Operating Instructions

Safety I/O-Modules

for

IS1 fieldstations

contains:

SAIMH   9462/12-0x-11   Safety Analog Input Modul HART

content:

Safety I/O-Modules for IS1

1   System overview

1.1   application

The IS1 remote I/O system has been extended with new safety I/O modules
(S-I/O) which are developed according the PROFISafe standard. In the first release a
maximum number of 6 / 8 HART 4-20 mA field devices can be connected to the new
Safety **A**nalog **I**nput **M**odul **H**ART (SAIMH) Type 9462/12-0x-11 module.

1.2   concept

S-I/O modules can be placed inside a standard IS1 system environment with
Profibus DP V1 interface beside other standard I/O-Modules.

If not specified in this document, the standard functionality and behaviour of the IS1
system and the standard I/O-modules is not affected by extension with the safety I/O
modules.

For safe communication, PROFISafe masters (F-hosts) which are compatible to the
PNO PROFIsafe Specification (V1 or V2 Mode) have to be used.

1.3   System requirements

CPM Hardware: The usage of S-I/O-Modules is only allowed together with the
following IS1 CPMs:

CPM Type	Ex-Zone	Supply	Busphysic	Hardware Revision
9440/15-01-11-C1243	Zone 2	24V	DP (RS485)	from Revision F
9440/22-01-11-C1243	Zone 1	24V	PNO (RS485IS)	all Revisions
9440/22-01-21-C1243	Zone 1	230V	PNO (RS485IS)	

Safety I/O-Modules for IS1

CPM Firmware: from Version 02-40 (DPV1)

S-AIMH: Type 9462/12-06-11   (6 Input signals with 12 Byte cyclic data)
    Type 9462/12-08-11   (8 Input signals with 16 Byte cyclic data)

GSD file: from version V3.00

F-host: PROFIBUS class 1 master according PROFIsafe specification
    PROFISafe Mode V1 or V2

    Some F-Hosts are limited to a maximum of 12 Bytes cyclic PROFIsafe data per module. Select the SAIMH module type according the capability of the F-host.

I/O-modules :   IOM Firmware from Revision 2.00

Systembehavior if newer and older Versions are used together:
The usage of GSD V3.xx with older CPM Firmware Revisions is not permitted. While the start up procedure of the DP slave the device specific diagnostics will respond with ´parameter error´ in the 6 Byte standard DP diagnosis telegram. The following diagnosis informations are according DPV0 and do not fit to GSD V3.xx.

Older GSD versions work together with CPMs from firmware version 0x-40 with the old functionality (without support of S-I/O-Modules and DPV1 extensions).

Safety I/O-Modules for IS1

Upgrade older installations:

- Update CPM to new Firmware Version (take care of required Hardware Revision)

- Import GSD V3.xx in Profibus Configuration tool and engineering project

- Check firmware revision of existing I/O modules (from Revision 2.00)

Hint: Using CPM firmware from V02-40 <u>and</u> GSD from V3.00 the contents of the diagnosis telegram for the complete IS1 station has been changed according DPV1 rules. Check if Master System supports DPV1 diagnosis mechanism.

1.4 Redundancy

The IS1 System redundancy structure can be used with S-I/O-Modules. Therefore, the Profisafe consecutive number has to be synchronized within the Controller(s) to ensure that both (active and passive) CPMs get the same consecutive number. The redundant structure can only be used to increase availability. It is not intended to increase functional safety.

In the case of redundant CPM structure, the S-I/O-Module is communicating with the active CPM only. The PROFIsafe telegram is then copied from the active to the passive CPM and from there be transmitted to the PLS.

Further details of IS1 system redundancy see file ´ IS1 PROFIRED_16e.pdf´

NOTE:

Using IS1 with redundant CPUs, the Parameter ***F_WD_Time*** of all PROFIsafe IOMs and the CPM Parameter ´timeout output modules´ must be set to >= 1 seconds and bigger than the worst case switch over time from primary to redundant IS1 CPM (controlled by IS1 redundancy support functions running in the F-host) to ensure bumpless switch over of all IS1 I/O Signals.

1.5 Servicebus support

I.S.Wizard and the IS1 DTM optionaly can be used for additional diagnosis

In stand alone operation without automation system the IS1 system can be configured, downloaded and started. The standard I/O modules can be operated.

All existing functionality for standard I/O-modules are available.

Due to functional safety requirements the functionality of S-I/O-Modules on service bus is limited:

- S-I/O-Modules can not be parametrised with PROFISafe F-Parameters and therefore can not be put in operation.

- Input and Output values can only be read if S-I/O-Module is in cyclic PROFISafe operation with an F-host.

- Output signals can not be forced.

2 System description

2.1 PROFISafe

Standard and safe data can be transmitted on one PROFIBUS network using the PROFISafe profile. Safety relevant data are transmitted encapsulated via standard PROFIBUS telegrams.

Using additional safety mechanisms in the transmitted PROFISafe Blocks, in the F-host and in the PROFISafe device (e.g. SAIMH) the requested safety is reached.

More details on: www.profibus.com

2.2 Engineering rules

The engineering rules of a standard IS1 System have to be taken into account.

(Operating Instructions IS1 DPV1xxxx.pdf)

In addition to that, the maximum number of modules is restricted by the length of configuration data. This depends on the type of used I/O-modules.

Rule: Sum of length of all IO-Modules <= 122 Byte

Length of Configuration data of IS1 modules

Module Type	Length config data [Byte]	Format
CPM	1	GIF
Standard IOM without DIM16+CF	4	SIF
DIM16 + CF	5	SIF
All IOM without SIL in GIF	1	GIF
SAIMH 6	11	ESIF
SAIMH 8	13	ESIF

GIF   (**G**eneral **I**dentification **F**ormat)
SIF   (**S**pecial **I**dentification **F**ormat)
ESIF   (**E**xtended **S**pecial **I**dent. **F**ormat)

Safety I/O-Modules for IS1

Example: If the IS1 System is assembled only with S-AIMH Type 9462, the following maximum module numbers are possible:

SAIMH	Max number SAIMH per IS1 fieldstation	Used rule
6 AI	11 (max. 8 using Zone 1 CPM)	number of I/O moduls is limited by max. lenth of configuration data.
8 AI	9 (max. 8 using Zone 1 CPM)	

Other combinations e.g. with standard modules, results in higher number of I/O-Modules according rule above.

2.3   Diagnostic data

The basic behavior of S-IO Modules corresponds to standard IS1 IO-Modules. For safety relevant diagnosis there are following extensions:

2.3.1   Profisafe specific extension of IOM Status in diagnosis telegram

Diagnostic informations of the PROFIsafe stack of the SAIMH are reported according PROFIsafe spec. within the IOM status in the diagnostic telegram of PROFIBUS DP with reserved "ErrorType" numbers.

Hex	Number	Diagnosis Information
0x40	64	Mismatch of safety destination address (F_Dest_Add)
0x41	65	Safety destination address not valid (F_Dest_Add)
0x42	66	Safety source address not valid (F_Source_Add)
0x43	67	Safety watchdog time value is 0 ms (F_WD_Time)
0x44	68	Parameter „F_SIL" exceeds SIL from specific device application
0x45	69	Parameter „F_CRC_Length" does not match the generated values
0x46	70	Version of F-Parameter set incorrect
0x47	71	CRC1-Fault

Further details of DPV1 specific diagnosis data see document ´Operating Instructions IS1 DPV1xxxx.pdf´.

Safety I/O-Modules for IS1

2.3.2 Indications

LCD Indications are stated in English language.
The following combination of LED and LCD Indications are possible:

LED green	LED red	Text in LCD Display	IOM status	Error source	Possible actions (solution)
On	Off	RUN 0--------7	**All signals of the F-module are OK.** The IOM is in safety operation	none	-
On	flashes	RUN 0xxxxxxx7	**Signal diagnosis.** Data Exchange with DP- and PROFISafe master is OK.	Signal(s) x inoperative - Short circuit - Line break - HW Error	• Rectify source of signal diagnosis • HW Error: exchange module
On	On	F-para.Fail yy *)	**No safety operation.** Data Exchange with DP Master is OK. Signals in safe position	Error in F-Parameter	Check F-Parameter in F-Host
		Wait op-ackn.		No user acconowledge after error correction or systrem startup	OA_C (Operator Acknowledge Command) on F Channel Host Driver required.
		Stop 0xxxxxxx7		Error in PROFIsafe operation (Watchdog)	• Check F-Host operation • Check timeout settings

flashes	Off	Wait for Cfg/Prm	Ready (after switch on, before data exchange with master) Module is OK Outputs are in a powerless condition (however, the HART Analog Output Module Type 9466 outputs 4 mA).	No Data Exchange with DP master !	• Initiate cyclical data exchange with the master • Check master, bus connection and CPM
flashes	flashes	Stop 0xxxxxxx7	data exchange is left (output signals in safe position)	-Cyclical data exchange with master is interrupted (DP or internal communication) - Clear data command	• Initiate cyclical data exchange with the master • Check master, bus connection and CPM
flashes	On	Config Fail	Configuration fault	Configuration incorrect or wrong module	Change configuration in master or plug right module type
Off	On or flashes	Device_Fault yy *)	IOM hardware error	- Hardware-Check error - EPROM error - EEPROM error	• Document error code and change module. • Return module to R.Stahl
Off	Off	-	Off	No supply voltage to IOM or defective IOM	• Check CPM power supply • check CPM • check Bus Rail • Engage I/O module correctly on the rail • Exchange I/O module

Safety I/O-Modules for IS1

*⁾ error codes „yy"

display priority	message	code xx	Diagnosis Information
1	Device fault	01-99	Replace Module
3	F-para. fail	01	Safety destination address not valid (F_Dest_Add)
4	F-para. fail	02	Mismatch of safety destination address (F_Dest_Add)
5	F-para. fail	03	Safety source address not valid (F_Source_Add)
6	F-para. fail	04	Safety watchdog time value is 0 ms (F_WD_Time)
7	F-para. fail	05	Parameter „F_SIL" exceeds SIL from specific device application
8	F-para. fail	06	Parameter „F_CRC_Length" does not match the generated values
9	F-para. fail	07	Version of F-Parameter set incorrect
10	F-para. fail	08	CRC1-Fault

Safety I/O-Modules for IS1

In Run and Stop state of S-I/O-Modules the status of each signal (left to right: Signal 0 to 7) is displayed.

```
F-Dest Adr  xxxx          F-Dest Adr  xxxx
Run   0--------7          Stop1 0--------7
```

Indication:

- no Error   **-**
- Internal HW-failure   **F**
- Overtemperature   **T**   *1)
- Short circuit   ⁖
- Line break   ┼

*1) divice is used outside of specified operating conditions

Note: If a module global Message or Warning exists at the same time, this always will be displayed with higher priority.

2.3.2.1 Indications during power up.

During power up of the S-I/O Module the firmware version is displayed.

```
F-IOM  start
V01-19
```

2.3.2.2 Indications in operation (display level)

While operation the following informations are displayed in the LCD Display

```
F-Dest Adr  xxxx
yyyyyyyyyyyyyyyy
```

text	content	values	
xxxxx	Profisafe address (F destination address)	`-----`	So far no address entered
		xxxx	decimal display of Profisafe address
yyyyyyyyy yyyyyyyy	Message	**Run**	safe operation
		yy··	messages see chapter "Indications"

Indications in display level

Line 1 of the LCD Display always indicates the entered Profisafe Address in decimal.

Line 2 displayes in addition signal specific, module global and safety relevant messages.

All informations are updated cyclicly.

Safety I/O-Modules for IS1

2.4 Behavior in case of error

Most errors of Hardware and Software can be detected by internal self test routines. These self test routines are divided into small steps and run permanently in parallel to the standard functionality. Most of the tests are executed completely while power on, too.

Error behaviour after failure detection on module global tests (e.g. RAM Test,…)

- Diagnosis message is displayed on LED and LCD display.

- Module is set into and retains in safe state. (no communication)

- Module has to be replaced!

- Reset of this failure state and restest can only be initiated by manual Power On.

Error behaviour after failure detection on internal signal specific hardware test

- Error message is displayed on LED and LCD display.

- Error condition is transmitted through Profisafe communication to master system by signal status. (Error condition is transmitted by DPV1 signal diagnosis, too)

- not affected channels continue operation

- Faulty Channel is set into and retains in this state. (transmitting bad signal status)

- Module has to be replaced!

- Reset of this failure state and restest can only be initiated by manual Power On.

Error behaviour in case of detection of external signal faults:

In case of external signal failure (eg short circuit or line break), it's reported via Profisafe communication to master system by signal status and diagnosis telegram, too. If the failure is removed, signal status returns to "good" again.

2.5 Adjustment of F-destination address

Behavior of the module while/after entry:

After finalising the entry of a F-destination address a verification query is to be answered. After that, the module jumps back to the state before jumping into adjustment level. The entered F-destination address is valid from this moment.

If the user confirms the address without changing it, the menue jumps back to Display Level without verification query.

2.5.1 Key assignment

command	marking	function	remark
<down>	$\vee$	*decrement*	
<Up>	$\wedge$	*increment*	
<ENTER>	Enter	*Enter*	Simultaneous pushing of both buttons: $\vee$ and $\wedge$
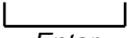
Safety I/O-Modules for IS1

2.5.2 Menu structure

Two levels are existing in the menu: Display- and adjustment Level.

Level	function
Display Level	Display of F-Destination address (line 1) and Information/Error message (line 2)
Adjustment Level	Adjustment Level for F-Destination address

Display Level

```
F-Dest Adr:xxxxx
no change in run
```

independent return

Display Level

```
F-Dest Adr:xxxxx
yyyyyyyyyyyyyyy
```

If module in cyclic PROFIsafe exchange (Run)

If module not in cyclic PROFIsafe exchange

Adjustment Level

```
Adj. F-Dest Adr
xxxxx
```

address **not** changed

verification query

```
Save     F-Dest
Adr? NO
```

address changed

```
up /
down
enter
```
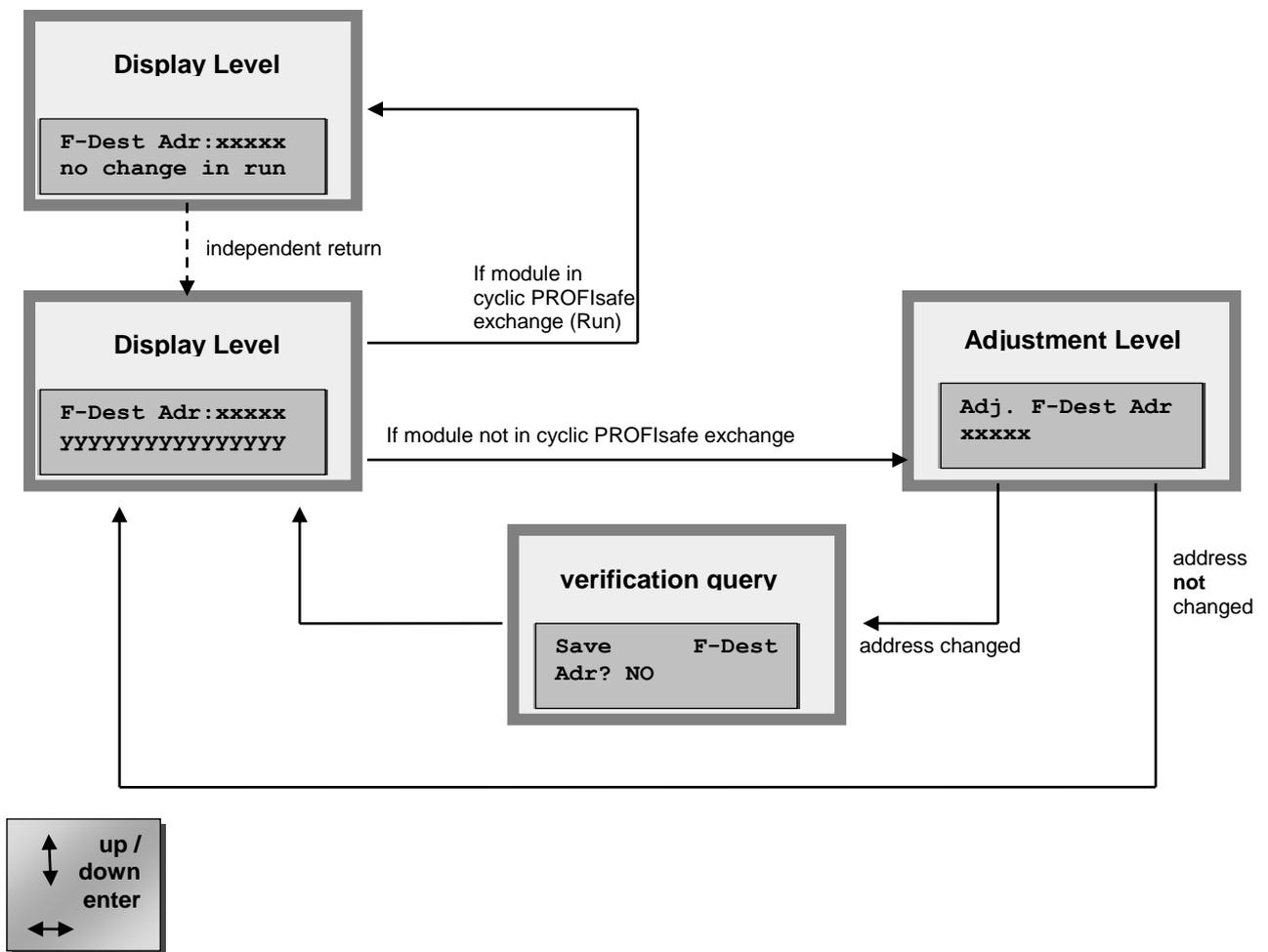
Level	Module in cyclic profisafe operation		Module not in cyclic profisafe operation	
	Line 1	Line 2	Line 1	Line 2
Display	„F-Dest Adr:" [address]	[Message]	„F-Dest Adr" [address]	[Message]
Adjustment	[Message]		„Adj. F-Dest Adr"	[address]

2.5.3 Adjust F-Destination Address

Jump from Display to Adjustment Level

The Adjustment Level can be reached from Display Level by pressing <ENTER> .

If this is done while module is in cyclic Profisafe operation, an error message is displayed for a while.

```
F-Dest Adr:xxxxx
no change in run
```

Adjustment of F-destination address (factory setting = 9999).

The F-destination address can be incremented or decremented by pressing <up> / <down> button.

One single push on the button modifies the address by one.

If the button is hold pressed, the address is changing continuous in slow speed. If the button is pressed for a longer time period, the address value is changing with increasing speed.

After address 9999 (Decimal) it jumps to 1 and vice versa.

Takeover of a new F destination address

Acknowledgement of the adjustment can be done by pressing <ENTER>

To set valid the adjusted address, the verification question has to be answered with Yes and acknowledged by <ENTER>

→ If No is set, the adjustment is rejected and the existing address before jump into adjustment level is still valid.

→If Yes is set, the recent F-Destination address is set to valid.

2.5.4 Behaviour at changes in the operation status while input

If the module is set into cyclic Profisafe operation or an module error arrises while it is in adjustment level, the module jumps into display level autonomous and uses the F-Destination Address valid before jump into adjustment level.

2.6 Readback of valid F-Destination address

The entered F-destination address of all S-I/O-Modules of a IS1 field station can be read back by an DPV1 data record (Only available with CPM Firmware with DPV1 support as of V 02-40).

A DPV1 Read Request to Slot 0 (CPM) Index 9 returns a 32 byte block of data.

For each slot 1 to 16 a UINT 16 containing the actual F-destination address is delivered. Not inserted modules or non S-I/O-modules deliver a value of 0x00.

byte	1	2	3	4	. . . .	31	32
slot	1		2		. . . .	16	

2.7 Softwareupdate

Update of CPM Software is only permitted to be done by trained service personal. The Update has to be executed in accordance with the manual of 'IS1 Firmware-download'. The hints and instructions stated in this document, have to be taken into account. After firmware download, the required settings and parameterisation have to be checked and to be set into the status before downloading process.

Instructions stated in the chapter `commissioning` have to be taken into account.

2.8 Comissioning / replacement

Bevore comissioning of the Safety System and after replacement of a module the safety function has to be tested. Part of the test is also to check if the real Profibus DP module address and the adjusted F-destination address conforms to system configuration and parameterisation in the F-Host.

Safety I/O-Modules for IS1

2.9 Prooftest

Routine prooftests are mandatory to keep alive the functional safety of the system. They are required to detect failures, which are not detectable in safe operation of the system.

The time interval has to be choosen in accordance with the wanted PFDavg – Level.

After expiration of the Prooftest intervall, testing of the module with all inputs and outputs is mandatory.

It shall be tested, if:

- o the real Profibus DP module address and the adjusted F-destination address conforms to system configuration and parameterisation in the F-Host.
- o the functionality and safety shut down of the loop is working (while the test the safe interaction of all components of the safety system shall be tested. If it's not possible to drive the process up till the safety system intervenes, because of process-related reasons, the system has to be forced to intervention by suitable simulation).
- o the LED and LCD display is working and no faulty conditions are displayed.

If errors or malfunctions were recognized during the test, the system has to be set out of service immediately and the safety of the process has to be keep ahead by other measures.

The execution of the prooftests, test conditions and results of the testing has to be documented.

Safety I/O-Modules for IS1

3   SAIMH module description / technical data

3.1   Application

The IS1 system is suitable now for safety systems of low demand mode. The system can be used in applications with a maximum demand rate of 1 per year. The safety function of the IS1 system and the S-modules can be used for example in safety process shut-down (PSD) applications according IEC 61508 up to SIL 2.

3.2   Functional safety data

The module can be used for SIL 2 applications

Safe state:	high >= 22.8 mA; low <= 2.4 mA , alarm code
	Outside valid signal range
	(see ´mapping of input data´)
SFF:	> 90% (type B devices)
HFT:	0
Mode:	Low demand
PFD per signal of IS1 S-Module:	<= 4% of PFD SIL 2 safety loop @ Tproof >1Year
Life time:	10 Years
Hardware structure:	1oo1D

Confirmation of meeting the requirements of IEC 61508 is done by an assement report of EXIDA.

The Failure rate of the IS1 System is calculated by a FMEDA (Failure Mode, Effects and Diagnostics Analysis). The failure rate of the components are taken from Siemens Standard SN29500 at a mean ambient temperature of 40°C. For the calculation a MTTR of 8 hours is assumed.

The values of functional safety can be taken from the EXIDA's 'management summary'.

Safety I/O-Modules for IS1

3.3 Technical Data

The S-AIMH enables the connection of explosion protected analog circuits with requirements according to IEC61508 up to SIL 2 onto the IS1 remote I/O system.

The Module provides Inputs for two wire 4-20 mA transmitters.

Accuracy:

Maximum deviation:	2 % (under considerations of functional safety)
	0.1 % (under functional considerations)
max. temperature drift:	0.1 % / 10 K (under both considerations)
Cycle times	tbd.
EMC:	In addition to the standard EMC values of the IS1 system the increased levels of Profibus Guideline 2232 „PROFIsafe - Requirements for Installation, Immunity and electrical Safety" are covered.
Temperature Range:	Ta = -20°C ... 65°C

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3.4 connections

Terminal marking	Signal	Module selection	
1	Signal 0 (+)	**6 channels** **9462/12-06-11**	**8 channels** **9462/12-08-11**
2	Signal 0 (-)		
3	Signal 1 (+)		
4	Signal 1 (-)		
.	.		
.	.		
11	Signal 5 (+)		
12	Signal 5 (-)		
13	Signal 6 (+)	Not transmitted.	
14	Signal 6 (-)		
15	Signal 7 (+)		
16	Signal 7 (-)		

3.5 Unused signal inputs

Short- and open circuit detection is permanent enabled for all inputs of the SAIMH module. Unused or spare inputs must be wired with resistors (2 kOhm – 4 kOhm, >= 0,6 Watt) to disable signal error messages and indications for this inputs.

3.6 HART support

The integrated HARD Multiplexer offers acyclic, bidirectional HART communication. The Module is transparent for any HART command. The information is communicated from the CPM by DPV1.

Note:

HART Functionality is not part of functional safety functions.

HART Variables PV1, PV2, PV3 and PV4 are not transported in the cyclic communication of DP.

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Attention:

The S-AIMH is fully transparent for HART Commands. Safety relevant changes of functions of the field device by HART Commands (e.g. scale of signal) are not examined or prevented by the S-AIMH. The operator is responsible to preserve the safe Function of the HART Field Devices. This can be done e.g. by locking the parameters on the field device in touch with organizationally measures.

3.7   Parameter

3.7.1   I-Parameter (funktional parameters)

The S-AIMH is a module with definite functional behaviour. The S-AIMH has no individual parameters (I-parameter) and has no functionality, which can be changed via parameters.

3.7.2   F-Parameter (Profisafe-Parameters)

The PROFIsafe F-parameters of the SAIMH module must be set in the configuration software of the PROFIsafe F-host using the IS1 GSD file.

F-parameter of SAIMH:

| Byte No.		Parameter		area / selection	settings in IS1 GSD		
					fix	de-fault	visible
0		DPV1-Header	Block length F-parameters		0x0E	-	N
1		DPV1-Header			0x05	-	N
2		DPV1-Header	slot F-module		0x00	-	N
3		DPV1-Header	Reserved		0x00	-	N
4	4.0	F_Prm_Flag 1	F_Check_SeqNr	No Check (0)	(0x0)	-	N
	4.1		F_Check_iPar	No Check (0)	(0x0)	-	N
	4.2 + 4.3		F_SIL	SIL 1, SIL 2, SIL 3, NoSIL	SIL 2 (0x01)	-	**Y**
	4.4 + 4.5		F_CRC_Length	2 Byte, 3 Byte, 4 Byte	4 Byte (0x02) *1)	-	**Y**
	4.6		F_Check_IO_ Structure	No Check (0)	(0x0)	-	N
	4.7		Reserved		(0x0)	-	N
5	5.0 – 5.2	F_Prm_Flag 2	Reserved		(0x0)	-	N
	5.3 – 5.5		F_Block_ID		(0x00)	-	N
	5.6 + 5.7		F_Par_Version	V1 (0x0), V2 (0x1)	V1 (0x00) or V2 (0x01)	-	**Y**
6, 7			**F_Source_Add**	1 … 65534		1	**Y**
8, 9			**F_Dest_Add**	1 … 65534		1	**Y**
10, 11			**F_WD_Time**	0 … 65535 (* 1 ms)		1000	**Y**
12, 13		CRC1	F_Par_CRC	0 … 65535	calculated	-	N

*1) CRC lenght is differnt depending on signal number and PROFIsafe mode of SAIMH:

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Byte 4 (F_Prm_Flag 1):

Mode	Byte 4		CRC
8 AI V1	0010 0100	0x24	4 Byte
8 AI V2	0010 0100	0x24	4 Byte
6 AI V1	0000 0100	0x04	2 Byte
6 AI V2	0001 0100	0x14	3 Byte

Example: Setting of F-parameters in F-host
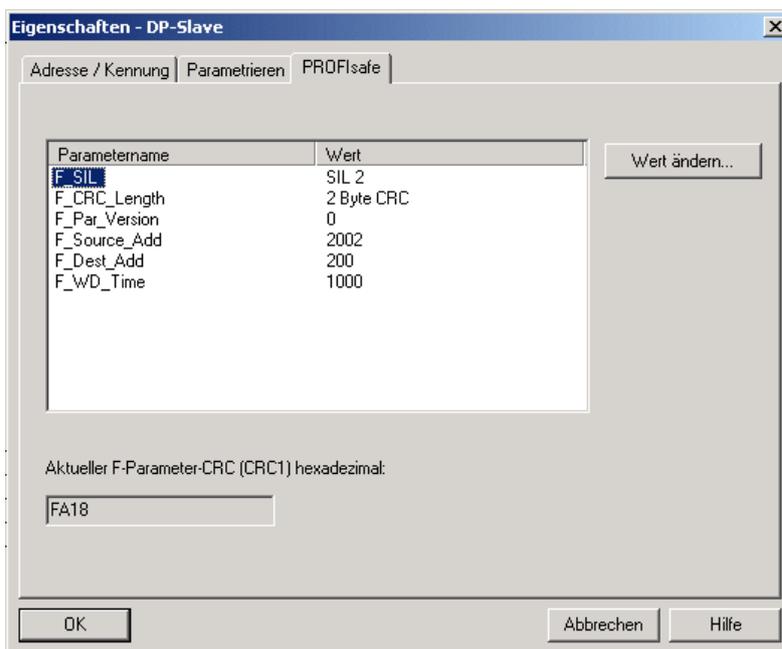
3.7.3   Supported PROFIsafe modes

PROFIsafe mode	F_Check_SeqNr	defined in GSD and supported from SAIMH
V1	No	Yes
	Yes	No ***1)**
V2	Yes	Yes

*1)   If this combination is selected from the F-host independent from the definitions in the GSD file, the SAIMH will not operate and reacts with the error ´Device Fault (code 0x0a)´. Please change F-Parameter in F-host.

3.8 Mapping of Input data

The SAIMH allocates the following cyclic data areas of PROFIBUS DP:

Module type	F-Input data	F-Output data	PROFI-Safe Mode	CRC	Input block (total length)	Output block (total length)
SAIM 8	16 Byte (8 Int16)	0 Byte	V1	4 Byte	22 Byte	6 Byte
			V2	4 Byte		
SAIM 6	12 Byte (6 Int16)	0 Byte	V1	2 Byte	16 Byte	4 Byte
			V2	3 Byte		

Input data block:

Input block (16 / 22 Byte)	
F-Input data (6 / 8 Int 16)	PROFISafe safety data

The scaling of the SAIMH corresponds to the data format of standard AI modules of IS1 with the measurement range 4 - 20 mA.

Range 4 – 20 mA	Units decimal	Units Hex	%	Range	Alarms / Diagnoses
>22,814 mA	*1)	*1)			Short circuit
22,814 mA	32511	7EFF	117,6%	Over range	-
20 mA	27648	6C00	100%	Nominal range	-
12 mA	13824	3600	50%		
4 mA	0	0	0%		
3,999 mA	-1	FFFF		Under range	-
2,4 mA	-2765	F533	-10%		
< 2,4 mA	*1)	*1)			Line break

*1) Transmitted value in case of error:

Behaviour in case of error	Type of error	Value transmitted if an error occurs	
Alarm code	Short circuit	32767	7FFF
	Open circuit	-32762	8006
General rule to generate status information in AS for all AI signals:	HW error	-32751	8011
	Overtemperature	-32750	8012
Signal is disturbed if Value >= 32512 or Value <= -32512			

NOTE:
As described in Profisafe specification, the Profisafe status byte generated by the S-AIMH has to be evaluated by F-Host and shall lead to modul global failure reaction.
In addition, the user is responsible to implement evaluation of signal status of each used safe signal and - in case of status "bad" - initiate signal specific failure reaction by application program!

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4   Required action in case of malfunction

If an error or malfunction arises, the system has to be set out of service immediately and the safety of the process has to be keep ahead by other measures. Malfunctions and failures within the IS1 Remote I/O System shall be reported to the manufacturer R.STAHL (Address see chapter 'support address') immediately.

5   Release Notes:

Version	Extensions / Changes
V1.0.0	First official Release of Operating Instructions
V1.0.1	Chapter 3.7.3 ´Supported PROFIsafe modes´ added

6   Support Address

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