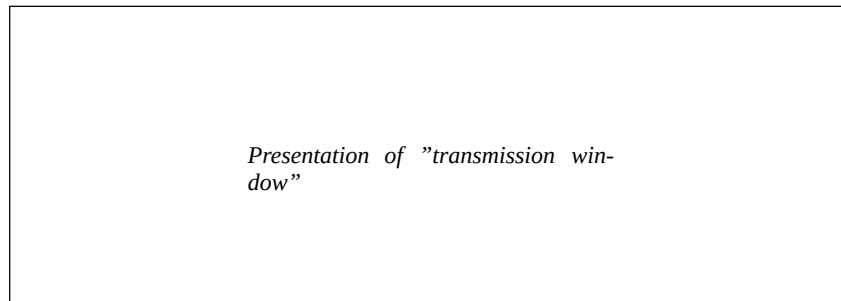
Transmission window

Figure 5-2 Transmission window of the SLG U92

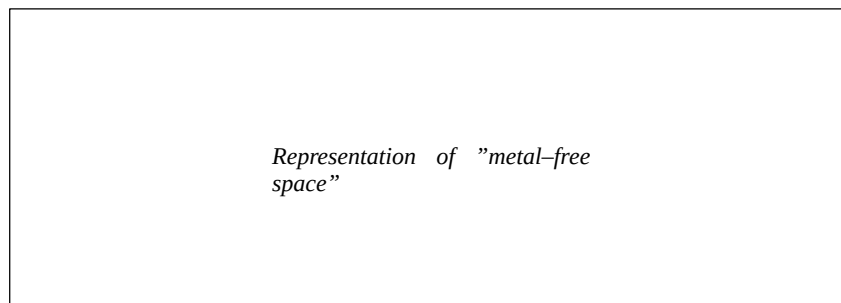
Metal-free space (in mm)

Figure 5-3 Metal-free space of SLG U92

Definition distance D

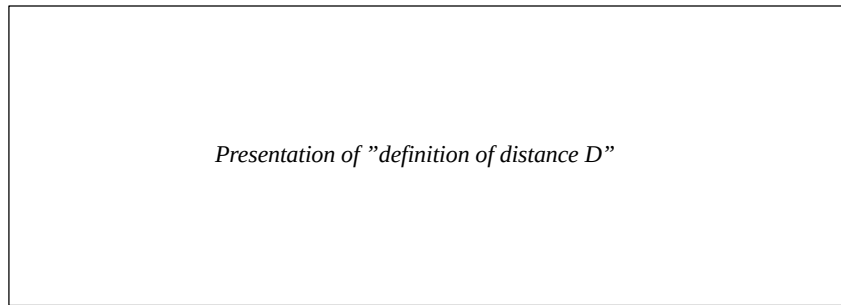


Figure 5-4 Distance D: SLG U92

Dimensions (in mm)

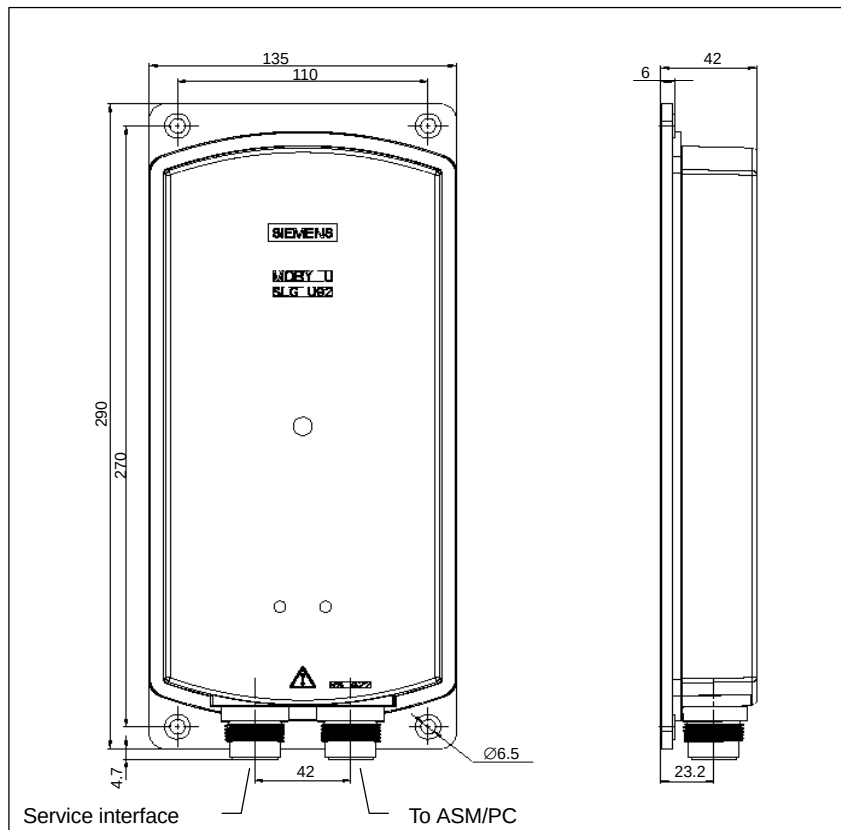


Figure 5-5 Dimensional drawing of the SLG U92

Interfaces

6

6.1 Introduction

Application area The ASM interfaces are the link between the MOBY U components (SLGs/MDSs) and the high-level controllers (e.g., SIMATIC S7) or PCs or computers. Depending on the interface used, up to two SLGs can be connected.

Setup and functions An ASM consists of a microcontroller system with its own program (PROM). The CPU receives the commands over the user interface and stores these in the RAM. The user receives an acknowledgment that the command has arrived. If the command is okay, the CPU begins executing it.

Overview

Table 6-1 Overview of the interfaces

ASM Type	Interfaces to PC/ Computer	Interfaces to SLG	Function Blocks	SLG Connections	Dimensions (W x H x D in mm)	Temperature Range (Operation)	Protection Rating
ASM 452	PROFIBUS-DPV1	2 x 5-pin prox. switch plug	FC 45 FC 46 FC 56	1	134 x 110 x 55	0 to +55 °C	IP 67
ASM 473	Can be plugged into ET 200X	2 x 5-pin prox. switch plug	FC 45 FC 56	1	87 x 110 x 55	0 to +55 °C	IP 67
ASM 475	Can be plugged into S7-300/ ET 200M	Via screw terminals	FC 45 FC 56	2 (parallel)	40 x 125 x 120	0 to +60 °C	IP 20

6.2 ASM 452

Application area

The ASM 452 interface is a MOBY module for use with MOBY components via PROFIBUS-DPV1 on the following devices.

- All computers and PCs
- All controllers

When the interfaces are used with a SIMATIC S7, function blocks are available to the user.



Figure 6-1 Interface ASM 452

The ASM 452 represents the further development of the familiar 450/451 interface modules. By using non-cyclic data communication on PROFIBUS-DPV1, even the most extensive PROFIBUS configurations have optimum data throughput. The minimum cyclic data load of the ASM 452 on PROFIBUS guarantees the user that other PROFIBUS stations (e.g., DI/DO) will continue to be processed very quickly.

The ASM 452 is an interface module for communication between PROFIBUS and the SLG U92 with RS 422. The data on the MDS U313/524/589 can be addressed with the ASM 452 in the following ways.

- Physical addressing ("normal" addressing) or
- With a filehandler similar to DOS

The SIMATIC S7 offers FCs for the two methods of access.

- FC 45 for "normal" addressing
- FC 46 for filehandler without multitasking. FC 56 for filehandler with multitasking.

FC 45 and FC 46/56 give the S7 user an easy-to-use interface with powerful commands. FC 45 and FC 56 offer additional command chaining and S7 data structures via UDTs.

Ordering data

Table 6-2 Ordering data of the ASM 452

Interface ASM 452 for PROFIBUS-DPV1 can be connected with 1x SLG U92 with RS 422	6GT2 002-0EB20
Accessories: Plug connector for PROFIBUS-DP connection and 24 V power	6ES7 194-1AA00-0XA0
SLG cable ASM 452 ↔ SLG Length 2 m; standard cable Other lengths: 5 m, 10 m, 20 m and 50 m	6GT2 091-1CH20 6GT2 091-1C...
Opt. conn. plug without SLG cable (for cable lengths > 20 m) ASM 452 ↔ SLG	6GT2 090-0BC00
M12 covering caps for unused SLG connections (1 package = 10 each)	3RX9 802-0AA00
MOBY software ¹⁾ with FC 46, FC 45, FC 56, GSD file	6GT2 080-2AA10
Replacement part: Plug connector plate; T design for PROFIBUS connection	6ES7 194-1FC00-0XA0
Description of FC 45 (for ASM 452) deutsch English	6GT2 097-3AM00-0DA1 6GT2 097-3AM00-0DA2
Description of FC 46 (for ASM 452) deutsch English	6GT2 097-3AC40-0DA1 6GT2 097-3AC40-0DA2
Description of FC 56	

1) See chapter .7.1

Technical data

Table 6-3 Technical data of ASM 452

	ASM 452 with FC 45	ASM 452 with FC 46	ASM 452 with FC 56
Serial interface to user	PROFIBUS-DPV1		
Procedure after connection	EN 50170, vol. 2, PROFIBUS PG 11 screw connection PROFIBUS and power supply plugs are not included.		
Transmission speed	9600 Baud to 12 Mbaud (automatic detection)		
Max. block length	2 words (cyclic)/240 bytes (non-cyclic)		
Serial interface to SLG			
Plug connector	2 M12 coupling plugs		
Line length, max.	2 m = standard length; Other prefabricated cables: 5 m, 10 m, 20 m, 50 m (up to 1000 m on request)		
SLGs which can be connected	1x SLG U92 with RS 422		
Software functions			
Programming	Depends on PROFIBUS-DP master		
Function blocks for SIMATIC S7	FC 45	FC 46	FC 56
MDS addressing	Direct access with addresses	Access via logical file names (file system similar to DOS)	
Commands	Initialize MDS, read data from MDS, write data to MDS, and so on	Format MDS, read file, write file, and so on	
Multitag capability	No	No	Yes
S7 data structures via UDTs	Yes	No	Yes
Voltage			
Nominal value	24 V DC		
Permissible range	20 to 30 VDC		
Current consumption	Max. of 180 mA; typ. 130 mA (without SLG, DO not loaded)		
Digital inputs	None		
Digital outputs	None		
Ambient temperature			
Operation	0 to +55 °C		
Transportation and storage	-40 to +70 °C		
Dimensions (W x H x D) in mm	134 x 110 x 55 (without bus plug)		

Table 6-3 Technical data of ASM 452

	ASM 452 with FC 45	ASM 452 with FC 46	ASM 452 with FC 56
Mounting	4 M5 screws; Mounting on all plates or walls		
Weight, approx.	0.5 kg		
Protection rating	IP 67		
MTBF (at 40 °C)	30 x 10 ⁴ hours = 34 years		

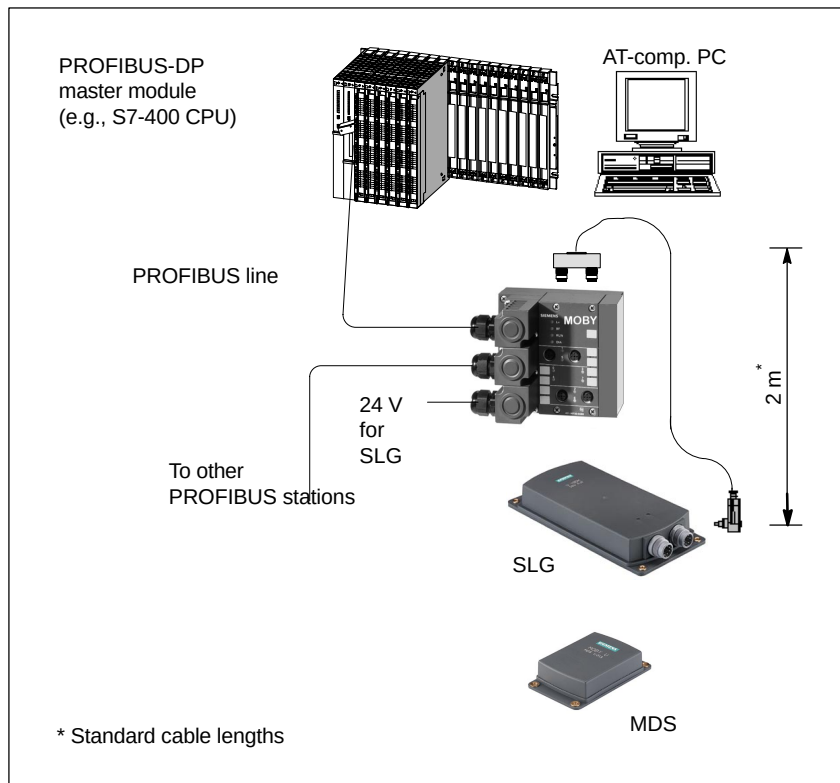


Figure 6-2 Configurator – ASM 452

Hardware description

The ASM 452 has the same housing as the distributed I/O device ET 200X. For the general chapters on the ASM 452 (e.g., mounting, operation and wiring, general technical data) see the ET 200X manual (order no. 6ES7 198-8FA00-8AA0). Accessories and network components are also covered by this manual.

PROFIBUS configuration

The ASM 452 is integrated in the hardware configuration with a GSD file. The ASM is then configured with HW Config of SIMATIC Manager or another PROFIBUS tool. "MOBY software" contains a GSD file for the ASM 452.

SLG connection technology

An SLG always occupies two M12 connection sockets on the ASM 452. A prefabricated cable (cf. figure 6-4) makes it very easy to connect the SLG. The standard version of the connection cable has a length of 2 m. Other available lengths are 5 m, 10 m, 20 m and 50 m.

An SLG connection plug with screw terminals is available for users who want to make their own cables (see figure 6-3). Cables and SLG connection plugs can be ordered from the MOBY catalog.

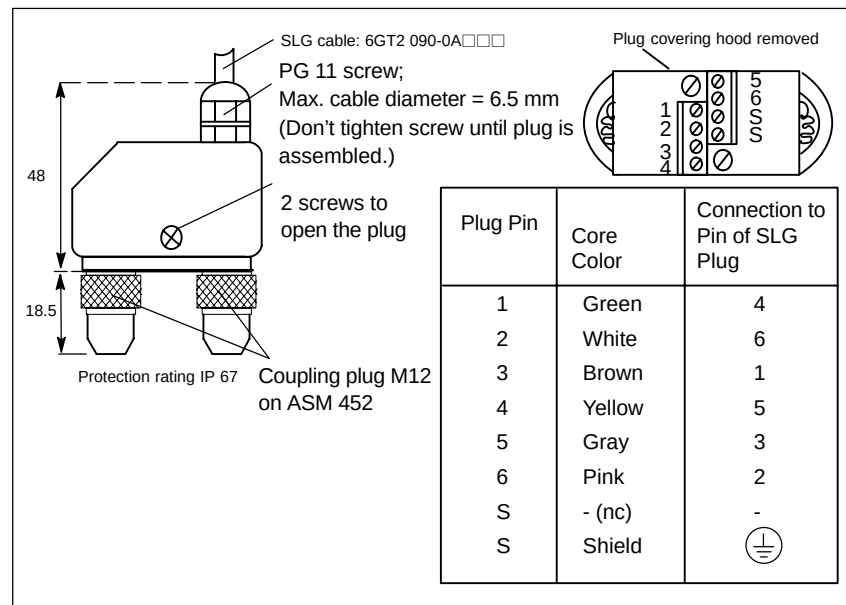


Figure 6-3 Connection plug for ASM 452, 473 ↔ SLG U92 with RS 422 (6GT2 090-0BC00)

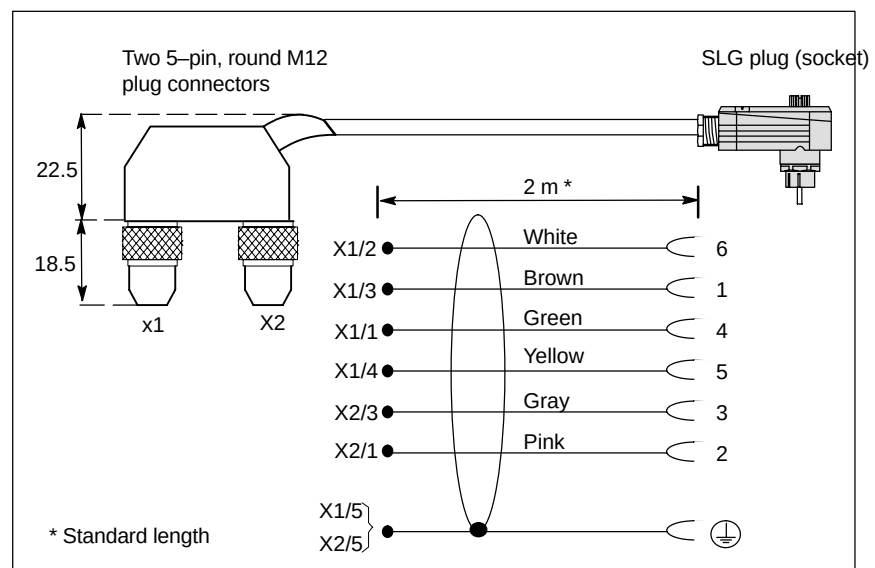


Figure 6-4 Connection cable for ASM 452, 473 ↔ SLG U92 with RS 422 (6GT2 091-1CH20)

Dimensional drawing

The following diagram shows a dimensional drawing of the ASM 452 with bus connection plugs. The length of the PG screws and the radius of the cable must both be added to the total width and depth specified below.

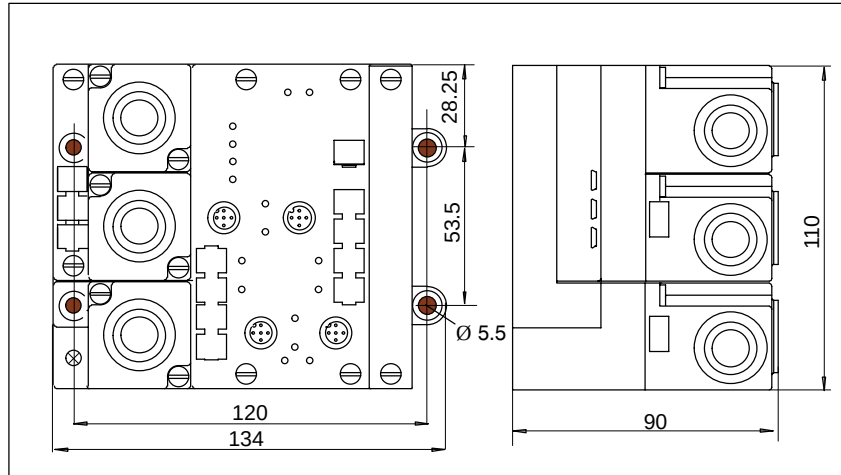


Figure 6-5 Dimensional drawing of the ASM 452

Pin allocations

The figure below shows the pin allocations of the ASM 452.

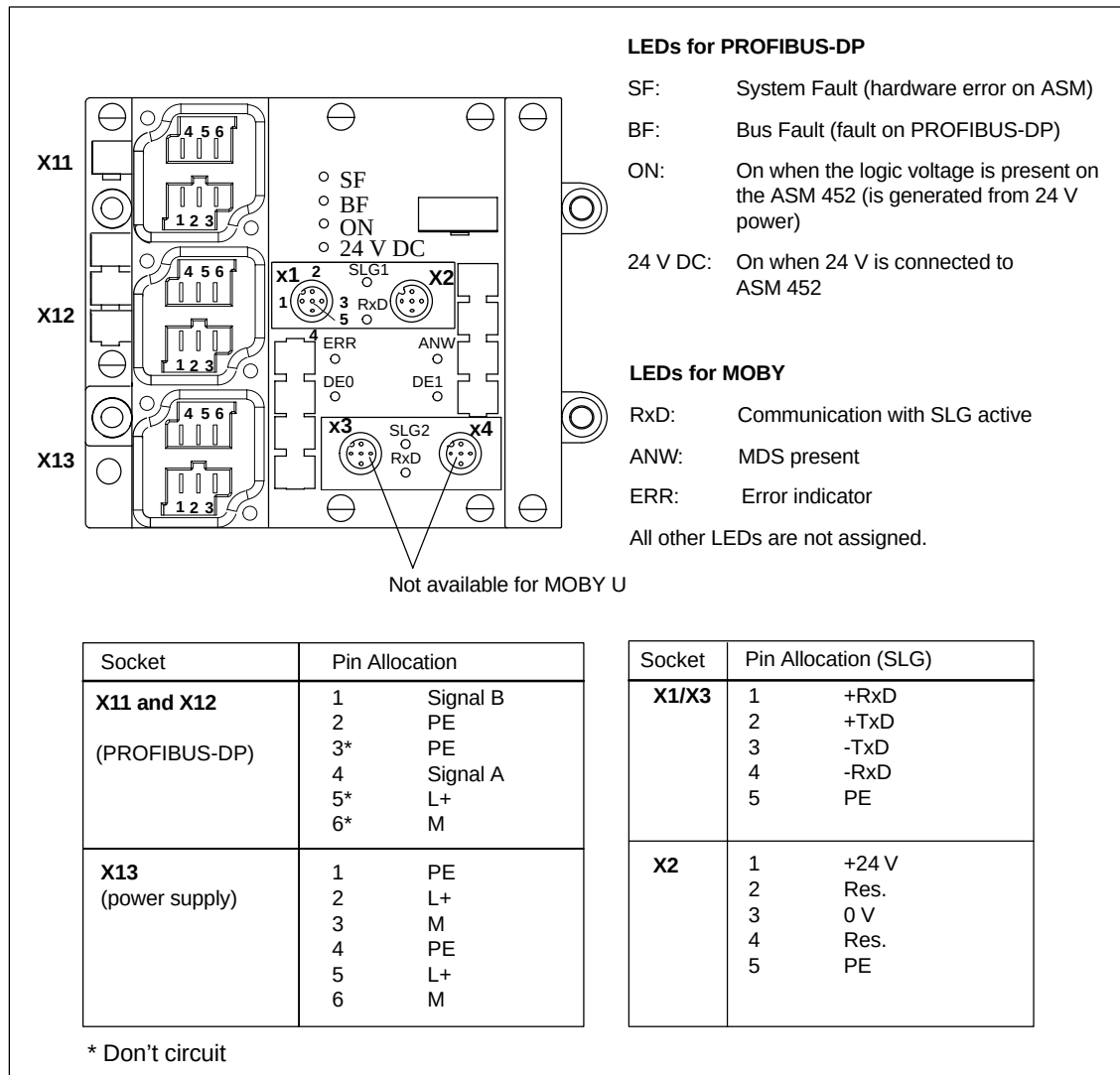


Figure 6-6 Pin allocation and LEDs of the ASM 452

Example of how much cable to bare

The following figure shows an example of how to bare a cable. The lengths apply to all cables which you can connect to the connection plugs. Twist existing shield braiding, stick in a core sleeve, and trim off excess.

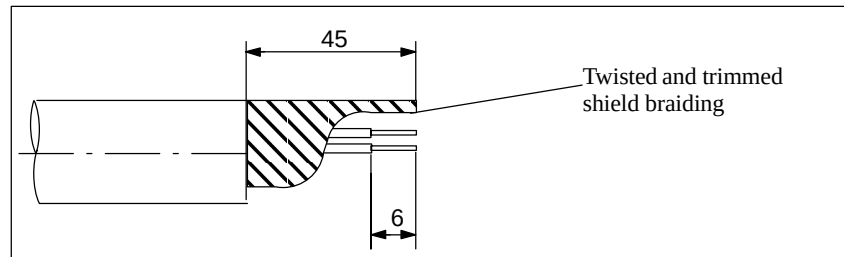


Figure 6-7 Length of bared cable for PROFIBUS cable

PROFIBUS address and terminating resistance

The plug connector plate of the ASM must be removed before you can set the PROFIBUS address or turn on the terminating resistance. The plug connector plate covers the DIP switches. The following figure shows the location of the DIP switches on the ASM and the applicable sample setting.

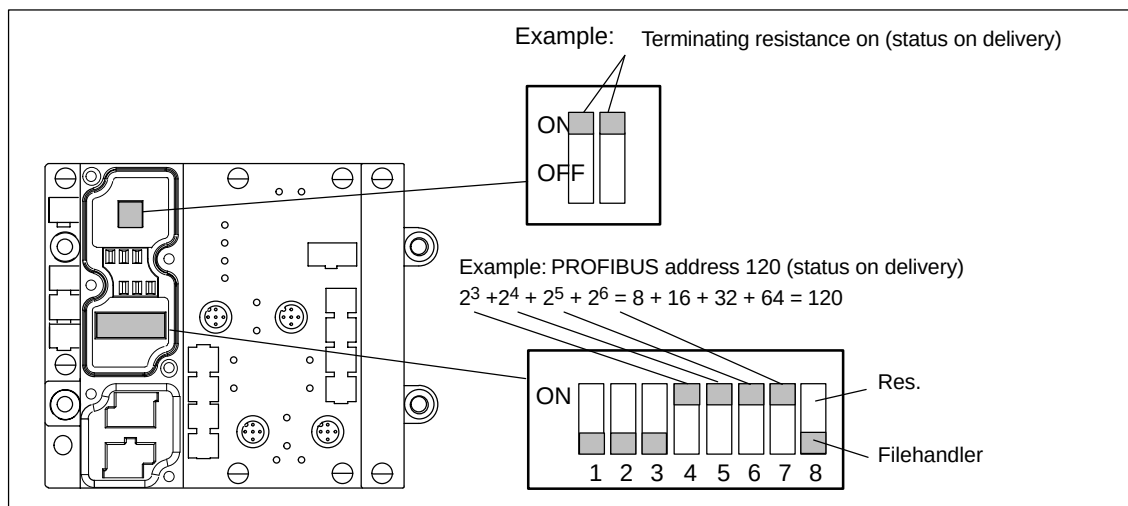


Figure 6-8 Setting PROFIBUS address/turning on terminating resistance

Note

- The PROFIBUS address on the ASM 452 must always be the same as the PROFIBUS address specified for this ASM in the configuration software.
- You must always turn **both** DIP switches to "on" or to "off" so that the terminating resistance is correct.

6.3 ASM 473

Application area

The ASM 473 interface is a MOBY module for the SIMATIC S7. It can be connected to the distributed I/O device ET 200X and DESINA. PROFIBUS-DPV1 serves as the interface to the user when the ET 200X is used. An S7-300 or S7-400 with integrated PROFIBUS connection can be used as the controller.

The ASM 473 supplements the SIMATIC S7 MOBY interface module ASM 475. With its protection rating of IP 67, it can be set up and operated directly within the process without an extra protective case.

An ET 200X basic module (BM 141/142) with the order number 6ES7 141-1BF11-0XB0 or 6ES7 142-1BD21-0XB0 or a BM 143 is a prerequisite for using the ASM 473.

The data are accessed on the MDS with physical addresses.

Function FC 45 is available for operation on a SIMATIC S7. The hardware configuration of the ASM 473 is performed with an Object Manager (OM) which is integrated in SIMATIC Manager.

Other features

- Up to 7 ASM 473s can be run in parallel on one ET 200X station.
- All I/O modules from the ET 200X family can be run parallel to the ASM 473.



Figure 6-9 Interface ASM 473

Ordering data

Table 6-4 Ordering data of the ASM 473

Interface ASM 473 1x SLG U92 with RS 422 can be connected	6GT2 002-0HA00
Accessories: SLG cable, ASM 473 ↔ SLG Length 2 m; standard cable Other lengths: 5 m, 10 m, 20 m and 50 m Opt. conn. plug without SLG cable (for cable lengths > 20 m) ASM 473 ↔ SLG MOBY Software ¹ with FC 45, GSD file	6GT2 091-1CH20 6GT2 091-1C... 6GT2 090-0BC00 6GT2 080-2AA10
Description of FC 45 (for ASM 473) deutsch English	6GT2 097-3AM00-0DA1 6GT2 097-3AM00-0DA2

1 See chapter 7.1.

Technical data

Table 6-5 Technical data of the ASM 473

Interface to the ET 200X Communication Command buffer on ASM	SIMATIC S7 P bus, cyclic/non-cyclic services 2 words (cyclic)/ 238 bytes (non-cyclic) 142 x 238 bytes
Serial interface to SLG Plug connector Line length, max. SLGs which can be connected	2 M12 coupling plugs 2 m = standard length; Other prefabricated cables = 5 m, 10 m, 20 m, 50 m (up to 1000 m on request) 1x SLG U92 with RS 422
Software functions Programming Function blocks for SIMATIC S7 MDS addressing Commands PROFIBUS diagnosis S7 diagnosis Firmware can be loaded.	Depends on PROFIBUS-DP master FC 45 Direct access with addresses Initialize MDS, read data from MDS, write data to MDS, and so on Yes, in acc. w. ET 200X basis station Yes, can be called via S7 OEM Yes, via S7 OEM

Table 6-5 Technical data of the ASM 473

Voltage	
Nominal value	24 V DC
Permissible range	20.4 V to 28.8 V DC
Current consumption	Typ. 75 mA; max. of 500 mA (or see technical data of your SLG)
Power loss of the module	1.6 W (typical)
Digital inputs/outputs	Via expansion modules from the ET 200X family
Ambient temperature	
Operation	0 °C to +55 °C
Transportation and storage	–40 °C to +70 °C
Dimensions (W x H x D) in mm	
Single device	87 x 110 x 55
Scaling interval	60 x 110 x 55
Mounting	2 M5 screws (supplied by customer)
Protection rating	2 M3 screws (supplied by device)
Weight, approx.	IP 67
	0.275 kg

For information on setup and other general technical data, see the ET 200X manual (order number 6SE7 198-8FA01-8AA0).

Configuration

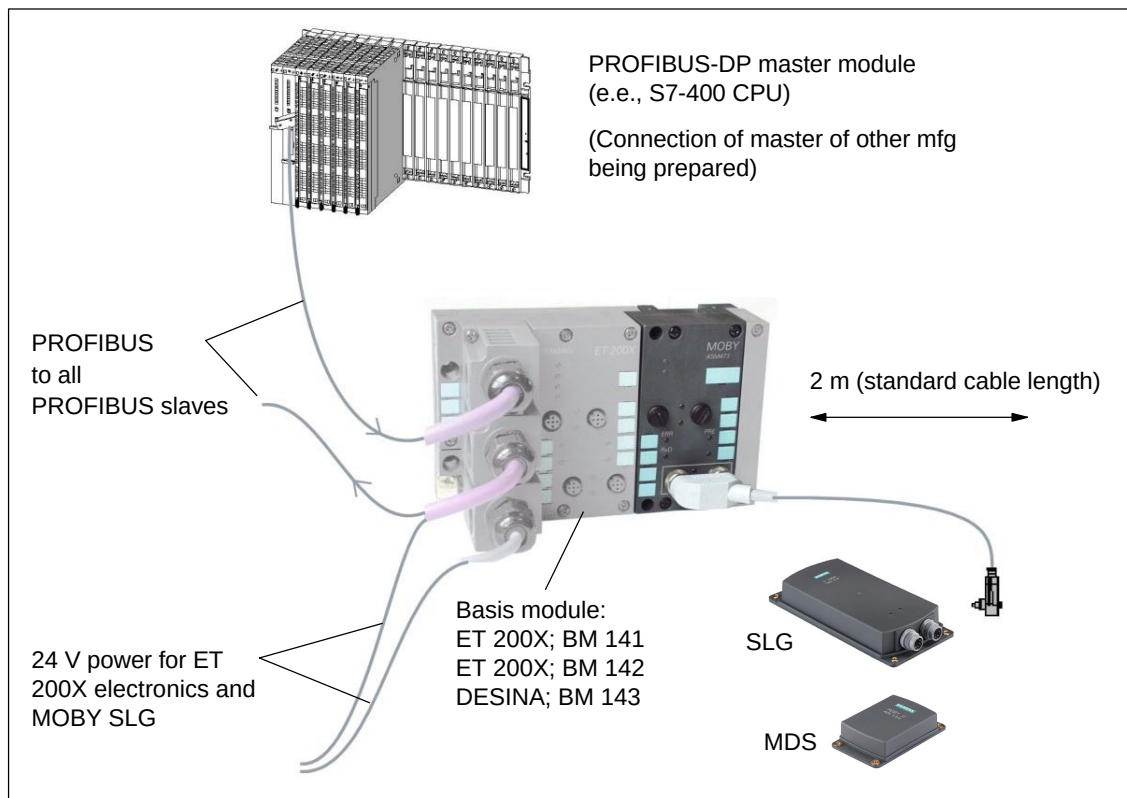


Figure 6-10 Configurator for an ASM 473

Note

The ET 200X differs from the ASM 452 (see figure 6-2) in that the 24 V must be fed to the PROFIBUS plug and the load voltage plug (see ET 200X manual for more information).

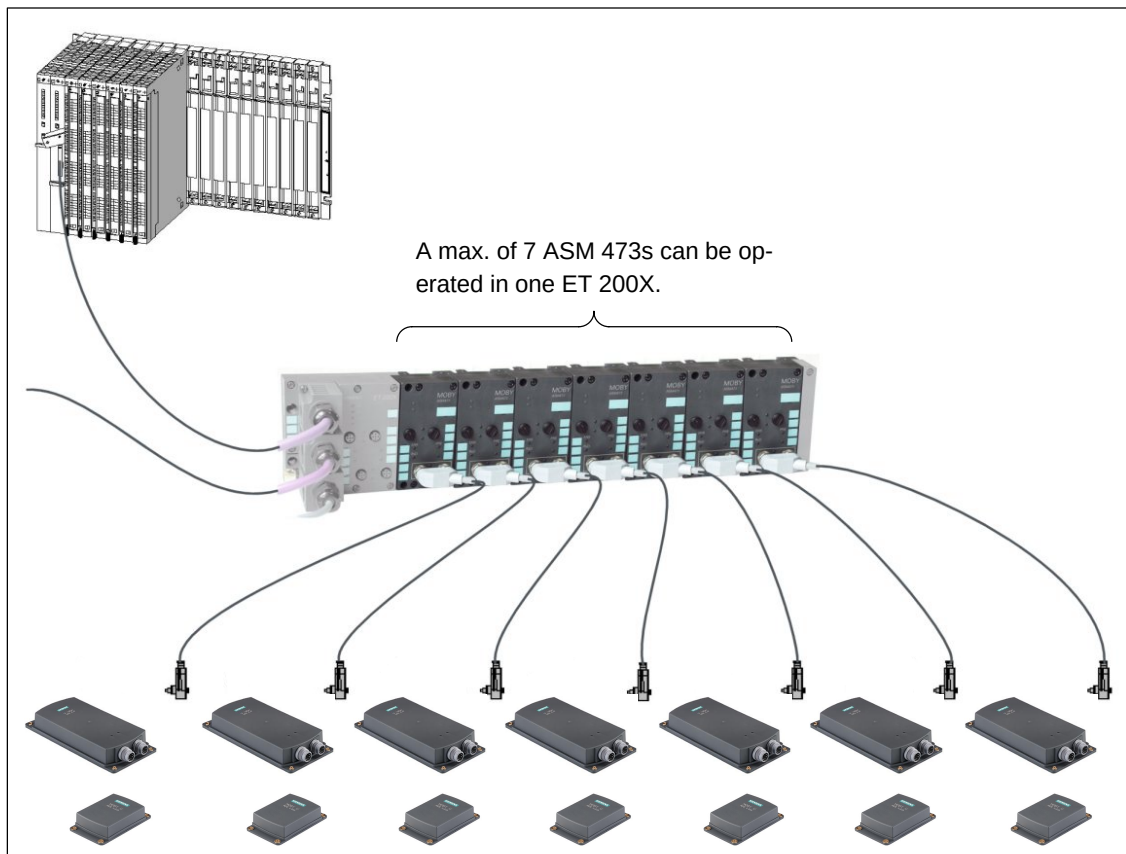


Figure 6-11 Maximum configuration of ASM 473s on one ET 200X

Depending on the PROFIBUS master, up to 123 ET 200X modules can be operated on one PROFIBUS branch.

Hardware configuration

The ASM 473 is integrated in the hardware configuration of SIMATIC Manager by calling Setup.exe in the directory S7_OM\ASM473_OM on the "MOBY Software" CD. At the moment the ASM 473 cannot be integrated on the master of another manufacturer.

SLG connection technology

An SLG always occupies two M12 connection sockets (X3 and X4) on the ASM 473. A prefabricated cable (cf. figure 6-4) makes it very easy to connect the SLG. The standard version of the connection cable has a length of 2 m. Other lengths are available on request. An SLG connection plug with screw terminals (see figure 6-3) is available for users who want to make their own cables. Cables and SLG connection plugs can be ordered from the MOBY catalog.

Pin allocations

The following figure shows the pin allocation to the SLG and describes the indicator elements.

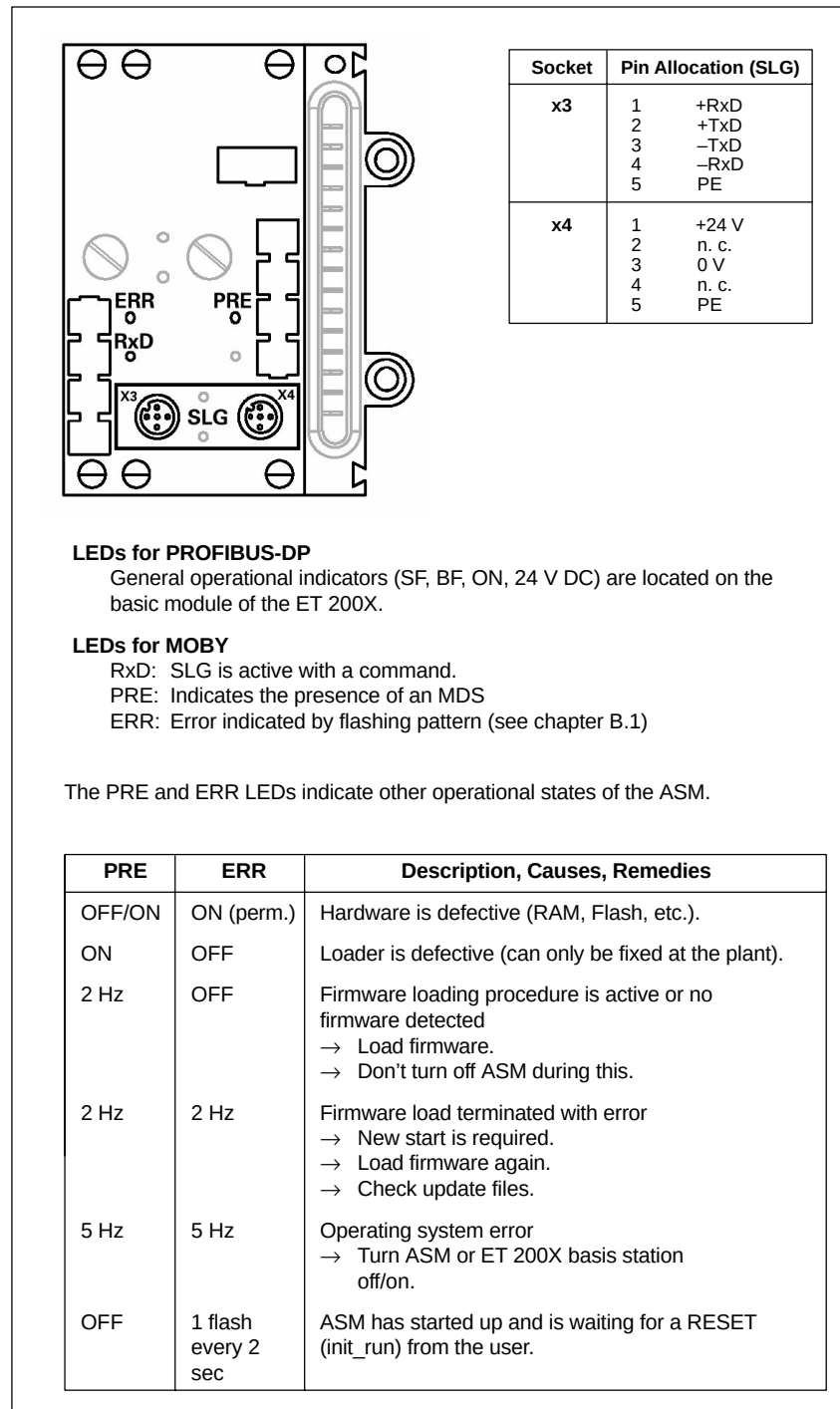


Figure 6-12 Pin allocation and LEDs of the ASM 473

Dimensional drawing of mounting holes

The figure below shows the dimensions for the positions of the holes for the mounting screws for one basic module and one ASM 473 expansion module.

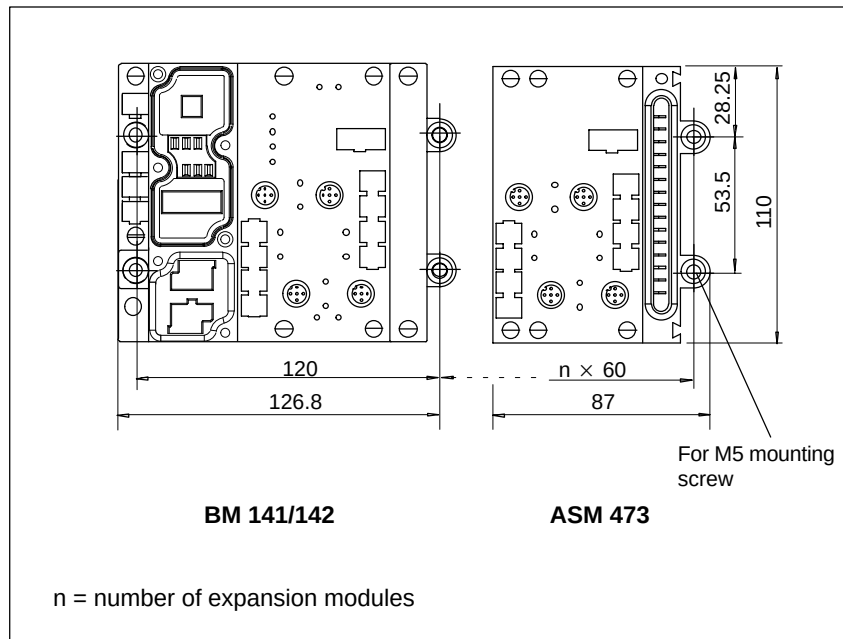


Figure 6-13 Dimensions for mounting holes for basic and expansion modules

6.4 ASM 475

Application area

The ASM 475 interface module is a MOBY module which can be installed on the SIMATIC S7–300 and ET 200M.

Up to eight ASM 475 interface modules can be installed and run in one module rack of the SIMATIC S7–300. When a setup with several module racks (max. of four) is used, the ASM 475 can be installed and run in every rack. In its maximum configuration, one SIMATIC S7–300 can handle up to 32 ASMs centrally. The ASMs can just as well be run on the distributed I/O ET 200M on PROFIBUS. This makes operation in an S7–400 environment possible. Up to 7 ASMs can be run on one ET 200M.

Error messages and operational states are indicated with LEDs. The galvanic isolation between SLG and the SIMATIC S7–300 bus permits interference-immune operation.

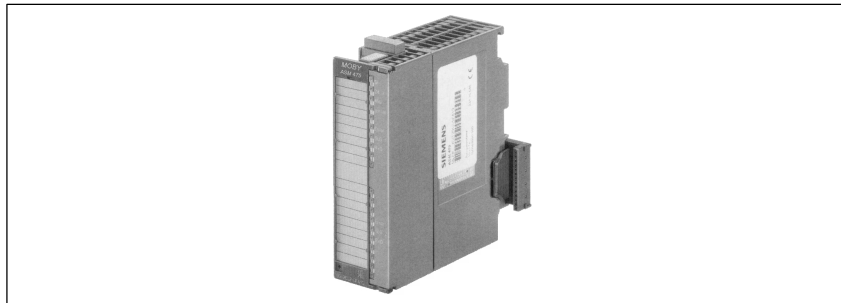


Figure 6-14 Interface ASM 475

The ASM 475 is an interface module for communication between the SIMATIC S7 and the SLG U92 with RS 422. The data on the MDS U313/524/589 can be addressed with the ASM 475 in the following ways.

- Physical addressing ("normal" addressing) or
- With a filehandler similar to DOS

The SIMATIC S7 offers a function for each of the two methods of access.

- FC 45 for "normal" addressing
- FC 56 for Filehandler

FC 45 and FC 56 give the S7 user an easy-to-use interface with powerful commands. FC 45 and FC 56 offer additional command chaining and S7 data structures via UDTs.

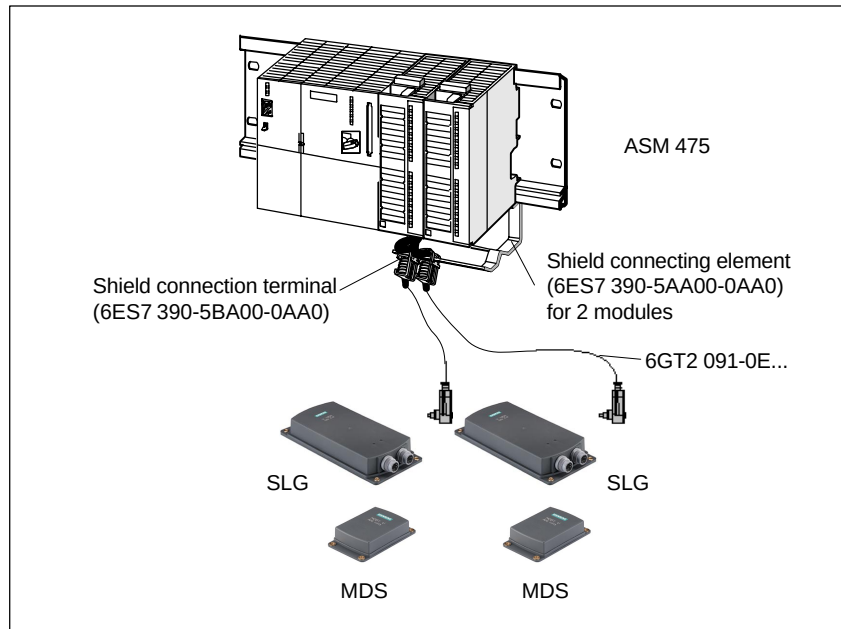


Figure 6-15 Configurator for an ASM 475

Ordering data

Table 6-6 Ordering data for ASM 475

Interface ASM 475 for SIMATIC S7 2 x SLG U92 with RS 422 can be connected parallel, without front plug connector	6GT2 002-0GA00
Accessories: Front plug connector (1 per ASM)	6ES7 392-1AJ00 -0AA0
SLG cable, ASM 475 ↔ SLG Lengths: 2 m, 5 m, 10 m, 20 m and 50 m Optional: SLG cable, ASM 475 → SLG with straight SLG plug	6GT2 091-0E... 6GT2 091-2E...
Shield connection terminal (1 per SLG cable) Shield connecting element	6ES7 390-5BA00 -0AA0 6ES7 390-5AA00 -0AA0
MOBY Software ¹⁾ with FC 45, FC 56, S7 Object Manager	6GT2 080-2AA10
Description of FC 45 (for ASM 475) deutsch English	6GT2 097-3AM00-0DA1 6GT2 097-3AM00-0DA2
Description of FC 56 (for ASM 475) deutsch English	

1) See chapter .7.1.

Technical data

Table 6-7 Technical data of the ASM 475

	ASM 475 with FC 45	ASM 475 with FC 56
Serial interface to SIMATIC S7-300 or ET 200M	P bus; cyclic and non-cyclic services	
Communication	2 words (cyclic)/238 bytes (non-cyclic)	
Command buffer on ASM 475	142 x 238 bytes per SLG U92	
Serial interface to SLG		
Plug connector	With screw terminal on front plug connector The front plug connector is included.	
Line length, max.	Prefabricated cables = 2 m, 5 m, 10 m, 50 m (up to 1000 m on request)	
SLGs which can be connected	2x SLG U92 with RS 422 Parallel operation	
Software functions		
Programming	Depends on PROFIBUS-DP master	
Function blocks for SIMATIC S7	FC 45	FC 56
MDS addressing	Access directly via addresses	Access via logical file names (file system similar to DOS)
Commands	Initialize MDS, read data from MDS, write data to MDS, and so on.	Format MDS, read file, write file, etc.
Multitag mode	No	Yes
S7 data structures with UDTs	Yes	Yes
Voltage		
Nominal value	24 V DC	
Permissible range	20.4 to 28.8 VDC	
Current consumption		
• Without SLG at U = 24 V DC, max.	350 mA	
• With connected SLGs, max.	500 mA, per connected SLG	
Power loss of the module(typ.)	2 W	
Current consumption from P bus, max.	80 mA	
Potential isolation between S7-300 and MOBY	Yes, use own power pack for ground-free operation for the ASM 475	
24 V fuse to SLG	Yes, electronic	

	ASM 475 with FC 45	ASM 475 with FC 56
Ambient temperature during operation		
• Horizontal setup of SIMATIC	0 to +60 °C	
• Vertical setup of SIMATIC	0 to +40 °C	
Transportation and storage	–40 to +70 °C	
Dimensions (W x H x D) in mm	40 x 125 x 120	
Weight, approx.	0.2 kg	

Wiring

The ASM 475 is commissioned in the following steps.

- Mount module
- Mount module on profile rail of the S7–300 (see manual of the S7-300)

Note

Before mounting the module, switch the CPU of the S7–300 to STOP.



Warning

Wire the S7–300 only when the power is off.

Note

To ensure interference-free operation of the ASM 475, make sure that ASM and SIMATIC CPU (or ASM and IM 153 with ET 200M operation) use the same voltage.

If not, error indicators which light up on the CPU when the ASM is turned on may not go off.

Front plate

The following figure shows the front plate of the ASM 475 and the inside of the front door with the connection diagram. The SLGs must be connected with the ASM as shown in the connection diagram.

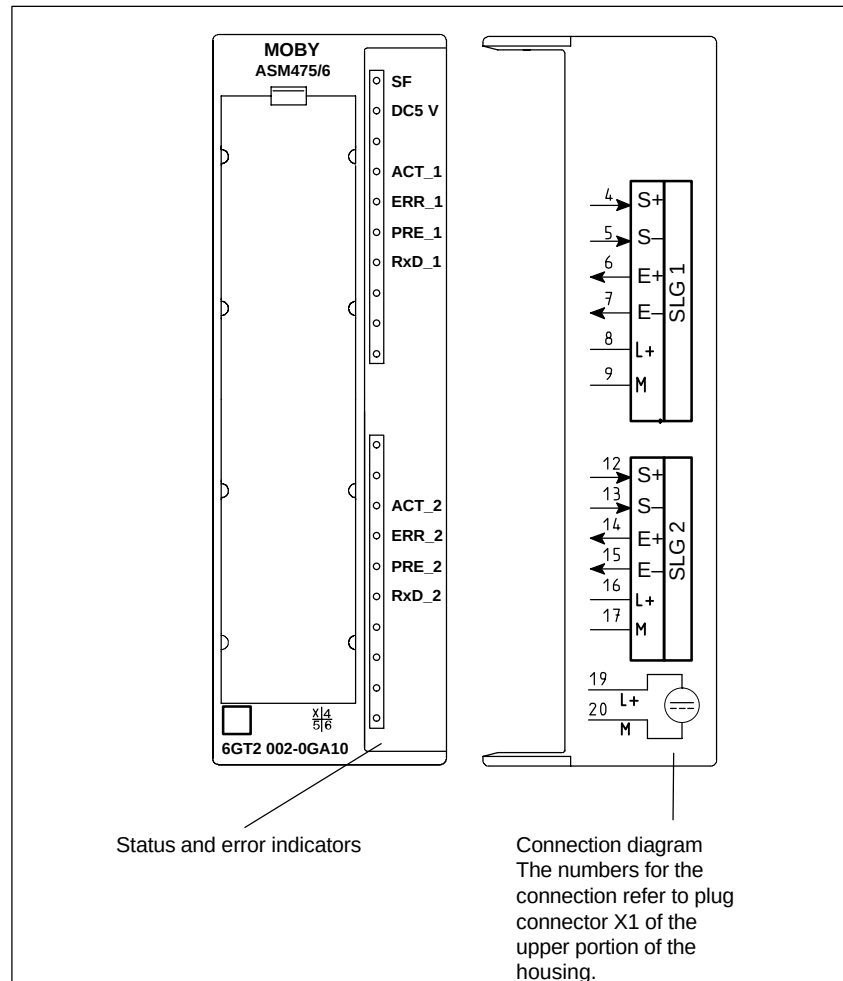


Figure 6-16 Front plate and inside of the front door of the ASM 475

Indicator elements on the ASM

Table 6-8 Function of the LEDs on the ASM 475

LED	Meaning
SF 5V DC	System Fault (hardware error on ASM) 24 V are connected on ASM and the 5 V on the ASM are okay.
ACT_1, ACT_2	The SLG is active with execution of a user command.
Error_1, Error_2	A flashing pattern shows the error that occurred last. This indicator can be reset with the parameter Option_1.
PRE_1, PRE_2 RxD_1, RxD_2	Shows the presence of an MDS; Indicates running communication with the SLG; interference on SLG can also cause this indicator to go on.

The LEDs PRE, ERR and SF on the ASM 475 indicate additional operating states.

Table 6-9 Operating states shown by LEDs on the ASM 475

SF	PRE_1	ERR_1	PRE_2	ERR_2	Meaning
ON	OFF/ON	ON (perm.)	OFF/ON	ON (perm.)	Hardware is defective (RAM, Flash, etc.).
ON	OFF	ON	OFF	OFF	Loader is defective (can only be fixed at the plant).
OFF	2 Hz	OFF	2 Hz	OFF	Firmware loading procedure is active or no firmware was detected. – Load firmware. – Don't turn off ASM during this.
OFF	2 Hz	2 Hz	2 Hz	2 Hz	Firmware loading terminated with error – New start required – Load firmware again. – Check update files.
Any	5 Hz	5 Hz	5 Hz	5 Hz	Operating system error – Turn ASM off/on.
OFF	OFF	1 flash every 2 sec	OFF	1 flash every 2 sec	ASM has started up and is waiting for a RESET (init_run) from the user.

Wiring to the SLG

The following figure shows the design of a connection cable between ASM and SLG. The specified colors apply to the standard MOBY cable for the ASM 475.

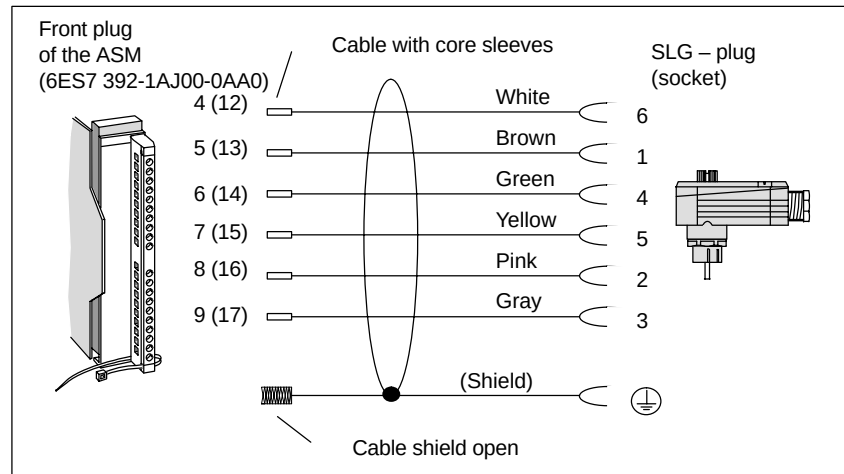


Figure 6-17 Wiring of the ASM 475 to the SLG U92 with RS 422 (6GT2 091-0E...)

Shield connection

See figure 3-12 or 6-15.

Lightning rods

Implement lightning rods and grounding measures if required for your application. Protection against lightning always requires an individual look at the entire plant.

Cable fabrication by the customer

To ensure EMC, the SLG cable must be led over an S7-300 shield connecting element (see figure 6-15). When customers make their own cables, the shield of the SLG cable must be bared as shown in figure 6-18.

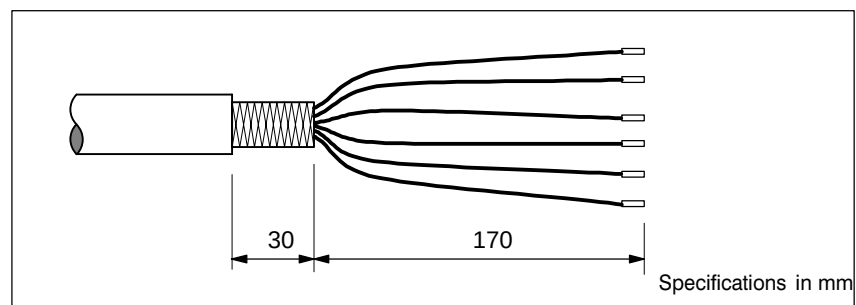


Figure 6-18 Baring of the cable shield for customer-fabricated cable

Configuration of the ASM for SIMATIC S7 under STEP 7

Note

Installation of MOBY requires functional STEP 7 software on a PC/PG. Please remember to use the latest version of STEP 7. At the moment, you will need STEP 7 V 5.1 Service Pack 3 for MOBY U operation.

Installation and configuration of the ASM 475 in the SIMATIC is performed with an installation program. The installation program is included on the "MOBY Software" product (6GT2 080-2AA10).

Installation

The installation files are located in subdirectory S7_om on the MOBY software CD. Most of the installation is automatic after Setup.exe is called. The specified steps during SETUP must be answered.

See the ASM 475 module in the hardware catalog of HW Config in the following subdirectory for hardware configuration of the SIMATIC S7.

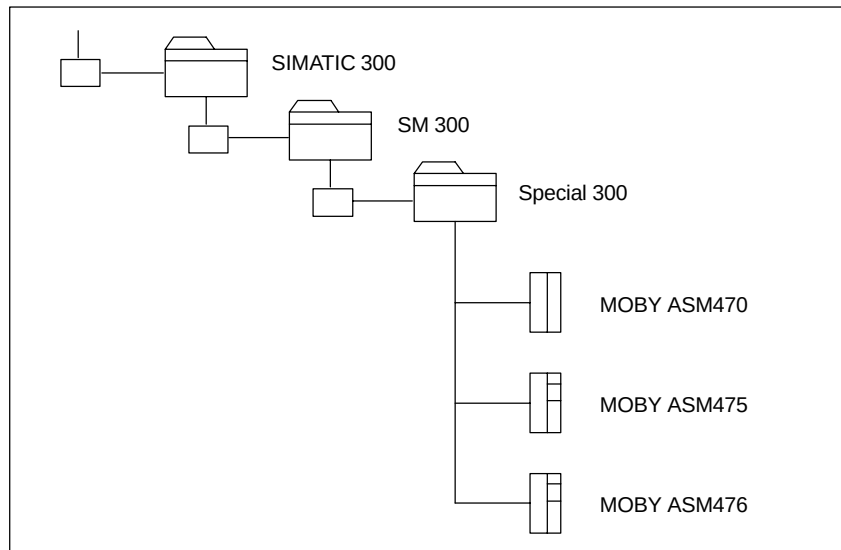


Figure 6-19 ASM 475 directory in the hardware catalog

FC 45/56 with sample project

You can use the "file dearchivation" function of SIMATIC Manager to load the FC with a sample project from the applicable subdirectory of "MOBY Software." The sample project is located in the S7PROJ directory of SIMATIC Manager.

Directory in MOBY Software	Project Name in SIMATIC Manager	Path Name in SIMATIC Manager
FC 45	MOBY FC45	Moby_f_1
FC 56*		

* Under preparation

Accessories

7

7.1 MOBY Software

The "MOBY Software" product is delivered on CD. It contains all function blocks and drivers for the MOBY system. The software components and their documentation are described briefly in the file "Read_me.txt" in the main directory of the CD.

The software components on the CD which are relevant to MOBY U are listed below.

- FC 45
SIMATIC S7 function for ASM 452 / 473 / 475
- FC 46
SIMATIC S7 function for ASM 452
- FC 56 for ASM 452/473/475 ¹
- MOBY_lib MOBY API
MOBY API application interface with the 3964R driver for Windows 98/2000/NT 4.0
- Manuals
Current status of MOBY documentation in PDF format
- S7-om
Installation program and Object Manager for interface modules ASM 473 and ASM 475
Sample projects are installed here with the appropriate FCs. These are located in the applicable FC directories.
- Demo
Test and demo programs for PC with Windows 98/2000/NT 4.0
- Tools
Useful programs for MOBY configuration are located here.
- Short descriptions of the individual directories in German or English (cf. "Les_mich.txt" or "Read_me.txt").
- Profi_gsd
PROFIBUS master device files for ASM 452

Only the components related to MOBY U are specified from all the software components (i.e., the complete MOBY system is not included).

Note

You will need at least version 3.4 of the MOBY Software CD to run MOBY U.

¹ Under preparation

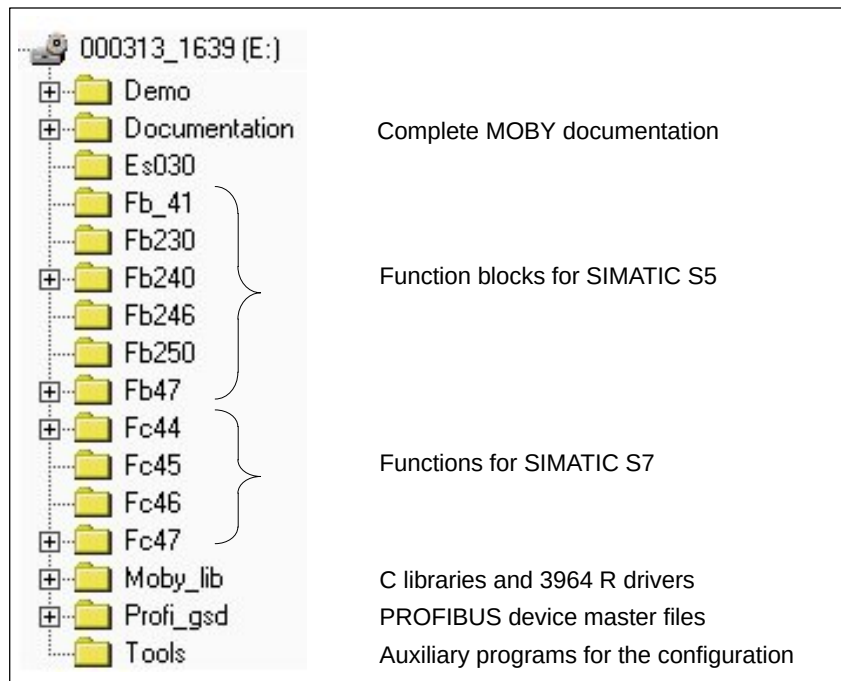


Figure 7-1 Program directories of "MOBY Software," release V 3.0

Note

On MOBY software or licensing

When you purchase an ASM or SLG interface module, this does not include software or documentation. The **CD-ROM "MOBY Software,"** which contains all available FBs/FCs for the SIMATIC, C libraries for Windows 98/2000/NT, demo programs and so on **must be ordered separately.** In addition, the CD-ROM contains the complete MOBY documentation (German and English) in PDF format.

When you purchase an ASM or SLG interface module, the price for use of the software including documentation on the "MOBY Software" CD-ROM is included. The purchaser obtains the right to make copies (duplication license) as needed for customer applications or system development for the plant.

In addition, the enclosed contract is valid for the use of software products against a one-time payment.

Ordering data

Table 7-1 Ordering data for MOBY Software

	Order No.
MOBY Software	6GT2 080-2AA10

7.2 MOBY Wide-Range Power Pack

Description

The MOBY[®] wide-range power pack is a compact, primary-pulsed power supply, designed for use on single-phase, alternating current networks with two DC outputs (socket plug connector, circuited in parallel). The robust physical construction is comprised of an aluminum housing which gives the finely-adjusted system a good blend of physical strength, protection against electromagnetic interference and optimum heat dissipation. The primary-pulsed power supply is protected against overload with a built-in power limitation circuit and is permanently short-circuit proof. The standardly integrated overvoltage fuse (SIOV) protects the electronics from excessively high voltages. Two SLG U92s can be directly connected to the MOBY wide-range power pack. You will also need the connection cable 6GT2 591-1C... (see chap. 3.6.2) for this.



Figure 7-2 MOBY wide-range power pack

Ordering data

Table 7-2 Ordering data for MOBY wide-range power pack

	Order No.
MOBY wide-range power pack, 100 - 230 V AC/24 V DC/2.2 A; incl. 2 counterplugs for the output voltage	6GT2 494-0AA00
Accessories: 24 V stub line for SLG U92 with RS 232; length of 5 m, extension for 6GT2 591-1C...	6GT2 491-1HH50

Technical data

Table 7-3 Technical data of the MOBY wide-range power pack

Input Input voltage Nominal value Range Frequency Input current Efficiency Power connection Power failure bypass Undervoltage switchoff Overvoltage protection	100 - 230 V AC 90 - 253 V AC 50/60 Hz 0.85 - 0.45 A $\geq 80\%$ at full load 2-m power line with fuse contact plug ≥ 10 msec Yes SIOV
Output Nominal output voltage Nominal output current Residual ripple Startup current limitation Permanent short-circuit proof	Socket contacts 24 V DC 2.2 A 20 mV _{ss} to 160 kHz 50 mV _{ss} > 160 kHz NTC Yes
Ambient conditions Ambient temperature Operation Transportation and storage Cooling	-20 °C to +40 °C (max. of +60 °C; see notes on safety) -40 °C to +80 °C Convection
General information Dimensions, power supply incl. mounting plate, (L x W x H) in mm Weight Color	205 x 80 x 60 (without connection plugs) Approx. 1000 g Anthracite
Electromagnetic compatibility Interference emission (EN 50081-1) Interference immunity (EN 50082-2)	Class B in acc. w. EN 55022 EN 61000-4-2
Safety Certifications Electrical safety test Potential isolation, primary/secondary Protection class Protection rating	CE, GS EN 60950/VDE 0805 and VDE 106 (part 1) 4 kV AC I, in acc. w. EN 60950 (VDE 0805) IP 65, in acc. w. EN 60529 (only when installed)

Plug allocation of 24 V output

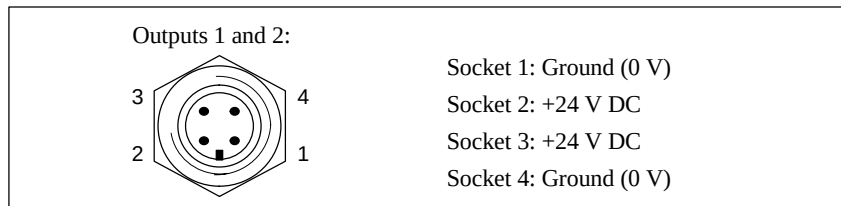


Figure 7-3 Plug allocation of 24 V output

Dimensions (in mm)

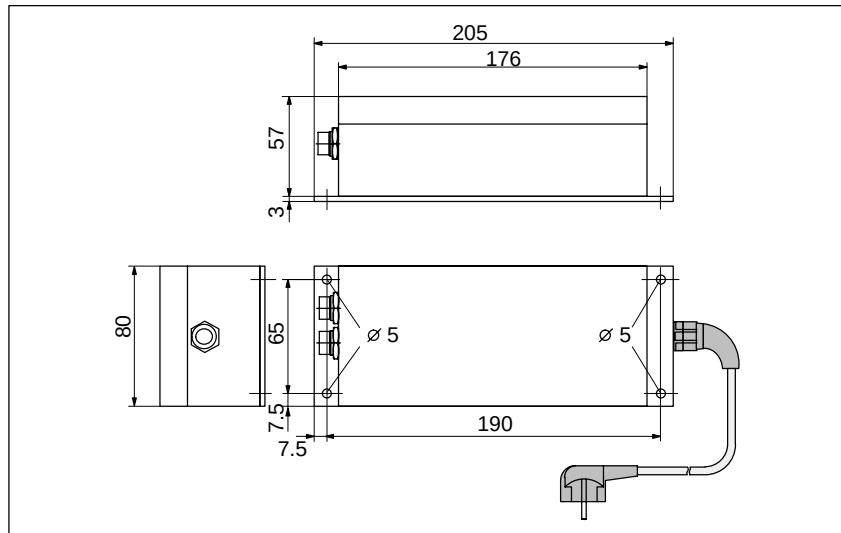


Figure 7-4 Dimensions of MOBY wide-range power pack

Notes on safety

Caution

Do not open the devices or modify them.

Failure to adhere will invalidate the CE and the manufacturer's warranty. Applicable DIN/VDE regulations or country-specific specifications must be observed when installing the power pack.

The application area of the power pack is limited to "information technology of electrical office machines" as described in the standard EN 60950/VDE 0805.

A device may only be commissioned and operated by qualified personnel. For the purposes of this manual, qualified personnel are persons who are authorized to commission, ground and tag devices, systems and electrical circuits in accordance with safety standards. The device may only be used for the applications described in the catalog and the technical description and then only with Siemens devices and components or devices or components of other manufacturers recommended by Siemens.

Correct operation of the product is dependent on correct storage, setup and installation as well as careful use and maintenance.

During installation, make sure that sufficient space is available so that the electrical output can be accessed.

The housing may heat up during operation to up to +40 °C and this is no cause for worry. However, make sure that the power pack is covered when the ambient temperature exceeds +40 °C to protect people from touching the excessively hot housing. The power pack must also have sufficient ventilation.

Documentation

A

Descriptions, bound

Table A-1 Ordering data for descriptions

	Order No.
Description of FC 45 deutsch English	6GT2 097-3AM00-0DA1 6GT2 097-3AM00-0DA2
Description of ASM 452/PC 46 deutsch English	6GT2 097-3AC40-0DA1 6GT2 097-3AC40-0DA2
Description of ASM 475/FC 45/FC 56 for SIMATIC S7 deutsch English	
Description of ASM 473	
Description of 3964 R for Win 95/NT (German/English)	On MOBY Software CD
Description of MOBY API	On MOBY Software CD
Description of MDS U589 deutsch English	

Error Messages

B

This chapter gives you the error messages of MOBY U. The messages are divided into three groups.

- B.1 This section covers the messages with the error numbers 01 hex to 1F hex. These messages apply to all interfaces and SLG U92s which use direct MDS addressing.
- B.2 Function blocks (e.g., FC 45) output additional messages on the status of the hardware. These special messages are described in this section.
- B.3 The third section covers the filehandler messages. The messages apply to the ASM 452 with FC 46/56 and the ASM 475 with FC 56.

B.1 General Errors

The following error codes may occur during MOBY U operation. The error codes are transferred during telegram communication in the status byte or are indicated by the red LED on the front plate. This LED shows the last error (for most ASMs) permanently even when this error has already been corrected.

With FC 45, this error code is indicated in the "error_MOBY" variables.

Table B-1 General errors

Error Code in Hex	LED Indication	Cause, Remedy
00	00	Not an error; result is okay.
–	01	See error code 0F.
01	02	Presence error: MDS has moved out of the transmission window of SLG. The MOBY command was only partially executed. Read command: No data are supplied to the computer. Write command: The data memory which just left the field has an incomplete data record. → S_a (working distance from SLG to MDS) is not adhered to. → Configuration error: Data block to be processed is too large (for dynamic operation). The next command (READ, WRITE, NEXT) is automatically assigned to the next MDS. Remarks: The error indication with the red LED on the front plate shows error code 02 this time.
02	02	Presence error: → A mobile data memory moved past the SLG but wasn't processed with a command or concluded with a NEXT command. → An INIT command was terminated with RESET. This error message cannot be given until the next command (read, write, status, RESET, DI/DO, or NEXT). Although the command is not executed, this error message is generated. The ASM then executes the next command normally. Error 02 is reported immediately via external diagnosis. Remarks: The red error LED showing the errors does not distinguish between error 01 and error 02 (see error code 01).
03	03	Errors in connection with the SLG → Voltage of ASM < 20 V or ASM not connected → 24 V has voltage drops. → Fuse on the ASM has blown. Check wiring. → Cable wired wrong between ASM and SLG or cable break → Hardware defective: ASM or SLG → Other SLG in the vicinity is active. → Interference on SLG cable or bus cable
04	04	Error in memory of MDS The data memory has never been written or has lost its contents due to battery failure. → Initialize data memory with the STG → With the ASM: Call initialization command. → Check battery of MDS or change MDS (battery bit). → Data memory is defective. → Initialization was performed with wrong memory size.
05	05	– Unknown command code in byte 2 of the telegram – The MDS reported address error (check telegram).

Table B-1 General errors

Error Code in Hex	LED Indication	Cause, Remedy
06	06	Field interference on SLG The SLG is receiving interference from its surroundings. → External interference field. The field of interference can be localized with the "inductive field indicator" of the STG. → The distance between two SLGs is too small and does not adhere to configuration guidelines. → The connection cable to the SLG is faulty, too long or does not meet specifications.
07	07	Too many sending errors The MDS was unable to receive the command or the write data from the SLG even after several attempts. → The MDS is positioned on the boundary of the transmission window. → Data transmission to the MDS is being bothered by external interference.
08	08	CRC sending error – The monitor receiving circuit detected an error while sending. → Same cause as for error 06 – The MDS reports CRC errors very frequently. → The MDS is located on the boundary of the SLG. → The MDS and/or the SLG have a hardware defect.
09	09	Only for initialization: CRC error while receiving the acknowledgment from the MDS → Same cause as for error 06
0A	10	Only for initialization: MDS is unable to execute INIT command. → MDS is defective.
0B	11	Only for initialization: Timeout while initializing the MDS → The MDS is located on the boundary of the transmission window. → The MDS is using too much current (defective). → Only with MDS 507/407E: MDS 507/407E mode was not enabled with the "RESET with parameter transfer" command.
0C	12	Memory of the MDS cannot be written. → Memory of the MDS is defective. → EEPROM-MDS was written too often and has reached the end of its life. → Wrong end address was parameterized with INIT command.
0D	13	Address error (address area exceeded) → Specified address doesn't exist on the MDS. → Check and correct command for telegram structure. → Status byte of command is not 00.
0E	14	ECC error The data cannot be read from the MDS. → MDS data have been lost (MDS defective). → The MDS was not initialized with ECC driver. → Initialize MDS. → MDS with EEPROM has reached the end of its life. The data have been lost. → Replace MDS. → The MDS moved out of the field while being written. → The MDS is positioned incorrectly. → User sent wrong command to ASM.

Table B-1 General errors

Error Code in Hex	LED Indication	Cause, Remedy
0F	01	Startup message The ASM sends this message after every startup. (A startup occurs each time the voltage is applied, each time the front switch is activated, after a reset via plug X1 or after a bus error.) The startup message remains queued until the user sends a RESET command to the ASM. This gives the user a chance to know when power returns to the ASM (i.e., ASM is ready again).
10	16	NEXT command is not possible or not permitted. → ASM is not using the presence check. → ASM has already received a NEXT command.
11	17	Short circuit or overload of the 24 V outputs Next command must be a RESET command. → The affected output is turned off. → All 24 V outputs are switched off if overload is total. → Reset can only be performed by turning the power off and on again.
12	18	Internal ASM communication error Connection to the MOBY processor is faulty. Next command must be a RESET command. → Hardware of ASM defective → Disturbing EMC interference
14	20	Internal ASM error Stack overflow. Next command must be a RESET command. → Turn 24 V power off and on again.
15	21	Wrong operational parameterization/RESET parameter has a mistake. → Check switch on ASM. → Check RESET command.
16	22	The command cannot be executed with the current bus configuration. → Input or output areas are too small for the size of the telegram. → Length specified in read or write command is too long. → Adapt bus configuration on the master module.
17	23	Handshake error Next command must be a RESET command. → During the handshake, user set a wrong bit in the command byte of the telegram. → Check user program and correct.
18	24	Only RESET command permitted → An error occurred which must be acknowledged with a RESET command (cause can be a brief short circuit on PROFIBUS).

Table B-1 General errors

Error Code in Hex	LED Indication	Cause, Remedy
19	25	Previous command active A new command was sent to the ASM/SLG although the last command is still active. → An active command can only be terminated with a RESET command. → The new command is concluded with error 19hex. The old command is being executed by the ASM/SLG and will be reported as finished afterwards.
1A	26	PROFIBUS-DP error occurred → Bus connection is interrupted (wire break, plug pulled). → Master won't address ASM anymore. → The error is reported as soon as the bus connection is okay again. – The telegram doesn't have the correct format.
1C	28	→ Antenna is already off. → Antenna is already on. → Mode in SET-ANT command is unknown. → Antenna cannot be turned off since an MDS command is still waiting. → Antenna is off. The MDS command cannot be executed.
1D	29	Number of MDSs in the field of the SLG > number of MDSs in the bunch specified in the RESET command.
1E	30	AB byte doesn't correspond to user data length. → Check and correct the telegrams in the user program.
1F	31	Communication with the MDS was terminated with RESET. This error can only be returned with a RESET command.
20 (binary xx1x xxxx)	32	No error message! Only occurs when an enabled ECC driver is being used. It indicates that the driver found a 1-bit error and corrected it. The read or written data are okay.
40 (binary x1xx xxxx)	64	No error message! Usually this bit is always set. It is reserved to indicate the status of a 2nd battery on the MDS.
80 (binary 1xxx xxxx)	128	No error message! Battery power of the MDS has fallen below the threshold value. We recommend changing the MDS immediately. This status bit is always set with EEPROM-MDSs. With SINUMERIK, the battery message does not have an "F" in IDENTIFICATION. The "fnr" field can be evaluated in one place for the complete system to detect a weak battery.

2 If several states occur at the same time, the following sequence applies: 0052, 0050, 0051

B.2 ASM-Specific Errors

B.2.1 Error Indicators in FC 45

The FC 45 indicates the error codes with 3 variables.

- error_MOBY:
MOBY errors in table B-1
- error_FC:
Errors supplied by FC 45 due to incorrect
parameterization (cf. table B-2)
- error_BUS:
Errors reported by system functions
SFC 58/59 (cf. table B-3)

Table B-2 error_FC error variable

error_FC (B#8#..)	Description
00	Not an error; standard value when everything is okay.
01	Params_DB doesn't exist on the SIMATIC.
02	Params_DB is too small. ⇒ UDT 10/11 was not used in the definition. ⇒ Params_DB must be 300 bytes long (for each channel). ⇒ Check Params_DB, Params_ADDR for correctness.
03	The DB after the pointer "command_DB_number" doesn't exist on the SIMATIC.
04	"Command_DB" on SIMATIC is too small. ⇒ UDT 20/21 was not used in the command definition. ⇒ The last command in "command_DB" is a chained command. Reset the chaining bit.
05	Invalid type of command
06	The received acknowledgment is not the expected acknowledgment. The parameters of the command and acknowledgment telegrams do not match (command, length, address_MDS). ⇒ The user changed the pointer command_DB_number/_address while the command was being executed. ⇒ The user changed the command parameters in the MOBY CMD data block (UDT 20) while the command was being executed.
07	The parameter MOBY_mode (defined in UDT 10) has an illegal value.
08	A bus error has occurred which was reported by system functions SFC 58/59. More information on the error is available in the variable error_Bus.

Table B-2 error_FCError variable

error_FC (B#8#..)	Description
09	The ASM has failed. ⇒ Power failure on MOBY ASM ⇒ PROFIBUS plug pulled or PROFIBUS cable broken The error is indicated when the ASM_Failure bit was set in OB 122. OB 122 is called when the FC 45 can no longer access the cyclic word for the MOBY ASM.
0A	The user started another init_run without waiting for ready while the first init_run command was still being processed. ⇒ Do <u>not</u> set init_run cyclically.
0B	init_run cannot be executed. Cyclic process image for ASM is faulty. FC 45 reports timeout of PII (This error can be fixed by writing the value #00 to address DBB 58 in UDT 10. However, in certain error situations, the FC 45s don't generate an error message and get hung up.) ⇒ ASM_address in UDT 10 is parameterized incorrectly. ASM_address may be pointing to the wrong module. ⇒ ASM hardware/firmware is faulty.
0C	Area length error. error_BUS has the error 8x22 or 8x23. ⇒ DAT_DB does not exist or is too small. Check DAT_DB_number and DAT_DB_address in UDT 20. ⇒ Perform init_run.

Table B-3 Error variable error_Bus

Error code (W#16#...)	Description
800A	ASM is not ready (temporary message). ⇒ This message is sent to a user who is not using the FC 45 but non-cyclically polls the ASM in very quick succession.
8x7F	Internal error in parameter x. Cannot be corrected by the user.
8x22 8x23	Area length error while reading a parameter Area length error while writing a parameter This error code indicates that parameter x is completely or partially outside the operand range or the length of a bit field in an ANY parameter is not divisible by 8.
8x24 8x25	Area error while reading a parameter Area error while writing a parameter This error code indicates that parameter x is located in an area which is illegal for the system function.
8x26	The parameter contains number of a time cell which is too large.
8x27	The parameter contains number of a counter cell which is too large.
8x28 8x29	Direction error while reading a parameter Direction error while writing a parameter The reference to parameter x is an operand whose bit address is not 0.

Table B-3 Error variable error_Bus

Error code (W#16#...)	Description
8x30 8x31	The parameter is located in the write-protected global DB. The parameter is located in the write-protected instance DB.
8x32 8x34 8x35	The parameter has a DB number that is too large. The parameter has an FC number that is too large. The parameter has an FB number that is too large.
8x3A 8x3C 8x3E	The parameter has the number of a DB which is not loaded. The parameter has the number of an FC which is not loaded. The parameter has the number of an FB which is not loaded.
8x42 8x43	An access error occurred while the system was trying to read a parameter from the I/O area of the inputs. An access error occurred while the system was trying to write a parameter to the I/O area of the outputs.
8x44 8x45	Error during nth ($n > 1$) read access after an error occurred Error during nth ($n > 1$) write access after an error occurred
8090	Specified logical base address is invalid. There is no allocation in SDB1/SDB2x or this is not a base address.
8092	A type other than BYTE was specified in an ANY reference.
8093	The area identifier obtained when the logical address was configured (SDB1, SDB2x) is not permitted for these SFCs. Permissible are: 0 = S7-400 1 = S7-300 2.7 = DP modules
80A0	Negative acknowledgment while read-accessing module. (Module was pulled during read access or module is defective.)
80A1	Negative acknowledgment while write-accessing the module. (Module was pulled during write access or module is defective.)
80A2	DP protocol error for layer 2, possible hardware defect.
80A3	DP protocol error with direct-data-link-mapper or user interface/user, possible hardware error.
80B0	- SFC for this type of module not possible - Module doesn't know the data record. - Data record number ≥ 241 is illegal. - Data records 0 and 1 are not permitted with SFC58 "WR_REC."
80B1	The length specified in the RECORD parameter is wrong.
80B2	The configured slot is not occupied.
80B3	The actual module type is not the required module type in SDB1.
80C0	- RD REC: The module has the data record but no read data have arrived yet. - WR REC: ASM is not ready to receive new data. ⇒ Wait for the cyclic counter to count up.
80C1	The data of the preceding write job on the module for the same data record have not yet been processed by the module.
80C2	The module is processing the maximum possible number of jobs for one CPU.
80C3	Required resources (memory, etc.) are busy at the moment.

Table B-3 Error variable error_Bus

Error code (W#16#...)	Description
80C4	Communication error: • Parity error • SW ready not set • Error in block length management • Checksum error on CPU side • Checksum error on module side
80C5	Distributed I/O not available

B.3 Filehandler Error Messages for ASM 452/475

Filehandler error messages

A0 06: The command ID of the started command is illegal (not defined). The correct KK must be specified.

A0 11: The telegram control parameters (DBN or KK) are not in the correct sequence. Two or more telegrams are written to the same page frame memory area. Parameterization of the FB call parameters "SSNR" and "KAN" of all channels must be checked.

- 1st command block: DBN (= byte 8/9 in telegram) is not 0001.
- Next block: DBN of user is not in the correct ascending order or the KK parameter (byte 4) doesn't fit the command which was just executed.

A0 15: Checkbyte mode is on. The checkbyte generated by FB 230 doesn't fit the command telegram. Error correction same as **A0 11**.

A0 16: The filehandler is now processing the commands of another user (e.g., STG, indicated by bit 6 "STG active/ASM test" of BEST). Command execution will be delayed until the other user is finished. If necessary, start the command again.

B0 01: Error in connection to the SLG

- Cable between ASM and SLG is incorrectly wired or there is a cable break.
- 24 V power is not connected or turned off.
- Hardware defective: Channel module or SLG

This error does not occur when the system commands (RESET, NEXT, ASM-STATUS) are started.

B0 02:

EAKO 1:	- A command was started but there is no MDS in the SLG's transmission window.
EAKO 0:	- The old/current MDS has moved out of the transmission window and the next/new MDS has entered the transmission window. A command was started (<u>not</u> NEXT). This command refers to the new MDS but the old/current MDS was not yet concluded with NEXT.
	- A new MDS entered the transmission field of the SLG and exited it again without this MDS being processed

with a command. ("MDS slipped through").

- C0 02:** The MDS reports a memory error.
The MDS has never been written or its battery failed and it lost its memory (not with EEPROM-MDS). Then:
- Change the MDS (if the battery monitoring bit is set).
 - Format MDS with FORMAT.
- C0 06:** During certain important processing procedures (e.g., writing system area of MDS, formatting MDS), the MDS may not leave the SLG's transmission window since otherwise the command would be terminated with this error. Then:
- Start command again.
 - The MDS is positioned on the boundary of the SLG's transmission window.
 - With EAKO = 1: MDS is not located in the SLG's transmission window when a command starts.
- C0 07:**
- The commands FORMAT or TRACE were sent with the wrong parameters. The physically addressed address doesn't exist on the MDS (MDS memory is smaller than specified by the command).
 - With READ/WRITE/UPDATE: Pointer in FAT is defective. A block is pointed to which doesn't exist on the MDS.
- C0 08:** Field interference on SLG. The SLG is receiving interference from its surroundings, e.g.,
- external interference field. The interference field can be documented with the "inductive field indicator" of the STG.
 - The distance between two SLGs is too short and does not comply with the configuration guidelines.
 - The connection cable to the SLG is defective, too long or does not meet specifications.
- C0 09:** Too many sending errors have occurred. The MDS was not able to correctly receive the command or the write data from the ASM even after several attempts.
- The MDS is positioned directly in the boundary area of the transmission window.
 - The data transmission to the MDS is being affected by external interference.

C0 10:

- CRC sending error. The monitor receiving circuit detected an error while sending. Cause of the error same as for **C0 08**.
- The MDS is reporting CRC errors very often. (MDS is located on the boundary or MDS/SLG defective.)

C0 11:

Same as **C0 08**.

C0 12:

MDS is unable to execute FORMAT command. The MDS is defective.

C0 13:

When being formatted, the MDS must be located in the transmission window of the SLG. Otherwise a timeout error occurs. This means:

- The MDS is positioned directly in the boundary area of the transmission window.
- The MDS is using too much current (defective).

C0 14:

Memory of the MDS cannot be written. This means:

- The MDS has less memory than specified in the FORMAT command (i.e., parameterize the MDS type correctly).
- The memory of the MDS is defective.

C0 15:

Address error. The address area of the MDS was exceeded.

- MDS is the wrong type.

C0 16:

An ECC error occurred. The data cannot be read from the MDS. This means:

- MDS data have been lost (MDS defective).
- The MDS moved out of the field while being written. The MDS is positioned incorrectly. (**Attention:** The system area of the MDS is automatically written to each SLG station.)

C0 17:

The filehandler is not working correctly.

- Check the command structure or command sequence.

D0 01:

The filehandler will only still accept a RESET command.

- Filehandler was not yet initialized with a RESET command.
- This state can only be resolved with a RESET command.

- D0 05:** The commands FORMAT, CREATE, WRITE, ATTRIB, UPDATE, COVER, QUEUE-READ or QUEUE-WRITE were sent with illegal parameters.
- FORMAT with illegal MDS name or MDS type
 - CREATE with illegal filename
 - WRITE/UPDATE with length of 0 (DLNG=0)
 - Illegal attribute
 - QUEUE-WRITE or QUEUE-READ with illegal option
 - COVER with illegal user (Only 0 or 1 are legal.)
- D0 07:**
- The system data transferred with the LOAD command are wrong.
 - DLNG is parameterized incorrectly for LOAD.
 - Wrong data block specified or incorrectly parameterized
 - MOVE command not executed correctly. On the MDS, DIR + FAT don't match checksum.
 - The MOVE command cannot be executed. The checksum does not fit DIR + FAT. The data memory has probably exited the transmission window while system operations (e.g., write DIR + FAT) were being executed or the data structure of the MDS is defective.
- D0 09:** The RESET command was transferred to the filehandler with the wrong parameters.
- Check bytes 11 to 17 of the telegram.
- D0 14:** WRITE command:
No longer enough memory space available on the MDS.
The data will not be completely written to the MDS.
CREATE command:
When a file is set up, no data block can be reserved for it.
No more memory blocks are free.
- D0 15:** The MDS could not be identified by the filehandler. Format the MDS again.
- D0 18:** The logically addressed address is not within the file. The FAT has an error.
The MDS must be formatted again.
- D0 22:** The data memory has been locked with the COVER command. A write-access command (e.g., UPDATE, CREATE) would destroy the data memory layout and is thus rejected.

D0 23:	COVER command: The MDS name specified in the command does not agree with the actual MDS name.
E0 01:	• The type of MDS present near the SLG does not agree with the set ECC mode. The MDS must be reformatted for the desired ECC mode. • The MDS is not a filehandler MDS. Format MDS.
E0 02:	No more directory entries are free. The file specified in the CREATE command can no longer be created.
E0 03:	The file specified in the CREATE command already exists in the directory (no duplicate names permitted).
E0 05:	• A secondary FAT error was discovered in the READ or WRITE command. The file application table (FAT) is defective. The MDS must be formatted again. • Wrong address specified in TRACE command
F0 01:	• The file addressed by a command (e.g., WRITE) doesn't exist in the directory. The file must be set up with CREATE. • Check file name (possibly not in ASCII format). • On or more files are to be read with QUEUE-READ but they do not exist on the MDS. Valid data are not transferred to the user.
F0 05:	Write access (WRITE, UPDATE or DELETE) to a file which may not be changed (and is protected with an appropriate attribute). • Change the access rights with the ATTRIB command and then start the WRITE/UPDATE/DELETE command again.
F0 06:	The RWD switch on the ASM doesn't have sufficient rights for this command. The command was ignored. → Check the switch.
F0 07:	QUEUE-READ: Specified file length shorter than file length

F0 08:	QUEUE-READ: The skip calculated by the filehandler is larger than 0FFF hex (4095 dec).
H1 02:	A new BEDB with the appropriate length must be loaded. Then start a <u>RESET command</u> .
H0 03:	The command index is illegal. Change command index.
H0 05:	Access rights of the applicable SLG do not permit this command. For instance, if the "R" access rights (read-only) have been granted to the SLG, a WRITE command cannot be sent to this SLG. This means that either the FB parameter "RWD" must be changed (and then a <u>RESET command</u> started to accept the change) or a legal command must be started.
H0 06:	The WRITE/UPDATE /LOAD/QUEUE-WRITE or QUEUE-READ command parameter specified in DW 9 (DLNG) in BEDB is not permitted. Permitted is only a user data length of 7FF0 hex (32752 dec) or a maximum of 210 decimal bytes for QUEUE-READ. Change DLNG accordingly.
H1 07:	The data block specified in DW 1 (BEDB) doesn't exist on the AS. The applicable data block must be loaded. Then start a <u>RESET command</u> so that the absolute addresses will be calculated.
H1 08:	This is a purely software error which cannot occur during normal operation. If the error occurs anyway, start a <u>RESET command</u>. Two or more telegrams are written to the same page frame memory location. This means: • There is an error in the user program. • Check the hardware. – SIMATIC bus – SIMATIC CPU
H1 09:	The read checkbyte of the acknowledgment telegram and the checkbyte calculated by FB 230 do not match (checkbyte mode was turned on). A <u>RESET command</u> must be started. Error correction same as H1 08 .
H1 10:	The channel module executed a hardware reset. The cause here may be a drop in voltage on the device rack or a plug-in contact error, for instance. The user must start a <u>RESET command</u> to parameterize the SLG again.

- H1 11:** The read acknowledgment has absolutely nothing to do with running operation. It is a purely software or synchronization error which cannot occur during normal operation. If the error occurs, start a RESET command. Error correction same as **H1 08**.
- H1 12:** The command identifier of the command and the acknowledgment don't match. This is a software or synchronization error which cannot occur during normal operation. If the error occurs, start a RESET command. Error correction same as **H1 08**.
- H1 13:** The first command block wasn't acknowledged appropriately (i.e., the telegram control parameters don't match). It is a purely software or synchronization error which cannot occur during normal operation. If the error occurs, start a RESET command. Error correction same as **H1 08**.
- H1 14:** An error was detected while the interface control register was being read. This means that there is no more synchronization between writing the command blocks and reading their acknowledgments. Usually there is an error in a plug-contact (plug-in contact of the channel module). A RESET command must be started to re-establish synchronization. Error correction same as **H1 08**.
- H1 15:** The starting address pointer to the user data calculated from the parameters DATDB and DATDW (DW 1 in BEDB) is outside the specified data block (pointer too long). Either DATDW must be shortened or the specified data block (DATDB) must be extended. Then a RESET command must be started.
- H1 16:** The telegram control parameters of the command and acknowledgment blocks don't match. It is a purely software or synchronization error which cannot occur during normal operation. If the error occurs, start a RESET command. For error correction see **H1 08**.
- H1 17:** See error **H1 16**.
- H1 18:** While the command was being executed (ready bit not yet set), the data start address pointer (calculated from DATDB and DATDW) was changed. This means that the absolute addresses are no longer correct. A RESET command must be started so that the absolute addresses can be calculated again.
- H1 19:** The absolute address which is accessed during a read or write command (from/to the data block) is outside the data block. This means that either the data block must be lengthened or the user data start address pointer (DATDB and DATDW) must be corrected (create more space in the data block). Then a RESET command must be started.

H1 20:	During running operation (cyclic call of FB 230), the AS memory was compressed or the absolute location of the blocks (BEDB and/or DATDB) was changed. This means that the absolute addresses are no longer correct. A <u>RESET command</u> must be started.
H1 21:	This indicator tells the user that only a <u>RESET command</u> can be used as the next command. All other commands will be rejected.
H0 25:	QUEUE-READ: QUDBTYP or QUANZ parameter not permitted
H0 26:	QUEUE-READ: DB or DX from specified DB/DX area missing on AS
H0 27:	QUEUE-READ: QUDW pointer is outside the DB or DX specified in QUDB.
H0 28:	QUEUE-READ: AS is missing DB or DX or DB/DX are too small to read in the user data.
H1 31:	The parameterized channel number (MOBY DB) is outside the valid area (1 to 8).
H1 32:	ASM doesn't react when startup bit of FC 56 is set (timeout).
H1 33:	init_RUN was not concluded within a certain time (timeout).
H1 34:	init_RUN was started several times without waiting for the acknowledgment.
H1 35:	Voltage failure on ASM/BUS error
H1 36:	command_DB too short (must be at least 28 bytes)
H1 37:	MOBY mode outside the permitted area (0 to 15)
H1 38:	ANW outside permissible area (0 to 7)
H1 39:	LOAD/MOVE command not permitted with multitaging

H1 40:	There is a gap between two consecutive acknowledgments.
H1 41:	DBN greater than ADB
H1 42:	DPV1 error occurred with SFC 58/59.
Kx xx:	QUEUE-WRITE parameterized incorrectly (DATDB/DATDW or DLNG) Option 0000 hex: The file entry parameterized in DATDB with the number xxx or xxx + 1 is not correct. Counting of the file entries in DATDB begins with 1. Option 0001 hex: The file entry parameterized in DATDB with the number xxx or xxx + 1 has a filename which already exists on the MDS. Counting of the file entries in DATDB begins with 1.

Note

The file entries are counted decimally.

ASCII Table

C

dec.	hex.	+00	+01	+02	+03	+04	+05	+06	+07	+08	+09	+0A	+0B	+0C	+0D	+0E	+0F
0	0x00		...	>	*	0	1	2	3	4	5	6	7	8	9	:	;
16	0x10	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
32	0x20		!	=	#	\$	%	&	'	(	)	*	+	,	-	.	/
48	0x30	0	1	2	3	4	5	6	7	8	9	:	:	<	=	>	?
64	0x40	@	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
80	0x50	P	Q	R	S	T	U	V	W	X	Y	Z	[	\	]	^	_
96	0x60	`	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
112	0x70	p	q	r	s	t	u	v	w	x	y	z	{		}	~	Δ
128	0x80	Ç	ü	é	à	â	ä	å	ç	ê	ë	è	é	ê	ë	ä	å
144	0x90	é	æ	ê	ó	ô	ö	ø	ù	ú	û	ü	ý	ÿ	í	î	ï
160	0xA0	á	í	ó	ú	ý	à	ä	é	ê	ë	ì	í	î	ï	ñ	ú
176	0xB0	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü
192	0xC0	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü
208	0xD0	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü
224	0xE0	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü
240	0xF0	-	±	=	÷	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü	ü

Index

Number

3RX9 802-0AA00, 6-4
6ES7 194-1AA00-0XA0, 6-4
6ES7 194-1FC00-0XA0, 6-4
6ES7 390-5AA00-0AA0, 6-19
6ES7 390-5BA00-0AA0, 6-19
6ES7 392-1AJ00-0AA0, 6-24
6GT2 000-0EF00, 4-9
6GT2 001-0EA10, 5-4
6GT2 002-0EB20, 6-4
6GT2 002-0HA00, 6-12, 6-19
6GT2 080-2AA10, 6-4, 6-12, 6-19, 7-3
6GT2 090-0A..., 3-21, 6-7
6GT2 090-0AN50, 3-28
6GT2 090-0AT12, 3-28
6GT2 090-0AT80, 3-28
6GT2 090-0BA00, 3-28
6GT2 090-0BC00, 6-4, 6-7
6GT2 090-0QA00, 4-12
6GT2 090-0QA00-ZA31, 4-12
6GT2 090-0QB00, 4-12
6GT2 091-0E..., 6-19, 6-24
6GT2 091-0EH20, 3-25
6GT2 091-0EH50, 3-25
6GT2 091-0EN10, 3-25
6GT2 091-0EN20, 3-25
6GT2 091-0EN50, 3-25
6GT2 091-1C..., 6-12
6GT2 091-1CH20, 3-24, 6-4, 6-7, 6-12, 6-19
6GT2 091-1CH50, 3-24
6GT2 091-1CN10, 3-24
6GT2 091-1CN20, 3-24
6GT2 091-1CN50, 3-24
6GT2 091-2CH20, 3-24
6GT2 091-2E..., 3-25, 6-19
6GT2 091-2EH20, 3-25
6GT2 091-2EH50, 3-25
6GT2 091-2EN10, 3-25
6GT2 091-2EN50, 3-25
6GT2 097-3AC40-0DA1, A-1
6GT2 097-3AC40-0DA2, A-1
6GT2 097-3AC60-0DA1, 6-4

6GT2 097-3AM00-0DA1, 6-4, 6-12, 6-19, A-1
6GT2 097-3AM00-0DA2, 6-4, 6-12, 6-19, A-1
6GT2 390-1AB00, 3-28
6GT2 491-1HH50, 7-4
6GT2 494-0AA00, 3-22, 7-4
6GT2 500-5JK10, 4-12
6GT2 590-0QA00, 4-12
6SE7 198-8FA01-8AA0, 6-13

A

ASM 452
Dimensions, 6-8
Ordering data, 6-4
Pin allocations, 6-9
PROFIBUS address and terminating resistance, 6-10
PROFIBUS configuration, 6-6
SLG connection technology, 6-7
Technical data, 6-5
ASM 473
Configuration, 6-14
Dimensions, 6-17
Hardware configuration, 6-15
Ordering data, 6-12
Pin allocations, 6-16
Setup and function, 6-11
SLG connection technology, 6-15
Technical data, 6-12
ASM 475
Ordering data, 6-19
Setup and functions, 6-18
Technical data, 6-20

B

Basic EMC rules, 3-18

C

Cable configuration, 3-21

Cables, Shielding, 3-16

E

EMC guidelines, Avoiding interference sources, 3-14

Equipotential bonding, 3-15

Extra power pack for SLG, 3-22

L

LEDs for MOBY, 6-16

LEDs for PROFIBUS-DP, 6-16

M

MDS U313

Field data, 4-7

Ordering data, 4-6

Technical data, 4-6

MDS U524

Field data, 4-10

Ordering data, 4-9

Technical data, 4-9

MDS U589

Field data, 4-14

Ordering data, 4-12

Technical data, 4-13

MOBY Software, 7-2

Ordering data, 7-3

MOBY wide-range power pack

Dimensions, 7-6

Ordering data, 7-4

Plug allocation of 24 V output, 7-6

Technical data, 7-5

O

Ordering data, Descriptions, A-1

P

Plug connector allocations, 3-22

S

Shielding concept, 3-20

SLG U92

Field data, 5-7

Ordering data, 5-4

Technical data, 5-5

T

Transmission window, 3-3

To:
Siemens AG
A&D SE ES4
Postfach 2355
D-90713 Fuerth

Sender:

Your name:

Your position:

Your company:

Street: _ _ _ _ _

City: _ _ _ _ _

Telephone: _ _ _ _ _

Please check your branch of industry.

☐ Automotive industry

☐ Chemicals industry

☐ Electro industry

☐ Foodstuffs

☐ Control technology

☐ Mechanical engineering

☐ Petrochemicals

☐ Pharmaceutical industry

☐ Plastics

☐ Paper

☐ Textiles

☐ Transportation

☐ Other _ _ _ _ _

Remarks/suggestions

Your ideas and suggestions help us to improve the quality and usefulness of our documentation. Please fill out this questionnaire and return it to Siemens.

Title of the manual:_____

Order number of the manual: _ _ _ _ _

Answer the following questions with your personal opinion (1 = good to 5 = poor).

1. Does this manual satisfy your requirements? ☐
2. Is the information easy to find? ☐
3. Is the information easy to understand? ☐
4. Are there enough technical details to satisfy your requirements? ☐
5. What is your opinion of the figures and tables? ☐

If you have experienced concrete problems, please explain here.

[illegible]