7.9   Project Documentation for Safety-Related Applications

The ELOP II programming tool allows the user to automatically print the documentation for a project. The most important document types include:

- Interface declaration
- List of variables
- Logic
- Description of data types
- Configurations for control cabinet, base plates, modules and system parameters
- PCS/variable cross-references
- Code generator informations

The layout of the various types of documents can be arbitrarily defined.

This documentation is required for the factory acceptance test (FAT) of a system subject to approval by a test authority (e.g., TÜV). The factory acceptance test (FAT) only applies to the user functionality, but not to the safety-related HIMA automation devices H41q-MS, H51q-MS, H41q-HS, H51q-HS, H41q-HRS, H51q-HRS that have already been approved.

HIMA recommends involving the test authority as soon as possible when designing systems that are subject to approval.

7.10   Safety-Related Communication Aspects (Safety-Related Data Transfer)

The HIPRO S protocol is certified for SIL 3.

7.10.1   Safety-Related Communication

The data transfer to resources safely assigned can be monitored via the PES master from within the resource's *Properties* dialog box (tab: **HIPRO-S**, **Edit** of the selected resource). To this end, a monitoring time can be set as *Time Interval*, and the *Reset Imported Variables* option can be activated once the monitoring time has been exceeded.

The monitoring time to be set depends on the process and must be agreed upon together with the responsible test authority.

Safety-related communication can also occur via the TÜV-certified safe**ethernet** protocol using the F 8627 X or F 8628 X Ethernet communication modules.

7.10.2   Time Requirements

To achieve a constant transmission time, HIMA recommends planning an individual PES master and an individual bus for safety-related data transmission with a baud rate of 57.6 kbit/s.

The data transmission time T_T resulting from the moment in which a sensor changes on a PES to the moment in which an output on another PES responds to the change, is:

$T_T = 2*CT_1 + 2*T_D + 2*CT_2$

CT_1	Cycle time of PES 1
CT_2	Cycle time of PES 2
T_D	Time required for data transfer between two controllers. It depends on the data connection in use:

- Serial data transfer: Use the value of the bus cycle time. Refer to the operating system manual (HI 800 105 E) to determine the bus cycle time.
- Data transfer via Ethernet: Use the maximum transmission time (T_{max}), refer to the data sheet of the F 8627 X (HI 800 265 E) for details.

7.10.3   Notes for Creating the User Program

The Ethernet network is automatically configured in ELOP II for HIPRO-S. However, the following notes must be taken into account when creating the user program:

- In ELOP II, the resource name must consist of eight characters, the two last characters must be numbers. Numbers between 1 and 99 may be used. The number combination must be unique such that it can be used to determine the IP address of the communication module.
- Safety-related communication with HIPRO-S operating in NORMAL mode must be set such that safety-related data exchange with any other device is configured in every automation device (i.e., exchange of dummy data, if no user data are exchanged).
- Dummy data need not be exchanged if the HIPRO-S DIRECT mode is used. Refer to the data sheet for the F 8627X module (HI 800 265 E) for details.
- The PES master program must be compiled to verify the HIPRO-S configuration. The occurred faults must be then corrected.
- During safety-related communication, 0 must be used as safe value for transmission data.