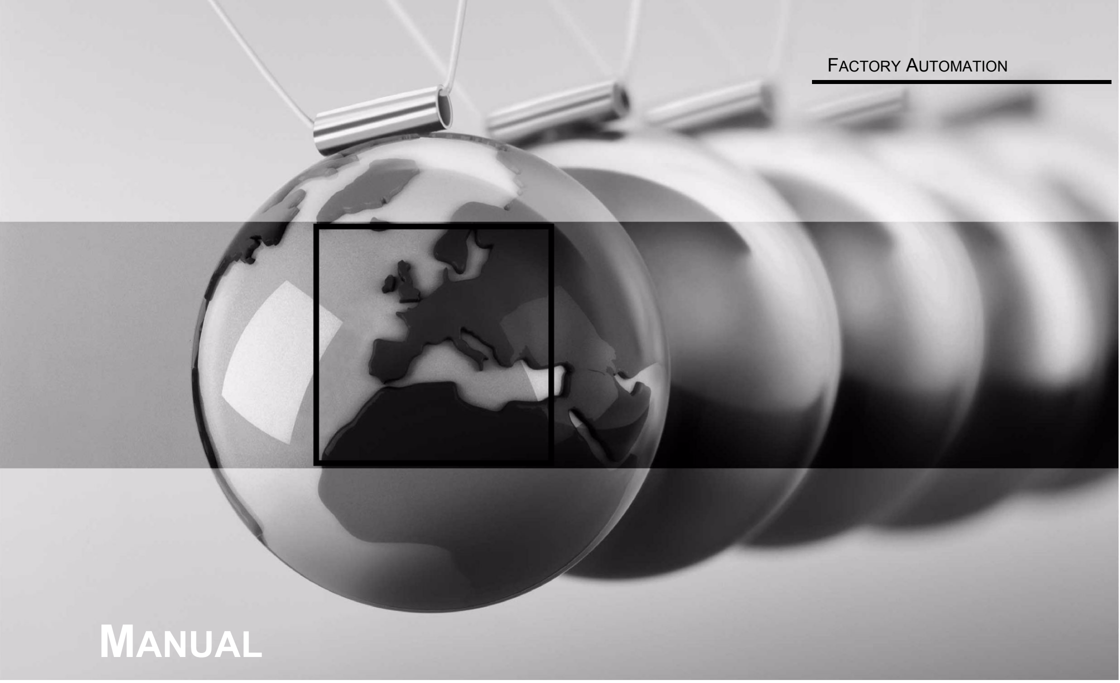

MANUAL

AS-I 3.0 COMMAND INTERFACE

PEPPERL+FUCHS
SENSING YOUR NEEDS

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AS-i 3.0 Command Interface

1. Introduction

The AS-i gateways integrate the AS-i slaves into the upstream fieldbus. Each upstream fieldbus (f.e. Modbus/TCP, CANopen, or PROFIBUS) has its unique possibilities to access cyclically and acyclically data. The gateway polls as an AS-i master all the slaves on the AS-i circuit. The result of these polls the gateway keeps in its internal state RAM as images of the inputs, outputs, parameters, and status. These images are available for use on the upstream fieldbus with their specific access methods. The images of the Modbus/TCP to AS-i gateway are available with Modbus Read and Write function calls on different Modbus registers. The main manual (command: insert cross reference) describes this in detail. CANopen provides this access with PDOs for cyclical access and SDOs for acyclical access.

The access to the images of the gateway is easy to configure on the upstream fieldbus and in most applications sufficient. However, the complete functionality of the gateway is available with the command interface. If you want to read the diagnosis string of an AS-i tuner (slave with 7.4 profile), you will need the command interface to call the WRITE_ACYC_DATA and READ_ACYC_DATA commands.

The command interface is avaible in a special image. A command is called by writing into this image and the command result is avaible with a read to this image.

Information!

The manual "AS-i 3.0 Command Interface" describes commands of the AS-i 3.0 Command Interface. A description of an AS-i Master is not included. Please refer to the corresponding manual of your AS-i Master for further information.

Please view the documentation of the respective device for further, device-specific information about the kind of the access to the command interface.

2. Structure of the Command Interface

The command interface has the following structure shown in *table 1* and *table 2*.

Table 1

command request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	command							
2	T	O	circuit					
3	request parameter byte 1							
…	…							
36	request parameter byte 34							

Tab. 2-1.

Bit ***T*** in the command interface is the **toggle bit**. The toggle bit is only necessary in the case of interfaces which transfer the data cyclically.

The execution of a command of the command interface is declined, if the number of the transferred parameters is too small, this could happen when the command interface is too small or the tegram is too short.

Circuit selects the AS-i circuit. Circuit = 0 selects the first AS-i circuit.
Bit ***O*** is the list order bit. The commands for reading and writinig slave lists support two different sorting schemas.
O = 0 selects the Standard schema.
O = 1 selects the Siemens schema (the sequence of the bits in the slave lists bytes is inverse).

Parameter byte n is the n^{th} parameter of the command. The number of parameters is different for different commands. It is not necessary to set the additional parameter bytes to 0 in the command interface, if a command does not use the maximum number of parameter bytes (36)

Table 2

command response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	command (mirrored)							
2	T	result						
3	response byte 1							
…	…							
36	response byte 34							

Tab. 2-2.

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There is the reflected command byte and the toggle bit of the request in the response. The execution of the command returns its result in the seven least significant bits of byte 2 of the response. 0 signals execution of the command without an error. The table *result codes* shows all possible result codes.

Information!

Please note that possibly some controls can exchange the high and low byte on the field bus with word orientated access to the command interface.

2.1 Result-code values

Name	Value	Description
OK	00_{16}	execution without fault
HI_NG	11_{16}	general fault
HI_OPCODE	12_{16}	illegal value in command
HI_LENGTH	13_{16}	length of the command interface is too short[1]
HI_ACCESS	14_{16}	no access right
EC_NG	21_{16}	general fault
EC_SND	22_{16}	slave (source addr) not detected
EC_SD0	23_{16}	slave 0 detected
EC_SD2	24_{16}	slave (target addr) not decteced
EC_DE	25_{16}	delete error
EC_SE	26_{16}	set error
EC_AT	27_{16}	address temporary
EC_ET	28_{16}	extended ID1 temporary
EC_RE	29_{16}	read (extended ID1) error

Tab. 2-3.

1. The length of the command interface in the I/O-data area respectively the length of the DP/V1 requests is too short

3. List of all Commands

!!!
The most of the described commands can be applied to all AS-i 3.0 Masters. Exceptions are indicated in footers.

Values for command

	see page	Command	Value	Meaning	Req Len	Res Len
	page 14	AS-i 16-bit data				
	page 14	RD_7X_IN	50_{16}	read 1 16-bit slave profile in.data	3	10
	page 15	WR_7X_OUT	51_{16}	write 1 16-bit slave profile out.data	11	2
	page 15	RD_7X_OUT	52_{16}	read 1 16-bit slave profile out.data	3	10
	page 16	RD_7X_IN_X	53_{16}	read 4 16-bit slave profile in.data	3	34
	page 16	WR_7X_OUT_X	54_{16}	write 4 16-bit slave profile out.data	35	2
	page 17	RD_7X_OUT_X	55_{16}	read 4 16-bit slave profile out.data	3	34
	page 18	OP_RD_16BIT_IN_CX	$4C_{16}$	read 16 channels 16-bit slave in.data	3	34
	page 19	OP_WR_16BIT_OUT_CX	$4D_{16}$	write 16 channels 16-bit slave out.data	36	2
	page 20	Commands acc. to Profile S-7.4/S-7.5				
!	page 20	WR_74_75_PARAM[1]	$5A_{16}$	write S-7.4/S-7.5-slave parameter	≥6	2
!	page 21	RD_74_75_PARAM[1]	$5B_{16}$	read S-7.4/S-7.5-slave parameter	4	≥3
!	page 22	RD_74_75_ID[1]	$5C_{16}$	read S-7.4/S-7.5-slave ID string	4	≥3
!	page 23	RD_74_DIAG[1]	$5D_{16}$	read S-7.4/S-7.5-slave diagnosis string	4	≥3
	page 24	Acyclic commands				
	page 24	WRITE_ACYC_TRANS	$4E_{16}$	write acyclic transfer	≥7	2
	page 30	command 1: read string S-7.4 ID				
	page 30	command 2: read string S-7.4 diag				
	page 30	command 3: read string S-7.4 param string				
	page 31	command 4: write S-7.4 param string				
	page 31	command 5: transfer S-7.5				
	page 32	command 6: read S-7.5 cyclic 16-bit slave configuration				
	page 33	command 7: read safety monitor diagnostic (sorted by OSSD)				
	page 35	command 8: read safety monitor diagnostic (unsorted)				
	page 36	command 9: diagnosing the Safe Link				
	page 36	command 10: read current safety monitor diagnostic				
	page 39	command 11: read shutdown-history				
	page 36	command 12: read current safety monitor diagnostic, device-allocation considered				
	page 39	command 13: read shutdown-history of a safety monitor, device-allocation considered				
	page 41	command 14: read safety monitor diagnostic				
	page 43	command 15: safety status				
	page 45	command 16: device index identifier (read identifier as plain text)				
	page 27	READ_ACYC_TRANS	$4F_{16}$	read acyclic transfer	5	≥2
	page 46	AS-i diagnostic				
	page 47	GET_LISTS	30_{16}	get LDS/LAS/LPS flags	2	29

Tab. 3-4.

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Values for command

	see page	Command	Value	Meaning	Req Len	Res Len
	page 49	GET_FLAGS	47_{16}	get flags	2	5
	page 50	GET_DELTA	57_{16}	get list of config. diff.	2	10
	page 51	GET_LCS	60_{16}	get LCS	2	10
	page 52	GET_LAS	45_{16}	get LAS	2	10
	page 53	GET_LDS	46_{16}	get LDS	2	10
	page 54	GET_LPF	$3E_{16}$	get LPF	2	10
	page 55	GET_LOS	61_{16}	get LOS	2	10
	page 56	SET_LOS	62_{16}	set LOS	10	2
	page 57	GET_TECA	63_{16}	get transm.err.counters	2	34
	page 58	GET_TECB	64_{16}	get transm.err.counters	2	34
	page 59	GET_TEC_X	66_{16}	get transm.err.counters	4	≥3
!	page 60	READ_FAULT_DETECTOR[2]	10_{16}	read Fault_Detector	2	4
!	page 61	READ_DUPLICATE_ADDR[3]	11_{16}	read list of duplicate addresses	2	10
!	page 62	GET_SLV_ERRCOUNT[4]	14_{16}	Get Slave Error Counters	3	14
!	page 63	GETCLEAR_SLV_ERRCOUNT[5]	15_{16}	Get Clear Slave Error Counters	3	14
!	page 64	READ_REL_CYC[6]	40_{16}	read OSSD switching cycle	2	10
!	page 65	MB_OP_GET_EXT_EF[7]	97_{16}	read extended earth fault information	2	8
!	page 66	MB_OP_GET_LINE_ ERRCOUNT[8]	12_{16}	read error counters	2	38
!	page 68	MB_OP_GETCLEAR_LINE_ ERRCOUNT[9]	13_{16}	read and reset error counters	2	38
!	page 70	Safe Link diagnostics[10]				
!	page 71	READ_NODE_OVERVIEW_HISTORY			3	6
!	page 72	READ_AND_CLEAR NODE_OVERVIEW_HISTORY			3	6
!	page 73	READ_NODE_OVERVIEW			3	34
!	page 74	READ_MANAGER_OVERVIEW			3	34
!	page 75	READ_NODE_STATUS			3	9
!	page 75	READ_INTERFACE			3	8
	page 77	Configuration of AS-i Master				
	page 78	SET_OP_MODE	$0C_{16}$	set Operation_Mode	3	2
	page 79	STORE_CDI	07_{16}	store Actual_Configuration	2	2
	page 80	READ_CDI	28_{16}	read Actual_Configuration	3	4
	page 81	SET_PCD	25_{16}	set Permanent_Config	5	2
	page 82	GET_PCD	26_{16}	get Permanent_Config	3	4
	page 83	SET_LPS	29_{16}	set LPS	11	2
	page 84	GET_LPS	44_{16}	get LPS	2	10
	page 84	STORE_PI	04_{16}	store Actual_Parameter	2	2
	page 85	WRITE_P	02_{16}	write Parameter	4	3
	page 86	READ_PI	03_{16}	read Parameter	3	3
	page 87	SET_PP	43_{16}	set Permanent_Parameter	4	2
	page 87	GET_PP	01_{16}	get Permanent_Parameter	3	3

Tab. 3-4.

Values for command

	see page	Command	Value	Meaning	Req Len	Res Len
	page 88	SET_AAE	$0B_{16}$	set Auto_Address_Enable	3	2
	page 89	SLAVE_ADDR	$0D_{16}$	change Slave_Address	4	2
	page 90	WRITE_XID1	$3F_{16}$	write Extended_ID-Code_1	3	2
	page 91	Other commands				
	page 92	IDLE	00_{16}	no request	2	2
	page 92	READ_IDI	41_{16}	read IDI	2	36
	page 93	WRITE_ODI	42_{16}	write ODI	34	2
	page 94	READ_ODI	56_{16}	read ODI	2	34
	page 95	SET_OFFLINE	$0A_{16}$	set Off-Line_Mode	3	2
	page 96	SET_DATA_EX	48_{16}	set Data_Exchange_Active	3	2
!	page 96	REWRITE_DPRAM[11]	78_{16}	rewrite DPRAM	3	3
	page 97	BUTTONS	75_{16}	disable push buttons	3	2
	page 97	FP_PARAM	$7D_{16}$	functional Profile Parameter	≥3	≥2
	page 98	FP_DATA[12]	$7E_{16}$	functional profile data	≥3	≥2
!	page 99	EXT_DIAG[13]	71_{16}	ExtDiag generation	6	2
!	page 100	RD_EXT_DIAG[14]	$7B_{16}$	read ExtDiag Settings	2	7
	page 101	INVERTER	$7C_{16}$	configure inverter slaves	12	4
	page 102	MB_OP_CTRL_WR_FLAGS	85_{16}	write flags	≥5	2
	page 103	MB_OP_CTRL_RD_FLAGS	86_{16}	read flags	4	≥3
	page 103	RD_MFK_PARAM	59_{16}	read SEW MFK21 parameter	6	≥3
	page 104	MB_OP_CTRL_RESET_CT	89_{16}	reset control cycle time	2	2
	page 105	MB_OP_CTRL_RD_PRM	88_{16}	read control parameter	4	18
	page 106	MB_OP_CTRL_WR_PRM	87_{16}	write control parameter	20	2
	page 107	MB_OP_CTRL_STATUS	83_{16}	read control status information	2	12
	page 108	MB_OP_CTRL_CONTROL	82_{16}	write control status flags	3	2
	page 109	MB_OP_NAME	72_{16}	read device name	2	34
	page 110	MB_OP_READ_SERIAL	76_{16}	read serial number	2	6
	page 111	Functional Profiles				
	page 112	"Safety at Work" list	00_{16}	slaves with released safety function, response contains EcFlags	3	8
	page 114	"Safety at Work" list	$0D_{16}$	slaves with released safety function, response doesn‘t contain EcFlags	3	6
	page 115	"Safety at Work" diagnosis[15]	02_{16}	monitor diagnosis	5	n
	page 120	Device Index Identifier	$1C_{16}$	Read the device identifer in plan text	7	n
	page 122	integrated AS-i sensors: Warnings	03_{16}	sensors with deleted D1 bit	3	10
	page 123	Integrated AS-i sensors: Availability	04_{16}	sensors with deleted D2 bit	3	6
	page 124	language-select	$0E_{16}$	read display language	4	3
	page 125	replacement of safety slaves input data	$0F_{16}$	read safety input slave "interpretation data"	3	4
	page 126	list of safety slaves	10_{16}	read addresses of safety slaves	3	6

Tab. 3-4.

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Values for command

see page	Command	Value	Meaning	Req Len	Res Len
page 127	function $1E_{16}$	$7E_{16}$	read AS-i current maximal value	3	4
		$7D_{16}$	reset AS-i current maximal value	3	2
page 129	function $1F_{16}$	$7E_{16}$	read AS-i current limit value	3	3
		$7D_{16}$	write AS-i current limit value	4	2
page 130	function 26_{16}	$7E_{16}$	read ripple voltage maximal value	3	6
		$7D_{16}$	reset ripple voltage maximal value	3	4
page 132	function 27_{16}	$7E_{16}$	read ripple voltage limit value	3	4
		$7D_{16}$	reset ripple voltage limit value	4	2
page 134	function 17_{16}	$7E_{16}$	read S-7.5 slave information	4	7
page 135	function 22_{16}	$7E_{16}$	read the type of power supply	3	3
		$7D_{16}$	write the type of power supply	4	2

Tab. 3-4.

1. There are improved versions of these commands. We don‘t recommend to use the old one any more.
2. The command READ_FAULT_DETECTOR is valid only for the use with masters which support this function. Please refer to the user manual of the master for further information.
3. The command READ_DUPLICATE_ADDR is valid only for the use with masters which support this function. Please refer to the user manual of the master for further information.
4. The command GET_SLV_ERRCOUNT is valid only for the use with masters which support this function. Please refer to the user manual of the master for further information.
5. The command GETCLEAR_SLV_ERRCOUNT is valid only for the use with masters which support this function. Please refer to the user manual of the master for further information.
6. Der Befehl READ_REL_CYC gilt nur für Master, die diese Funktion unterstützen. Bitte schauen Sie im Handbuch des Masters nach weiteren Informationen.
7. Der Befehl MB_OP_GET_EXT_EF gilt nur für Master, die diese Funktion unterstützen. Bitte schauen Sie im Handbuch des Masters nach weiteren Informationen.
8. Der Befehl MB_OP_GET_LINE_ERRCOUNT gilt nur für Master, die diese Funktion unterstützen. Bitte schauen Sie im Handbuch des Masters nach weiteren Informationen.
9. Der Befehl MB_OP_GETCLEAR_LINE_ERRCOUNT gilt nur für Master, die diese Funktion unterstützen. Bitte schauen Sie im Handbuch des Masters nach weiteren Informationen.
10. The command CROSS_COMMUNICATION_DIAG is valid only for the use with masters which support this function. Please refer to the user manual of the master for further information.
11. The command REWRITE_DPRAM is valid only for the use with AS-i 3.0 Module OEM Master.
12. There are improved versions of these commands. We don‘t recommend to use the old one any more.
13. The command EXT_DIAG is valid only for the use with AS-i 3.0 PROFIBUS Gateways.
14. The command RD_EXT_DIAG is valid only for the use with AS-i 3.0 PROFIBUS Gateways.
15. There are improved versions of these commands. We don‘t recommend to use the old one any more.

4. Commands of the Command Interface

4.1 AS-i 16-bit data

4.1.1 Overview of the commands

see page	Values for command Command	Value	Meaning	Req Len	Res Len
page 14	RD_7X_IN	50_{16}	read 1 16-bit slave profile in.data	3	10
page 15	WR_7X_OUT	51_{16}	write 1 16-bit slave profile out.data	11	2
page 15	RD_7X_OUT	52_{16}	read 1 16-bit slave profile out.data	3	10
page 16	RD_7X_IN_X	53_{16}	read 4 16-bit slave profile in.data	3	34
page 16	WR_7X_OUT_X	54_{16}	write 4 16-bit slave profile out.data	35	2
page 17	RD_7X_OUT_X	55_{16}	read 4 16-bit slave profile out.data	3	34
page 18	OP_RD_16BIT_IN_CX	$4C_{16}$	read 16 channels 16-bit slave in.data	3	34
page 19	OP_WR_16BIT_OUT_CX	$4D_{16}$	write 16 channels 16-bit slave out.data	36	2

Tab. 4-5.

4.1.2 Read 1 16-bit Slave in.Data (RD_7X_IN)

With this command, the four 16-bit channels of an AS-i input slave according to the slave profile (S-7.3, S-7.4, S-7.5, S-7.A.8, S.A.9, S-7.A.A) can be read.

Information!

A-Slaves map the data on channels 1 and 2.

B-Slaves map the data on channels 3 and 4.

Only values among 1 and 31 can be taken as a slave address.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	50_{16}							
2	T	–	circuit					
3	–		0	slave address				

Tab. 4-6.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	50_{16}							
2	T	result						
3	channel 1, high byte							
…	…							
10	channel 4, low byte							

Tab. 4-7.

4.1.3 Write 1 16-bit Slave out. Data (WR_7X_OUT)

With this command, the four 16-bit channels of an AS-ioutput slave according to the slave profile (S-7.3, S-7.4, S-7.5, S-7.A.8, S.A.9, S-7.A.A) can be written.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	51_{16}							
2	T	–	circuit					
3	–		0	slave address				
4	channel 1, high byte							
…	…							
11	channel 4, low byte							

Tab. 4-8.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	51_{16}							
2	T	result						

Tab. 4-9.

4.1.4 Read 1 16-bit Slave out. Data (RD_7X_OUT)

With this command, the four 16-bit channels of an AS-i output slave according to the slave profile (S-7.3, S-7.4, S-7.5, S-7.A.8, S.A.9, S-7.A.A) can be read.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	52_{16}							
2	T	–	circuit					
3	–		0	slave address				

Tab. 4-10.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	52_{16}							
2	T	result						
3	channel 1, high byte							
…	…							
10	channel 4, low byte							

Tab. 4-11.

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4.1.5 Read 4 16-bit Slave in. Data (RD_7X_IN_X)

With this command, the four 16-bit channels of 4 AS-i input slaves with successive addresses according to slave profile (S-7.3, S-7.4, S-7.5, S-7.A.8, S.A.9, S-7.A.A) can be read.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	53_{16}							
2	T	–	circuit					
3	–		0	1st slave address				

Tab. 4-12.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	53_{16}							
2	T	result						
3	1st slave, channel 1, high byte							
…	…							
34	4th slave, channel 4, low byte							

Tab. 4-13.

4.1.6 Write 4 7.3 Slave out. Data (WR_7X_OUT_X)

With this command the four 16-bit channels of four AS-i output slaves with successive addresses according to slave profile (S-7.3, S-7.4, S-7.5, S-7.A.8, S.A.9, S-7.A.A) can be written.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	54_{16}							
2	T	–	circuit					
3	–		0	1st slave address				
4	1st slave, channel 1, high byte							
…	…							
35	4th slave, channel 4, low byte							

Tab. 4-14.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	54_{16}							
2	T	result						

Tab. 4-15.

4.1.7 Read 4 7.3 Slave out. Data (RD_7X_OUT_X)

With this command, the four 16-bit channels of four AS-i output slaves with successive addresses according to slave profile (S-7.3, S-7.4, S-7.5, S-7.A.8, S.A.9, S-7.A.A) can be read.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	55_{16}							
2	T	–	circuit					
3	–		0	1st slave address				

Tab. 4-16.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	55_{16}							
2	T	result						
3	1st slave, channel 1, high byte							
…	…							
34	4th slave, channel 4, low byte							

Tab. 4-17.

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4.1.8 Read 16 channels 16-bit Slave in. Data (OP_RD_16BIT_IN_CX)

With this command, 16 channels of the 16-bit input-data for slaves with successive addresses according to slave profile (S-7.3, S-7.4, S-7.5, S-7.A.8, S.A.9, S-7.A.A) can be read.

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$4C_{16}$							
2	T	–	circuit					
3	1. slave							
4	number of channels per slave							

Tab. 4-18.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$4C_{16}$							
2	T	result						
3	1. slave, channel 1, high byte							
4	1. slave, channel 1, low byte							
…	…							
33	16. channel, high byte							
34	16. channel, low byte							

Tab. 4-19.

4.1.9 Write 16 channels 16-bit slave out. Data (OP_WR_16BIT_OUT_CX)

With this command, 16 channels of the 16-bit output-data for slaves with successive addresses according to slave profile (S-7.3, S-7.4, S-7.5, S-7.A.8, S.A.9, S-7.A.A) can be written.

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$4D_{16}$							
2	T	circuit						
3	1. slave							
4	number of channels per slave							
5	1. slave, 1. channel, high byte							
6	1. slave, 1. channel, low byte							
…	…							
35	16. channel, high byte							
36	16. channel, low byte							

Tab. 4-20.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$4D_{16}$							
2	T	result						

Tab. 4-21.

4.2 Commands acc. to Profile S-7.4/S-7.5

4.2.1 Overview of the commands

Values for command

see page	Command	Value	Meaning	Req Len	Res Len
page 20	WR_74_75_PARAM[1]	$5A_{16}$	write S-7.4/S-7.5-slave parameter	≥6	2
page 21	RD_74_75_PARAM[1]	$5B_{16}$	read S-7.4/S-7.5-slave parameter	4	≥3
page 22	RD_74_75_ID[1]	$5C_{16}$	read S-7.4/S-7.5-slave ID string	4	≥3
page 23	RD_74_DIAG[1]	$5D_{16}$	read S-7.4/S-7.5-slave diagnostic string	4	≥3

Tab. 4-22.

1. There are improved versions of these commands. We don‘t recommend to use the old one any more.

4.2.2 WR_74_75_PARAM

With this function the parameter string of a slave according to profile S-7.4 is being written or the data transfer with a slave according to profile S-7.5 is started.

By a slave according to profile 7.5, data have to be registered into the buffer in the same form, as they have to be sent by AS-i.

Since the string can be longer than the command interface, it is written into the buffer in parts at first and then it is transferred to the slave.

n is the length of the part of the string which should be written into the buffer from *index i* on.

If i ≡ 0, then the string is being transferred to the slave.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$5A_{16}$							
2	T	–	circuit					
3	slave address							
4	i							
5	n							
6	buffer byte i							
…	…							
n+5	buffer byte i+n-1							

Tab. 4-23.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$5A_{16}$							
2	T	results						

Tab. 4-24.

Issue date: 7.6.2013

4.2.3 RD_74_75_PARAM

With this function the parameter string of a slave according to profile S-7.4 is being read or the slave response according to profile S-7.5 is being read.

If it is about a slave according to profile 7.5, so have the data in the response buffer the following meaning:

FFh 00_{16}: Transfer is still active

FFh xx_{16}: Transfer finished with error

The first byte in the buffer not equal FF_{16}: slave response. The response is in the same form registered in the buffer and transmitted over AS-i.

Since the string can be longer than the command interface, it is written into the buffer. The content of the buffer can read in parts from index i.

The first byte of the buffer is the length of the read string.

If i ≡ 0, the string is being read from the slave, otherwise the function responses out of the memory; the data can be read consistently.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$5B_{16}$							
2	T	–	circuit					
3	slave address							
4	i							

Tab. 4-25.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$5B_{16}$							
2	T	result						
3	buffer byte i							
…	…							
n+2	buffer byte i+n-1							

Tab. 4-26.

4.2.4 RD_74_75_ID

With this function the ID string of a slave according to profile S-7.4 or the 16-bit slave configuration according to profile 7.5 is being read. Since the string can be longer than the command interface, it is written into the buffer. The content of the buffer can read in parts from index i.

The first byte of the buffer is the length of the read string.

If i ≡ 0, the string is being read from the slave, otherwise the function responses out of the memory, the data can be read consistently.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$5C_{16}$							
2	T	–	circuit					
3	slave address							
4	i							

Tab. 4-27.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$5C_{16}$							
2	T	result						
3	buffer byte i							
…	…							
n+2	buffer byte i+n-1							

Tab. 4-28.

By a 7.5 slave is the request always 1. The response byte contains the cyclic 16-bit slave configuration according to S-7.5 profile (analog/transparent bits are cancelled). If the response is 08_{16}, that means that the cyclic 16-bit configuration could not be detected.

Issue date: 7.6.2013

4.2.5 RD_74_DIAG

With this function the diagnostic string of a slave according to profile S-7.4 is being read. Since the string can be longer than the command interface, it is written into the buffer. The content of the buffer can be read in parts from index i.

The first byte of the buffer indicates the length of the read string.

If i $\equiv$ 0, the string is being read from the slave, otherwise the function responses out of the memory, the data can be read consistently.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$5D_{16}$							
2	T	–	circuit					
3	slave address							
4	i							

Tab. 4-29.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$5D_{16}$							
2	T	result						
3	buffer byte i							
…	…							
n+2	buffer byte i+n-1							

Tab. 4-30.

4.3 Acyclic commands

4.3.1 Overview of the commands

Values for command

see page	Command	Value	Meaning	Req Len	Res Len
page 24	WRITE_ACYC_TRANS	$4E_{16}$	write acyclic transfer	≥7	2
page 27	READ_ACYC_TRANS	$4F_{16}$	read acyclic transfer	5	≥2

Tab. 4-31.

4.3.2 WRITE_ACYCLIC_TRANS

This function starts various types of acyclic transfer (S-7.4, S-7.5 and Safety Monitor). The transfer is performed in the background. The result must be read using READ_ACYC_TRANS. The function is intended to be a replacement for the functions (RD_74_75_PARAM, WR_74_75_PARAM, RD_74_75_ID, RD_74_DIAG and "Safety at Work" monitor diagnostic), as it runs in the background and does not stop the AS-i master during the transfer.

As the data to be transferred can be longer than the command interface, the data is first written to a buffer in sections before the transfer is started.

n is the length of the sub-string that is to be written to the buffer starting from index (i). When i = 0, the transfer is started.

Information

See <table 4-33> for an overview of the acyclic transfer commands and the supported monitor types.

Attention!

Don`t execute acyclic commands via multiple command interfaces simultaneously!

Issue date: 7.6.2013

Overview of acyclic transfer commands

see page	command	description
page 30	1	read string S-7.4 ID
page 30	2	read string S-7.4 diag
page 30	3	read string S-7.4 param string
page 31	4	write S-7.4 param string
page 31	5	transfer S-7.5
page 30	6	read S-7.5 cyclic 16-bit slave configuration
page 33	7	read safety monitor diagnostic (sorted by OSSD)
page 35	8	read safety monitor diagnostic (unsorted)
page 36	9	reserved / not defined
page 36	10	read current safety monitor diagnostic
page 39	11	read shutdown-history
page 36	12	read current safety monitor diagnostic, device-allocation considered
page 39	13	read shutdown-history of a safety monitor, device-allocation considered
page 41	14	read safety monitor diagnostic
page 43	15	safety status
page 45	16	device index identifier (read identifier as plain text)

Tab. 4-32.

Information

The commands 7 … 16 are available only with safety devices.

Overview of monitors and commands for safety devices

Type of monitor and/or function range	supported commands									
	7	8	9	10	11	12	13	14	15	16
monitor function range "**basic**"	■	■	—	—	—	—	—	—	—	—
monitor function range "**enhanced**"	■	■	—	—	—	—	—	—	—	—
monitor Generation II (in stainless steel) "**legacy mode**"	■	■	—	—	—	—	—	—	—	—
monitor Generation II (in stainless steel) "**extended mode**"	—	—	—	■	■	■	■	■	—	—
internal monitor Generation II (in stainless steel) "software-version **V4.x**"	—	—	—	—	—	—	—	■	■	—
external monitor Generation II (in stainless steel) "software-version **V4.x**"	—	—	—	—	—	—	—	■	—	■

Tab. 4-33.

Legend:

■ the command is supported

— the command is *not* supported

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$4E_{16}$							
2	T	circuit						
3	slave address							
4	buffer index (i) high							
5	buffer index (i) low							
6	command[1]							
7	number of (n)							
8	data 0							
…	...							
n+7	data n-1							

Tab. 4-34.

1. For a list of all supported commands see <table 4-32>.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$4E_{16}$							
2	return							

Tab. 4-35.

Issue date: 7.6.2013

4.3.3 READ_ACYCLIC_TRANS

With this call the response of the transfer command (started with WRITE_ACYCLIC_TRANS) is read.

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$4F_{16}$							
2	T	circuit						
3	slave address							
4	buffer index (i) high							
5	buffer index (i) low							

Tab. 4-36.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$4F_{16}$							
2	T	response						
3	data i							
...	...							
m[1]	data i+(m-2)							

Tab. 4-37.

1. command interface response length **m**

The response data have the same format, as by commands RD_74_75_PARAM, RD_74_75_ID and „safety at work“-monitor diagnostic, see chap. <"Safety at Work" Monitor diagnostic>.

4.3.3.1 Structure of the response buffer

As the string to be transferred can be longer than the command interface, the string is first saved in a buffer that can be read in sections using the buffer index **(i)**.

The first byte in the response buffer defines the current command. FF_{16} signifies transfer still active, FE_{16} signifies transfer interrupted with errors. In the correct case, the command from WRITE_ACYC_TRANS is given here.

The first sub-section of the string is read using i ≡ 0, the second with i = m-2, etc. The two following bytes (high, low) define the length of the response buffer.

It is recommended to start reading the data always using index i ≡ 0. This message also contains the header. The user data length is therefore reduced by 3 bytes.

Information!

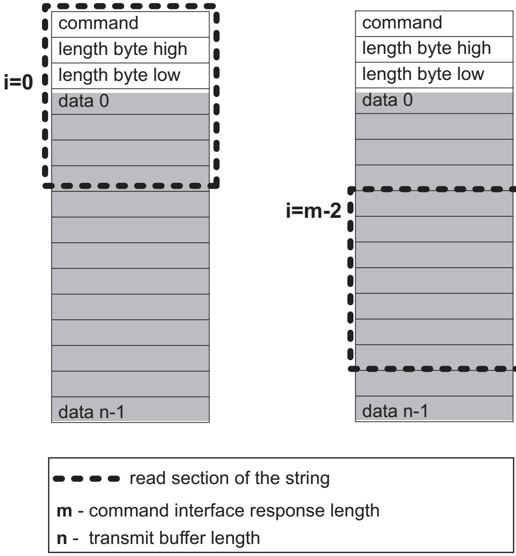
Data with length i ½ 0 can be read successfull only once. Each further read command with length i ½ 0 ist quit with an error. Therefore further read process (sections) must be carried out with i >0!

Response buffer								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	command[1]							
2	length byt[2]e n (high)							
3	length byte n (low)							
4	data 0							
...	...							
n+3	data n-1							

Tab. 4-38.

1. FFh signifies transfer still active, FEh signified transfer interrupted with errors. In the correct case the command from WRITE_ACYC_TRANS is given here.
2. Transmit buffer length **n**.

Issue date: 7.6.2013



Information!

For further information see section <Example for the readout of the safety monitor with ACYC_TRANS>

4.3.3.2 Command 1: Read „S-7.4 ID String"

With this call the *ID string* of a slave according to profile S-7.4 can be read.

Response buffer								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	ID string byte 0							
2	ID string byte 1							
...	...							
n	ID string byte n-1							

Tab. 4-39.

4.3.3.3 Command 2: Read „S-7.4 Diag String"

With this call the *diag string* of a slave according to profile S-7.4 can be read.

Response buffer								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	diag string byte 0							
2	diag string byte 1							
...	...							
n	diag string byte n-1							

Tab. 4-40.

4.3.3.4 Command 3: Read „S-7.4 Param String"

With this call the *param string* of a slave according to profile S-7.4 can be read.

Response buffer								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	param string byte 0							
2	param string byte 1							
...	...							
n	param string byte n-1							

Tab. 4-41.

4.3.3.5 Command 4: Write „S-7.4 Param String“

With this call the *param string* of a slave according to profile S-7.4 can be written.

Request buffer								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	param string byte 0							
2	param string byte 1							
...	...							
n	param string byte n-1							

Tab. 4-42.

4.3.3.6 Command 5: „Transfer S-7.5“

With this call the *transfer string* of a slave according to profile S-7.5 can be trasferred. The request/response buffer contain the S-7.5 strings in the same form as they are transferred via AS-i.

Request buffer								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	CTT2 command byte (16_{10} - 19_{10})							
2	index							
3	length							
4	data 0							
5	data 1							
...	...							
n	data n-4							

Tab. 4-43.

Response buffer								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	CTT2 reponse byte (50_{10} - 52_{10}, 90_{10} - 92_{10})							
2	data 0							
3	data 1							
...	...							
n	data n-2							

Tab. 4-44.

Issue date: 7.6.2013

4.3.3.7 Command 6: Read „Cyclical S-7.5 16-bit configuration“

With this call the cyclical S-7.5 16-bit configuration can be read, the analog/transparent bits being deleted in the response.

The cyclical 16-bit configuration cannot be determined if the response is 08_{16}.

Response buffer								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	0	0: no output 1: 1-byte output 2: 1-word output 3: 2-word output 4: 3-word output 5: 4-word output			0: data are valid 1: data are not valid	0: no input 1: 1-byte input 2: 1-word input 3: 2-word input 4: 3-word input 5: 4-word input		

Tab. 4-45.

Issue date: 7.6.2013

4.3.3.8 Command 7: Read „Safety monitor diagnostic (sorted acc. to OSSD)“

Information

This command is only available with the safety monitor, function range "basic/enhanced" (plastic enclosures) and GII "legacy mode" (stainless steel housing).

See <table 4-32> for an overview of the acyclic transfer commands and the supported monitor types.

With this command you can read the safety monitor diagnostic sorted acc. to the OSSD.

Response buffer								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
0	00_{16}							
1	monitor state							
2	OSSD 1 state							
3	OSSD 2 state							
4	number of *not green*[1] devices, OSSD 1							
5	number of *not green*[1] devices, OSSD 2							
6	device index 32, OSSD 1							
7	device color 32, OSSD 1							
8	device index 33, OSSD 1							
…	…							
133	device color 95, OSSD 1							
134	device index 32, OSSD 2							
…	…							
261	device color 95, OSSD 2							

Tab. 4-46.

1. The maximal value is 7, higher values are limited to 7.

Issue date: 7.6.2013

Monitor state

Code	significance
0	protective mode, everything OK (output circuits that are not installed, not configured or dependent output circuits are indicated as OK)
1	protective mode, output circuit 1 off.
2	protective mode, output circuit 2 off
3	protective mode, both output circuits off.
4	configuration mode: power on
5	configuration mode
6	reserved / not defined
7	configuration mode: fatal device error, RESET or device replacement necessary

Tab. 4-47.

Color coding

Code	color	meaning
0	green	block is in the ON state (switched on)
1	green flashing	block is in the ON state (switched on), but already in the transition to the OFF state, e.g. shutdown delay
2	yellow	block is ready, but is still waiting for a further condition, e.g. local acknowledgement or Start button
3	yellow flashing	time condition exceeded, action must be repeated, e.g. synchronization time exceeded
4	red	block is in the OFF state (switched off)
5	red flashing	the error interlock is active, clear using one the following actions: > Acknowledge using the ESC/Service button > Power OFF/ON > AS-i OFF/ON
6	grey	OSSD not used / no communication with the AS-i slave

Tab. 4-48.

Information!

See also the separate "Safety-at-Work" monitor documentation for a description of the codes used for monitor state, OSSD state, device colors and assignments to OSSDs.

Issue date: 7.6.2013

4.3.3.9 Command 8: Read „Safety monitor diagnostic unsorted“

Information

This command is only available with the safety monitor, function range "basic/enhanced" (plastic enclosures) and GII "legacy mode" (stainless steel housing).

See <table 4-32> for an overview of the acyclic transfer commands and the supported monitor types.

With this command you can read the safety monitor diagnostic unsorted.

Response buffer								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
0	00_{16}							
1	monitor state							
2	OSSD 1 state							
3	OSSD 2 state							
4	number of *not green*[1] devices, OSSD 1							
5	—							
6	device index 32							
7	device color 32							
8	device index 33							
…	…							
133	device color 95							
134	device index 32							
135	assignment of the device 32 to the OSSD							
…	…							
261	assignment of the device 95 to the OSSD							

Tab. 4-49.

1. The maximal value is 7, higher values are limited to 7.

Following assignment is possible:

00_{16}: Preprocessing

01_{16}: OSSD 1

02_{16}: OSSD 2

03_{16}: OSSD 1+2

80_{16}: Device doesn‘t exist

Information!

See the section <Command 7: Read „Safety monitor diagnostic (sorted acc. to OSSD)“> for a description of the codes used for monitor state, OSSD state, device colors and assignments to OSSDs and the "Safety-at-Work" monitor documentation.

4.3.3.10 Command 9: „Diagnosing the Safe Link “

The SaW monitors with Safe Link create a histogram of the estimated telegram run times for each communication partner. The run times are divided into increments of 5ms between 20 and 200ms, so that the histogram consists of 36 counters.

The monitors also run counters for Safe Link telegrams presumed to have been lost.

You can use Command 9 to read out these values and at the same time restart the measurement.

Send buffer								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	Sub-command 26_{16}							
2	80_{16} + node address							

Tab. 4-50.

Reply buffer								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	Sub-command 26_{16}							
2	Histogram value < 25 ms (low byte)							
3	Histogram value < 25 ms (high byte)							
4	Histogram value < 30 ms (low byte)							
5	Histogram value < 35 ms (high byte)							
…	…							
72	Histogram value ≥ 200 ms (low byte)							
73	Histogram value ≥ 200 ms (high byte)							
74	Single error							
75	Double error							
76	Triple error							

Tab. 4-51.

4.3.3.11 Commands 10 and 12: read "Current safety monitor diagnostic"

Information

This command is only available with safety monitors, version GII "ext. mode" (in stainless steel housing).

See <table 4-33> for an overview of the acyclic transfer commands and the supported monitor types.

Issue date: 7.6.2013

Information!

See the section <Command 7: Read „Safety monitor diagnostic (sorted acc. to OSSD)“> for a description of the codes used for monitor state, OSSD state, device colors and assignments to OSSDs and the "Safety-at-Work" monitor documentation.

If the slave-/monitor address is "0", the internal monitor is activated, otherwise the external one.

Command	Description
10	read current safety monitor diagnostic
12	read current safety monitor diagnostic, module allocation considered

Tab. 4-52.

Request buffer								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
	no data bytes in the request buffer							

Tab. 4-53.

Response buffer								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
0	reserved 00_{16}							
1	monitor state[1]							
2	OSSD 1 state[2]							
3	OSSD 2 state							
4	number of *not green*[3] devices							
5	—							
6	device index 32							
7	device[4] color 32							
8	device index 33							
9	device color 33							
...								
132	device index 95							
133	device color 95							
134	device index 32							
135	assignment[5] of the device 32 to the OSSD							
...								
260	device index 95							
261	assignment of the device 95 to the OSSD							

Tab. 4-54.

1. For code description see <table 4-47>.
2. By means of device colors it is possible to form an opinion about the state of the OSSDs see < table 4-48>.
3. The maximal value is 7, higher values are limited to 7.

4. By means of device colors it is possible to form an opinion about the state of the OSSDs see < table 4-48>.
5. For assignment of the devices to the OSSD see <table 4-55>.

Allocation								
Value	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
0	device exists	Device state has *not* changed itself since the last turning-off			device assigned to the preprocessing			
1	device doesn‘t exist	Device state has changed itself since the last turning-off			device assigned to the OSSD 1			
2					device assigned to the OSSD 2			
3					device assigned to the OSSD 1 and OSSD 2			

Tab. 4-55.

4.3.3.12 Commands 11 and 13: read "Current safety monitor shutdown-history"

Information

This command is only available with safety monitors, version GII "ext. mode" (in stainless steel housing).

See <table 4-33> for an overview of the acyclic transfer commands and the supported monitor types.

In the case of a second generation safety monitor, the shutdown-history can be read additionally to the safety unit diagnostic.

If an OSSD abandons the state *green*, the states of all devices are hold on at this moment. Therefore it is possible to detect the cause for the turning-off läter.

If there has been no turning-off of the related OSSD since the start, all devices are *grey*.

If the slave-/monitor address is "0", the internal monitor is activated, otherwise the external one.

Command	Description
11	read shutdown-history
13	read shutdown-history of a safety monitor, module allocation considered

Tab. 4-56.

Request buffer (only for commands 10 + 11)								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	OSSD: 0=OSSD 1; 1=OSSD 2							

Tab. 4-57.

Response buffer								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
0	reserved 00_{16}							
1	monitor state[1]							
2	OSSD 1 state[2]							
3	OSSD 2 state							
4	number of *not green*[3] devices							
5	—							
6	device index 32							
7	device[4] color 32							
8	device index 33							
9	device color 33							
...								

Tab. 4-58.

Response buffer								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
132	device index 95							
133	device color 95							
134	device index 32							
135	assignment[5] of the device 32 to the OSSD							
...								
260	device index 95							
261	assignment of the device 95 to the OSSD							

Tab. 4-58.

1. For code description see <table 4-48>.
2. By means of device colors it is possible to form an opinion about the state of the OSSDs see < table 4-48>.
3. The maximal value is 7, higher values are limited to 7.
4. By means of device colors it is possible to form an opinion about the state of the OSSDs see < table 4-48>.
5. For assignment of the devices to the OSSD see <table 4-55>.

Allocation								
Value	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
0	device exists	Device state has *not* changed itself since the last turning-off			device assigned to the preprocessing			
1	device doesn‘t exist	Device state has changed itself since the last turning-off			device assigned to the OSSD 1			
2					device assigned to the OSSD 2			
3					device assigned to the OSSD 1 and OSSD 2			

Tab. 4-59.

4.3.3.13 Command 14: Read "Safety monitor diagnostic"

Information

This command is only available with safety monitors, version GII "ext. mode" and SV4.x.

See <table 4-33> for an overview of the acyclic transfer commands and the supported monitor types.

Information!

The length of the "command 14" may vary, because it provides up to colors for up to 256 devices depending on the SaW configuration.

With this command the safety monitor diagnostic can be read.

Request buffer								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	list selection (0=current diagnostic; >0=diagnostic by OSSD turning-off (past events memory)							
2	number of the OSSD (0=preprocessing)							
3	Fdiagnostic format (0=comlete diagnostic; 1=sorted according to the diagnostic index)							

Tab. 4-60.

Response buffer								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	response type (0=device color; >0=reserved)							
2	monitor state; byte 1 (see table 4-62 for description)							
3	OSSD type (0=internal OSSD; 1=peripheral OSSD)							
4	OSSD info - OSSD number, if internal OSSD (0=preprocessing, 1=OSSD 1, 2=OSSD 2); - Slave address, if peripheral OSSD (address 0 – 63, bit 7 points at the AS-i circuit that is allocated to the AS-i slave; 0=circuit 1, 1=circuit 2)							
5	OSSD state (Bit 0-bit 3 color of the OSSD; bit 4-bit 7 reserved)							
6	color device 0 (description see <table 4-63>).							
...	...							
261	color device 255							

Tab. 4-61.

Monitor state	
Bit [4 ... 0]	
0 ... 31	reserved
Bit 5	configuration mode
0	monitor *not* in configuration mode
1	monitor in configuration mode
Bit 6	protected mode
0	monitor *not* in protected mode
1	monitor in protected mode
Bit 7	device error
0	no device error
1	fatal device error, RESET or device exchange required

Tab. 4-62.

State and color coding	
Bit [2 ... 0]	State and/or color coding
00_{16}	green permanent light
01_{16}	green flashing
02_{16}	yellow permanent light
03_{16}	yellow flashing
04_{16}	red permanent light
05_{16}	red flashing
06_{16}	grey and/or off
07_{16}	green/yellow
Bit [4 ... 3]	
0 ... 3	reserved
Bit 5	modification (switch-off history)
0	*no* device modification by "switch off"
1	device modification by "switch off"
Bit 6	existence
0	device exists
1	device doesn‘t exist
Bit 7	Usage
0	device is used in this OSSD
1	device is *not* used in this OSSD

Tab. 4-63.

4.3.3.14 Command 15: "Safety Status"

Information

This command is only available with internal safety monitors software-version SV4.x.

See <table 4-33> for an overview of the acyclic transfer commands and the supported monitor types.

With this command the status of internal safety monitors in the version 2 can be read.

Information!

You´ll find an example for internal monitors in section <Example for internal monitors with 16 OSSDs>.

Request buffer								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	reserved 00_{16}							

Tab. 4-64.

Response buffer								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	reserved 00_{16}							
2	OSSD 1 state[1]							
3	OSSD 2 state[1]							
...	...							
n	OSSD n-1 state[1]							

Tab. 4-65.

1. see <table 4-66>.

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Coding of status byte	
Bit [0 ... 2]	state and/or color
00_{16}	green permanent light
01_{16}	green flashing
02_{16}	yellow permanent light
03_{16}	yellow flashing
04_{16}	red permanent light
05_{16}	red flashing
06_{16}	grey and/or off
07_{16}	reserved
Bit [6]	state and/or color
0	*no* device flashes yellow in this OSSD
1	at least *one* device flashes yellow in this OSSD
Bit [7]	state and/or color
0	*no* device flashes red in this OSSD
1	at least *one* device flashes red in this OSSD

Tab. 4-66.

4.3.3.15 Command 16: Read "Device index identifier"

Information

This command is only available with external safety monitors software-version SV4.x. See <table 4-33> for an overview of the acyclic transfer commands and the supported monitor types.

With this command the device index identifier can be read as plain text.

Request buffer								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	device number and its index identifier to be read out (high byte)							
2	device number and its index identifier to be read out (low byte)							
3	type of numbering (0: unsorted; 1: sorted)							

Tab. 4-67.

Response buffer								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
0							device deactiva-ted	device non-existent
1	device name as null-terminated string							

Tab. 4-68.

Information!

You´ll find an example for external monitors in section <Example device index identifier (read identifier as plain text)>.

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4.4 AS-i diagnostic

4.4.1 Overview of the commands

Values for command

see page	Command	Value	Meaning	Req Len	Res Len
page 47	GET_LISTS	30_{16}	get LDS/LAS/LPS flags	2	29
page 49	GET_FLAGS	47_{16}	get flags	2	5
page 50	GET_DELTA	57_{16}	get list of config. diff.	2	10
page 51	GET_LCS	60_{16}	get LCS	2	10
page 52	GET_LAS	45_{16}	get LAS	2	10
page 53	GET_LDS	46_{16}	get LDS	2	10
page 54	GET_LPF	$3E_{16}$	get LPF	2	10
page 55	GET_LOS	61_{16}	get LOS	2	10
page 56	SET_LOS	62_{16}	set LOS	10	2
page 57	GET_TECA	63_{16}	get transm.err.counters	2	34
page 58	GET_TECB	64_{16}	get transm.err.counters	2	34
page 59	GET_TEC_X	66_{16}	get transm.err.counters	4	≥3
page 60	READ_FAULT_DETECTOR[1]	10_{16}	read Fault_Detector	2	4
page 61	READ_DUPLICATE_ADDR[2]	11_{16}	read list of duplicate addresses	2	10
page 62	GET_SLV_ERRCOUNT[3]	15_{16}	Get Slave Error Counters	3	14
page 63	GETCLEAR_SLV_ERRCOUNT[4]	15_{16}	Get Clear Slave Error Counters	3	14
page 64	READ_REL_CYC[5]	40_{16}	read OSSD switching cycle	2	10
page 65	MB_OP_GET_EXT_EF[6]	97_{16}	read extended earth fault information	2	8
page 66	MB_OP_GET_LINE_ ERRCOUNT[7]	12_{16}	read error counters	2	38
page 68	MB_OP_GETCLEAR_LINE_ ERRCOUNT[8]	13_{16}	read and reset error counters	2	38

Tab. 4-69.

1. The command READ_FAULT_DETECTOR is valid only for the use with masters which support this function. Please refer to the user manual of the master for further information.
2. The command READ_DUPLICATE_ADDR is valid only for the use with masters which support this function. Please refer to the user manual of the master for further information.
3. The command GET_SLV_ERRCOUNT is valid only for the use with masters which support this function. Please refer to the user manual of the master for further information.
4. The command GETCLEAR_SLV_ERRCOUNT is valid only for the use with masters which support this function. Please refer to the user manual of the master for further information.
5. Der Befehl READ_REL_CYC gilt nur für Master, die diese Funktion unterstützen. Bitte schauen Sie im Handbuch des Masters nach weiteren Informationen.
6. Der Befehl MB_OP_GET_EXT_EF gilt nur für Master, die diese Funktion unterstützen. Bitte schauen Sie im Handbuch des Masters nach weiteren Informationen.
7. Der Befehl MB_OP_GET_LINE_ERRCOUNT gilt nur für Master, die diese Funktion unterstützen. Bitte schauen Sie im Handbuch des Masters nach weiteren Informationen.
8. Der Befehl MB_OP_GETCLEAR_LINE_ERRCOUNT gilt nur für Master, die diese Funktion unterstützen. Bitte schauen Sie im Handbuch des Masters nach weiteren Informationen.

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4.4.2 Get Lists and Flags (Get_LPS, Get_LAS, Get_LDS, Get_Flags) (GET_LISTS)

With this call, the following entries of the AS-i Master can be read:

- The list of active AS-i slaves (**LAS**)
- The list of detected AS-i slaves (**LDS**)
- The list of projected AS-i slaves (**LPS**)
- The flags according to the AS-i slave specification

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	30_{16}							
2	T	O	circuit					

Tab. 4-70.

Response (if O ≡ 0)								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	30_{16}							
2	T	result						
3	7A	6A	5A	4A	3A	2A	1A	0A
…	LAS							
10	31B	30B	29B	28B	27B	26B	25B	24B
11	7A	6A	5A	4A	3A	2A	1A	0A
…	LDS							
18	31B	30B	29B	28B	27B	26B	25B	24B
19	7A	6A	5A	4A	3A	2A	1A	0A
…	LPS							
26	31B	30B	29B	28B	27B	26B	25B	24B
27	–							Pok
28	OR	APF	NA	CA	AAv	AAs	S0	Cok
29	–	–	–	–	–	AAe	OL	DX

Tab. 4-71.

Response (if O ≡ 1)								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	30_{16}							
2	T	result						
3	0A	1A	2A	3A	4A	5A	6A	7A
…	LAS							
10	24B	25B	26B	27B	28B	29B	30B	31B
11	0A	1A	2A	3A	4A	5A	6A	7A
…	LDS							

Tab. 4-72.

Response (if O ≡ 1)								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
18	24B	25B	26B	27B	28B	29B	30B	31B
19	0A	1A	2A	3A	4A	5A	6A	7A
…	LPS							
26	24B	25B	26B	27B	28B	29B	30B	31B
27	Cok	S0	AAs	AAv	CA	NA	APF	OR
28	–	–	–	Pok	AAe	1	–	OL
29	–	–	–	–	–	–	–	–

Tab. 4-72.

Pok	Periphery_Ok
S0	LDS.0
AAs	Auto_Address_Assign
AAv	Auto_Address_Available
CA	Configuration_Active
NA	Normal_Operation_Active
APF	APF
OR	Offline_Ready
Cok	Config_Ok
AAe	Auto_Address_Enable
OL	Offline
DX	Data_Exchange_Active

Issue date: 7.6.2013

4.4.3 Get Flags (GET_FLAGS)

With this call, the flags according to the AS-i slave specification can be read.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	47_{16}							
2	T	–	circuit					

Tab. 4-73.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	47_{16}							
2	T	response						
3								Pok
4	OR	APF	NA	CA	AAv	AAs	S0	Cok
5	–					AAe	OL	DX

Tab. 4-74.

Pok Periphery_OK
This flag is set when no AS-i slave is signaling a peripheral fault.

S0 LDS.0
This flag is set when an AS-i slave with address 0 exists.

AAs Auto_Address_Assign
This flag is being set when the automatic address programming is possible (in other words, AUTO_ADDR_ENABLE = 1; no "incorrect" slave connected to the AS-i).

AAv Auto_Address_Available
This flag is set when the automatic address programming can be executed, exactly one AS-i slave is currently out of operation.

CA Configuration_Active
The flag is set in configuration mode and reset in protected mode.

NA Normal_Operation_Active
This flag is set when the AS-i master is in normal operation.

APF AS-i Power Fail
This flag is set when the voltage on the AS-i cable is too low.

OR Offline_Ready
The flag is set when the offline phase is active.

Cok Config_OK
This flag is set when the desired (configured) and actual configuration match.

AAe Auto_Address_Enable
This flag indicates whether the automatic address programming is enabled (bit = 1) or disabled (bit = 0) by the user.

OL Offline
This flag is set when the mode should be changed to OFFLINE or when this mode has already been reached.

DX Data_Exchange_Active
If the "Data_Exchange_Active" flag is set, the data exchange between AS-i master and slaves is available in the data exchange phase. If this bit is not set the data exchange is not available. The read ID telegrams are transmitted to the slave.

The bit is set if the AS-i master enters the offline phase.

4.4.4 Get Delta List (GET_DELTA)

The delta list contains the list of slave addresses with configuration errors.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	57_{16}							
2	T	0	circuit					

Tab. 4-75.

Response (if O ≡ 0)								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	57_{16}							
2	T	result						
3	7A	6A	5A	4A	3A	2A	1A	–
…	…							
10	31B	30B	29B	28B	27B	26B	25B	24B

Tab. 4-76.

Response (if O ≡ 1)								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	57_{16}							
2	T	result						
3	0	1A	2A	3A	4A	5A	6A	7A
…	…							
10	24B	25B	26B	27B	28B	29B	30B	31B

Tab. 4-77.

Issue date: 7.6.2013

4.4.5 Get list of corrupted Slaves (GET_LCS and GET_LCS_R6 (6CH))

The call GET_LCS_R6 (6CH) differs to the call GET_LCS in the half long LCS list.

With the bit 2^5 is selected if the upper (=1) or lower (=0) part of the LCS is read. Read first with 2^5 in order to create a local copy of the LCS. Reading with bit 2^5=1 transmits the upper part of the copy.

With the call GET_LCS, the List of Corrupted Slaves (*LCS*) can be read.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	60_{16}							
2	T	O	circuit					

Tab. 4-78.

Response (if O ≡ 0)								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	60_{16}							
2	T	result						
3	7A	6A	5A	4A	3A	2A	1A	0A
…	…							
10	31B	30B	29B	28B	27B	26B	25B	24B

Tab. 4-79.

Response (if O ≡ 1)								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	60_{16}							
2	T	result						
3	0A	1A	2A	3A	4A	5A	6A	7A
…	…							
10	24B	25B	26B	27B	28B	29B	30B	31B

Tab. 4-80.

4.4.6 Get list of activated Slaves (GET_LAS)

With this call, the list of activated slaves (*LAS*) can be read.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	45_{16}							
2	T	O	circuit					

Tab. 4-81.

Response (if O ≡ 0)								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	45_{16}							
2	T	result						
3	7A	6A	5A	4A	3A	2A	1A	0A
…	…							
10	31B	30B	29B	28B	27B	26B	25B	24B

Tab. 4-82.

Response (if O ≡ 1)								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	45_{16}							
2	T	result						
3	0A	1A	2A	3A	4A	5A	6A	7A
…	…							
10	24B	25B	26B	27B	28B	29B	30B	31B

Tab. 4-83.

4.4.7 Get list of detected AS-i Slaves (GET_LDS)

With this call, the list of detected AS-i slaves (*LDS*) can be read.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	46_{16}							
2	T	O	circuit					

Tab. 4-84.

Response (if O ≡ 0)								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	46_{16}							
2	T	result						
3	7A	6A	5A	4A	3A	2A	1A	0A
…	…							
10	31B	30B	29B	28B	27B	26B	25B	24B

Tab. 4-85.

Response (if O ≡ 1)								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	46_{16}							
2	T	result						
3	0A	1A	2A	3A	4A	5A	6A	7A
…	…							
10	24B	25B	26B	27B	28B	29B	30B	31B

Tab. 4-86.

Issue date: 7.6.2013

4.4.8 Get list of peripheral faults (GET_LPF)

With this call, the list of peripheral faults (*LPF*) signaled by the AS-i slaves is read out from the AS-i master. The LPF is updated cyclically by the AS-i master. If and when an AS-i slave signals faults of the attached peripherals (for example broken wire) can be found in the description of the AS-i slave.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$3E_{16}$							
2	T	O	circuit					

Tab. 4-87.

Response (if O ≡ 0)								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$3E_{16}$							
2	T	result						
3	7A	6A	5A	4A	3A	2A	1A	0A
…	…							
10	31B	30B	29B	28B	27B	26B	25B	24B

Tab. 4-88.

Response (if O ≡ 1)								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$3E_{16}$							
2	T	result						
3	0A	1A	2A	3A	4A	5A	6A	7A
…	…							
10	24B	25B	26B	27B	28B	29B	30B	31B

Tab. 4-89.

Issue date: 7.6.2013

4.4.9 Get list of offline Slaves (GET_LOS)

With this call, the list of slaves causing the offline phase when a configuration error occurs in being read out (List of Offline Slaves, *LOS*).

The user can choose the reaction of the master when a configuration error occurs. The master can be switched off line when an important slave causes a configuration error; less important slaves can send an error to the host, AS-i however will not be switched offline.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	61_{16}							
2	T	O	circuit					

Tab. 4-90.

Response (if O ≡ 0)								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	61_{16}							
2	T	result						
3	7A	6A	5A	4A	3A	2A	1A	0A
…	…							
10	31B	30B	29B	28B	27B	26B	25B	24B

Tab. 4-91.

Response (if O ≡ 1)								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	61_{16}							
2	T	result						
3	0A	1A	2A	3A	4A	5A	6A	7A
…	…							
10	24B	25B	26B	27B	28B	29B	30B	31B

Tab. 4-92.

Issue date: 7.6.2013

4.4.10 Set list of offline Slaves (SET_LOS and SET_LOS_R6 (6Dh))

The call **SET_LOS_R6 ($6D_{16}$)** differs to the call GET_LOS in the half long LOS list.

With the bit 2^5 is selected if the upper (=1) or lower (=0) part of the LOS is written.

With this call, the list of slaves causing the offline phase when a configuration error occurs in being defined (List of Offline Slaves, *LOS*).

The user can choose the reaction of the master when a configuration error occurs. The master can be switched offline when an important slave causes a configuration error; less important slaves can send an error to the host, AS-i however will not be switched offline.

Request (if O ≡ 0)								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	62_{16}							
2	T	O	circuit					
3	7A	6A	5A	4A	3A	2A	1A	0A
…	…							
10	31B	30B	29B	28B	27B	26B	25B	24B

Tab. 4-93.

Request (if O ≡ 1)								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	62_{16}							
2	T	1	circuit					
3	0A	1A	2A	3A	4A	5A	6A	7A
…	…							
10	24B	25B	26B	27B	28B	29B	30B	31B

Tab. 4-94.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	62_{16}							
2	T	result						

Tab. 4-95.

4.4.11 Get transm.err.counters (GET_TECA)

Information!

In order to get the real number of transcription errors, multiply the value with 2.

With this call the error counters of all single slaves/A-slaves can be read (see chapter: Advanced diagnostic for AS-i Masters in the manual of your AS-i Master).

With every reading out of the counts, the error counters will be restarted.

The counts are being read out via the corresponding host interface and will be deleted with every read access. The counter´s value is limited to 254. 255 will cause a counter overflow.

The counts could be independent of the counters, which are displayed in the display of the gateway.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	63_{16}							
2	T	–	circuit					

Tab. 4-96.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	63_{16}							
2	T	result						
3	APF							
4	slave 1A							
…	…							
34	slave 31A							

Tab. 4-97.

4.4.12 Get transm.err.counters (GET_TECB)

Information!

In order to get the real number of transcription errors, multiply the value with 2.

With this call, the counts of the error counters for B-slaves are being read out (see chap. "Advanced diagnostic for AS-i Masters" in the manual of your AS-i Master).

With every reading out of the counts, the error counters will be restarted.

The counts are being read out via the corresponding host interface and will be deleted with every read access. The counter´s value is limited to 254. 255 will cause a counter overflow.

The counts could be independent of the counters, which are displayed in the display of the gateway.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	64_{16}							
2	T	–	circuit					

Tab. 4-98.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	64_{16}							
2	T	result						
3	APF							
4	slave 1B							
…	…							
34	slave 31B							

Tab. 4-99.

4.4.13 Get transm.err.counters (GET_TEC_X)

Beginning with a definite slave address, the counts of the n error counters are being read out with this call.

With every reading out the counts, the error counters will be restarted.

The counts are being read out via the corresponding host interface and will be deleted with every read access. The counter´s value is limited to 254. 255 will cause a counter overflow.

The counts could be independent of the counters, which are displayed in the display of the gateway.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	66_{16}							
2	T	–	circuit					
3	1. slave address							
4	number of counters							

Tab. 4-100.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	66_{16}							
2	T	result						
3	counter 1							
…	…							
n	counter n - 2							

Tab. 4-101.

4.4.14 Read fault detector (READ_FAULT_DETECTOR)

!!!
The command READ_FAULT_DETECTOR is valid only for the use with masters which support this function.
Please see the user manual of the master for further information.

With this call all informations of the AS-i detector are read out. In the first byte are stored the values transferred in the moment, in the second all values since the last deleting. By it is possible to recognize immediate, no more existing before messages also. The second byte is deleted by reading.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	10_{16}							
2	T	–	circuit					

Tab. 4-102.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	10_{16}							
2	T	result						
3	DA	ST	US	ES	PFr	PFa	reserved	
4	DA	ST	US	ES	PFr	PFa	reserved	

Tab. 4-103.

DA: duplicate address
ST: noise
US: over voltage
ES: earth fault
PFr: failure of redundant 24V (option single master)
PFa: failure of 24V AUX (option safety monitor)

4.4.15 Read list of duplicate addresses (READ_DUPLICATE_ADDR)

!!!
The command READ_DUPLICATE_ADDR is valid only for the use with masters which support this function.
Please see the user manual of the master for further information.

With this call the list of slaves with duplicate addresses (the assignment of one address to two slaves) is read out.

Information!

Further diagnostic functions for "Safety at Work" and for availability (resp. for warnings) of integrated sensors are detailed explained in the chapter "Functional Profiles" (see chap. <Functional Profiles>).

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	11_{16}							
2	T	O	circuit					

Tab. 4-104.

Response (if O ≡ 0)								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	11_{16}							
2	T	result						
3	7A	6A	5A	4A	3A	2A	1A	0A
…	…							
10	31B	30B	29B	28B	27B	26B	25B	24B

Tab. 4-105.

Response (if O ≡ 1)								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	11_{16}							
2	T	result						
3	0A	1A	2A	3A	4A	5A	6A	7A
…	…							
10	24B	25B	26B	27B	28B	29B	30B	31B

Tab. 4-106.

4.4.16 Get Slave Error Counters (GET_SLV_ERRCOUNT)

!!!
The command GET_SLV_ERRCOUNT is valid only for the use with masters which support this function.
Please see the user manual of the master for further information.

With this call the slave error counter register will be read out.

The read-out error counter listings correspond to the error counter listings of the display.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	14_{16}							
2	T*	circuit						
3	slave address							

Tab. 4-107.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	14_{16}							
2	T*	result						
3	no slave, high byte							
4	no slave, low byte							
5	no slave telegram, high byte							
6	no slave telegram, low byte							
7	slave telegram error, high byte							
8	slave telegram error, low byte							
9	peripheral faults, high byte							
10	peripheral faults, low byte							
11	protocol fault, high byte							
12	protocol fault, low byte							
13	master telegram, high byte							
14	master telegram, low byte							

Tab. 4-108.

* Toggle bit, circuit selection and response code are not applicable when called by DLL

Issue date: 7.6.2013

4.4.17 Get Clear Slave Error Counters (GETCLEAR_SLV_ERRCOUNT)

!!!

The command GETCLEAR_SLV_ERRCOUNT is valid only for the use with masters which support this function.

Please see the user manual of the master for further information.

With this call the slave error counter register will be read out and then reset.

The read-out error counter listings correspond to the error counter listings of the display.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	15_{16}							
2	T*	circuit						
3	slave address							

Tab. 4-109.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	15_{16}							
2	T*	result						
3	no slave, high byte							
4	no slave, low byte							
5	no slave telegram, high byte							
6	no slave telegram, low byte							
7	slave telegram error, high byte							
8	slave telegram error, low byte							
9	peripheral faults, high byte							
10	peripheral faults, low byte							
11	protocol fault, high byte							
12	protocol fault, low byte							
13	master telegram, high byte							
14	master telegram, low byte							

Tab. 4-110.

* Toggle bit, circuit selection and response code are not applicable when called by DLL

4.4.18 Read OSSD switching cycle (READ_REL_CYC)

!!!
The command READ_REL_CYC is valid only for the use with masters which support this function.
Please see the user manual of the master for further information.

With this call the switching cycles of the two OSSDs will be read out.

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	40_{16}							
2	T	–						circuit

Tab. 4-111.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	40_{16}							
2	T	result						
3	OSSD1 cycle counter, low byte							
4	…							
5	…							
6	OSSD1 cycle counter, low byte							
7	OSSD2 cycle counter, low byte							
8	…							
9	…							
10	OSSD2 cycle counter, high byte							

Tab. 4-112.

4.4.19 Read extended earth fault information (MB_OP_GET_EXT_EF)

!!!
The command MB_OP_GET_EXT_EF is valid only for the use with masters which support this function.
Please see the user manual of the master for further information.

With this call the extended earth fault information will be read out.

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1				97_{16}				
2	T	–						circuit

Tab. 4-113.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1				97_{16}				
2	T				result			
3				DC voltage, low byte				
4				DC voltage, high byte				
5				percentage earth fault relationship with an offset of 128[1]				
6		reserved		circuit		reserved		ES
7								NS
8								AP

Tab. 4-114.

1. Example: A percentage earth fault of -100% is indicated in byte 5 with the value 28, a percentage earth fault of +100% with the value 228.

ES: Earth fault in AS-i circuit

NS: 0: AS-i circuit is the source of failure
1: AS-i circuit is *not* the source of failure

AP: supply:
0: grounded 24VDC
1: AS-i power supply

4.4.20 Read error counters (MB_OP_GET_LINE_ERRCOUNT)

!!!
The command MB_OP_GET_LINE_ERRCOUNT is valid only for the use with masters which support this function.
Please see the user manual of the master for further information.

With this call various error counters of an AS-i circuit will be read out for diagnostics.

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	12_{16}							
2	T	–						circuit

Tab. 4-115.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	12_{16}							
2	T	result						
3	number of AS-i power fails; high byte							
4	number of AS-i power fails; low byte							
5	number of earth faults; high byte							
6	number of earth faults; low byte							
7	number of slave failures; high byte							
...	...							
10	number of slave failures; low byte							
11	number of missing slave telegramms; high byte							
..	...							
14	number of missing slave telegramms; low byte							
15	number of faulty slave telegramms; high byte							
...	...							
18	number of faulty slave telegramms; low byte							
19	number of slave peripheral faults; high byte							
...	...							
22	number of slave peripheral faults; low byte							
23	number of slave protocol faults; high byte							
...	...							
26	number of slave protocol faults; low byte							
27	number of master telegram faults; high byte							

Tab. 4-116.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
...	...							
30	number of master telegram faults; low byte							
31	Slv. 0	1/1A	2/2A	3/3A	4/4A	5/5A	6/6A	7/7A
...	...							
34	24/24A	25/25A	26/26A	27/27A	28/28A	29/29A	30/30A	31/31A
35	-	1B	2B	3B	4B	5B	6B	7B
...	...							
38	24B	25B	26B	27B	28B	29B	30B	31B

Tab. 4-116.

Bytes 31 through 38 of the reply contain a list of the defective slaves. The List bit of a slave is set when the respective slave has contributed to the counter state of an error counter in reply bits 7 through 26.

If there are insufficient access rights a reply consisting of zeros is sent instead of the HI_ACCESS message.

4.4.21 Read and reset error counters (MB_OP_GETCLEAR_LINE_ERRCOUNT)

!!!
The command MB_OP_GETCLEAR_LINE_ERRCOUNT is valid only for the use with masters which support this function.
Please see the user manual of the master for further information.

With this call various error counters of an AS-i circuit will be read out for diagnostics and then reseted.

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	13_{16}							
2	T	–						circuit

Tab. 4-117.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	13_{16}							
2	T	result						
3	number of AS-i power fails; high byte							
4	number of AS-i power fails; low byte							
5	number of earth faults; high byte							
6	number of earth faults; low byte							
7	number of slave failures; high byte							
...	...							
10	number of slave failures; low byte							
11	number of missing slave telegramms; high byte							
..	...							
14	number of missing slave telegramms; low byte							
15	number of faulty slave telegramms; high byte							
...	...							
18	number of faulty slave telegramms; low byte							
19	number of slave peripheral faults; high byte							
...	...							
22	number of slave peripheral faults; low byte							
23	number of slave protocol faults; high byte							
...	...							
26	number of slave protocol faults; low byte							
27	number of master telegram faults; high byte							

Tab. 4-118.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
...	...							
30	Number of master telegram faults; Low Byte							
31	Slv. 0	1/1A	2/2A	3/3A	4/4A	5/5A	6/6A	7/7A
...	...							
34	24/24A	25/25A	26/26A	27/27A	28/28A	29/29A	30/30A	31/31A
35	-	1B	2B	3B	4B	5B	6B	7B
...	...							
38	24B	25B	26B	27B	28B	29B	30B	31B

Tab. 4-118.

Bytes 31 through 38 of the reply contain a list of the defective slaves. The List bit of a slave is set when the respective slave has contributed to the counter state of an error counter in reply bits 7 through 26.

If there are insufficient access rights a reply consisting of zeros is sent instead of the HI_ACCESS message.

4.5 Safe Link diagnostics

Value for the command

see page	Command	Value	Meaning
page 70	CROSS_COMMUNICATION_DIAG	$3A_{16}$	Safe Link diagnostics

!!!

*The command **Cross_Communication_Diag** is valid only for the use with devices which support this function.*

Please see the user manual of the master for further information.

4.5.1 Diagnostics display

Procedure for displaying the diagnostics for devices using Safe Link:

Step 1 – Acquire all the participating nodes:

- Query the Manager Overview for the Manager device (Command $3A_{16}$, 03_{16}).
- Ask directly for the status of all nodes entered there ($3A_{16}$, 04_{16}).

Step 2 – Acquire the node relationships:

- This requires that all participating nodes be asked for their NodeOverview ($3A_{16}$, 02_{16}) and a link matrix be generated.
- In the NodeOverview a node shows which other nodes it expects data from.

Step 3 – Acquire the connection quality:

- The resulting link matrix can now be used to ask each node for the statistics data for the nodes from which it expects data.
- Each node gathers the telegram age and any missing telegrams (single, double, triple) for each of its data sources. These can be queried for the node over the diagnostics interface using the AcycTrans command 9.

4.5.2 Overview of the commands

Values for sub commands

see page	Command	Value	Meaning	Req Len	Res Len
page 71	1	00_{16}	READ_NODE_OVERVIEW_HISTORY	3	6
page 72	2	01_{16}	READ_AND_CLEAR NODE_OVERVIEW_HISTORY	3	6
page 73	3	02_{16}	READ_NODE_OVERVIEW	3	34
page 74	4	03_{16}	READ_MANAGER_OVERVIEW	3	34
page 75	5	04_{16}	READ_NODE_STATUS	3	9
page 76	6	05_{16}	READ_INTERFACE	3	8

Tab. 4-119.

Issue date: 7.6.2013

4.5.3 Command 1: READ_NODE_OVERVIEW_HISTORY

One byte is reserved for each node. If the bit is '1', it means that the state of a node is changed at least once from "active" to "not active".

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$3A_{16}$							
2	T*	circuit						
3	00_{16}							

Tab. 4-120.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$3A_{16}$							
2	T	result[1]						
3	node 1 – node 8 (node 1 = bit 0)							
4	node 9 – node 16							
5	node 17 – node 24							
6	node 25 – node 32 (node 32 = bit 7)							

Tab. 4-121.

1. See description in chap. <Result-code values>.

Issue date: 7.6.2013

4.5.4 Command 2: READ_AND_CLEAR_NODE_OVERVIEW_HISTORY

One byte is reserved for each node. If the bit is '1', it means that the state of a node is changed at least once from "active" to "not active". This list will automatically be reset after the read-out.

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$3A_{16}$							
2	T	circuit						
3	01_{16}							

Tab. 4-122.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$3A_{16}$							
2	T	result[1]						
3	node 1 – node 8 (node 1 = bit 0)							
4	node 9 – node 16							
5	node 17 – node 24							
6	node 25 – node 32 (node 32 = bit 7)							

Tab. 4-123.

1. See description in chap. <Result-code values>.

Issue date: 7.6.2013

4.5.5 Command 3: READ_NODE_OVERVIEW

One byte is reserved for each node

Wert	Name	Beschreibung
0	not used	there is no active connection to this node
1	not active	there is a connection to this node, but it is not active (not taught or because the communication is interrupted)
—	—	—
3	active	there is an active connection to this node

Tab. 4-124.

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$3A_{16}$							
2	T*	circuit						
3	02_{16}							

Tab. 4-125.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$3A_{16}$							
2	T	result[1]						
3	node 1							
4	node 2							
5-33	node 3 – node 31							
34	node 32							

Tab. 4-126.

1. See description in chap. <Result-code values>.

Issue date: 7.6.2013

4.5.6 Command 4: READ_MANAGER_OVERVIEW

One byte is reserved for each node:

Value	Name	Description
0	missing	this node is used, but it is not active currently
1	rejected	this node has been refused through the manager
2	rejected	this node has been refused through the manager
3	not taught	teach-in required by this node
4	rejected	this node has been refused through the manager
5	busy	intermediate state
6	active	there is no active connection to this node
254	not used	this node is not used

Tab. 4-127.

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$3A_{16}$							
2	T*	circuit						
3	03_{16}							

Tab. 4-128.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$3A_{16}$							
2	T	result[1]						
3	node 1							
4	node 2							
5-33	node 3 – node 31							
34	node 32							

Tab. 4-129.

1. See description in chap. <Result-code values>.

Issue date: 7.6.2013

4.5.7 Command 5: READ_NODE_STATUS

This menu provides information about the individual node itself:

Value	Name	Description
0	start	start-up phase of the Safe Link
1		
2		
3	active	there is no active connection to this node

Tab. 4-130.

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$3A_{16}$							
2	T*	circuit						
3	04_{16}							

Tab. 4-131.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$3A_{16}$							
2	T	result[1]						
3	node adresse – low byte							
4	node adresse – high byte							
5	manager adresse – low byte							
6	manager adresse – high byte							
7	domain number – low byte							
8	domain number – high byte							
9	node status							

Tab. 4-132.

1. See description in chap. <Result-code values>.

Issue date: 7.6.2013

4.5.8 Command 6: READ_INTERFACE

This menu provides settings for the used communication technology:

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$3A_{16}$							
2	T*	circuit						
3	05_{16}							

Tab. 4-133.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$3A_{16}$							
2	T	result[1]						
3	multicast group – byte 0 (low byte)							
4	multicast group – byte 1							
5	multicast group – byte 2							
6	multicast group – byte 3 (high byte)							
7	UDP-port – byte 0 (low byte)							
8	UDP port – byte 1 (high byte)							

Tab. 4-134.

1. See description in chap. <Result-code values>.

4.6 Configuration of AS-i Master

4.6.1 Overview of the commands

Values for command

see page	Command	Value	Meaning	Req Len	Res Len
page 78	SET_OP_MODE	$0C_{16}$	set Operation_Mode	3	2
page 79	STORE_CDI	07_{16}	store Actual_Configuration	2	2
page 80	READ_CDI	28_{16}	read Actual_Configuration	3	4
page 81	SET_PCD	25_{16}	set Permanent_Config	5	2
page 82	GET_PCD	26_{16}	get Permanent_Config	3	4
page 83	SET_LPS	29_{16}	set LPS	11	2
page 84	GET_LPS	44_{16}	get LPS	2	10
page 84	STORE_PI	04_{16}	store Actual_Parameter	2	2
page 85	WRITE_P	02_{16}	write Parameter	4	3
page 86	READ_PI	03_{16}	read Parameter	3	3
page 87	SET_PP	43_{16}	set Permanent_Parameter	4	2
page 87	GET_PP	01_{16}	get Permanent_Parameter	3	3
page 88	SET_AAE	$0B_{16}$	set Auto_Address_Enable	3	2
page 89	SLAVE_ADDR	$0D_{16}$	change Slave_Address	4	2
page 90	WRITE_XID1	$3F_{16}$	write Extended_ID-Code_1	3	2

Tab. 4-135.

Issue date: 7.6.2013

4.6.2 Set operation mode (SET_OP_MODE: Set_Operation_Mode)

This call switches between configuration mode and protected mode. In protected mode, only AS-i slaves entered in the LPS and whose expected and actual configurations match, are being activated.

In other words: The slaves are being activated if the I/O configuration and the ID codes of the detected AS-i slaves are identical to the configured values.

In configuration mode, all detected AS-i slaves (except for AS-i slave "0") are activated. This also applies to AS-i slaves for which there are differences between the expected and actual configuration.

The “OPERATION MODE” bit is stored permanently; in other words, it is retained after a cold/warm restart.

When you change from configuration mode to protected mode, the AS-i master will do a warm restart (change to the offline phase followed by a change to the online mode).

Information!

If an AS-i Slave with address "0" is entered in the LDS, the AS-i Master cannot change from configuration mode to protected mode.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$0C_{16}$							
2	T	–	circuit					
3	operation mode							

Tab. 4-136.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$0C_{16}$							
2	T	result						

Tab. 4-137.

Meaning of bit operation mode:

0: protected mode

1: configuration mode

4.6.3 Store actual configuration (STORE_CDI)

With this call, the (actual) configuration data (I/O configuration, ID code, extended ID1 code and extended ID2 code) of all AS-i slaves are stored permanently in the EEPROM as the (expected) configuration data. The list of activated AS-i slaves (*LAS*) is adopted in the list of permanent AS-i slaves (*LPS*).

When this command is executed, the AS-i master changes to the offline phase and then changes back to the normal mode (warm restart on the AS-i master).

This command can only be executed in the configuration mode.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	07_{16}							
2	T	–	circuit					

Tab. 4-138.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	07_{16}							
2	T	result						

Tab. 4-139.

4.6.4 Read actual configuration (READ_CDI)

With this call, the following configuration data of an addressed AS-i slave obtained by the AS-i master on the AS-i are read.

- I/O configuration
- ID code
- Extended ID1 code
- Extended ID2 code

The configuration data are specified by the manufacturer of the AS-i slave.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	28_{16}							
2	T	–	circuit					
3	–		B	slave address				

Tab. 4-140.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	28_{16}							
2	T	result						
3	xID2				xID1			
4	ID				I0			

Tab. 4-141.

Meaning of bit B:

B = 0 Single AS-i slave or A-slave

B = 1 B-slave

4.6.5 Set permanent configuration (SET_PCD)

This call sets the following configuration data for the addressed AS-i slave:

- I/O configuration
- ID code
- Extended ID1 code
- Extended ID2 code

The configuration data are stored permanently on the EEPROM of the AS-i Master and are used as the expected configuration by the AS-i master in the protected mode. The configuration data are specified by the manufacturer of the AS-i slave.

If the addressed AS-i slave does not support an extended ID code 1/2, the value F_{hex} must be specified.

When this command is executed, the AS-i master changes to the offline phase and then changes back to the normal mode (warm restart).

This command can only be executed in the configuration mode.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	25_{16}							
2	T	–	circuit					
3	–		B	slave address				
4	xID2				xID1			
5	ID				I0			

Tab. 4-142.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	25_{16}							
2	T	result						

Tab. 4-143.

Meaning of bit B:

B = 0 Single AS-i slave or A-slave

B = 1 B-slave

4.6.6 Get extended permanent configuration (GET_PCD)

This call reads the following configuration data (configured data) of an addressed AS-i slave stored on the EEPROM of the AS-i master:

- I/O configuration
- ID code
- Extended ID1 code
- Extended ID2 code

The configuration data are specified by the manufacturer of the AS-i slave.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	26_{16}							
2	T	–	circuit					
3	–		B	slave address				

Tab. 4-144.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	26_{16}							
2	T	result						
3	xID2				xID1			
4	ID				I0			

Tab. 4-145.

Meaning of bit B:

B = 0 Single AS-i slave or A-slave

B = 1 B-slave

4.6.7 Set list of projected slaves (SET_LPS and SET_LPS_R6 (6Bh))

The command **SET_LPS_R6 (6Bh)** differs from the command **SET-LPs** in:

- no empty byte (3)
- half so long LPS list

With the bit 2^5 is selected if the upper (=1) or lower (=0) part of the LCS is read.

With this call, the list of configured AS-islaves is transferred for permanent storage in the EEPROM of the master.

When this command is executed, the AS-i master changes to the offline phase and then changes back to the normal mode (warm restart).

This command can only be executed in the configuration mode.

Request (if O ≡ 0)								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	29_{16}							
2	T	0	circuit					
3	00_{16}							
4	7A	6A	5A	4A	3A	2A	1A	–
…	…							
11	31B	30B	29B	28B	27B	26B	25B	24B

Tab. 4-146.

Request (if O ≡ 1)								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	29_{16}							
2	T	1	circuit					
3	00_{16}							
4	–	1A	2A	3A	4A	5A	6A	7A
…	…							
11	24B	25B	26B	27B	28B	29B	30B	31B

Tab. 4-147.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	29_{16}							
2	T	result						

Tab. 4-148.

4.6.8 Get list of projected slaves (GET_LPS)

With this call, the list of projected AS-i slaves (*LPS*) is read out of the AS-i Master.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	44_{16}							
2	T	O	circuit					

Tab. 4-149.

Response (if O ≡ 0)								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	44_{16}							
2	T	result						
3	7A	6A	5A	4A	3A	2A	1A	0A
…	…							
10	31B	30B	29B	28B	27B	26B	25B	24B

Tab. 4-150.

Response (if O ≡ 1)								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	44_{16}							
2	T	result						
3	0A	1A	2A	3A	4A	5A	6A	7A
…	…							
10	24B	25B	26B	27B	28B	29B	30B	31B

Tab. 4-151.

4.6.9 Store actual parameters (STORE_PI)

With this call, the configured parameters stored on the EEPROM are overwritten with the current, permanently stored (actual) parameters; in other words, the current parameters of all AS-i slaves are stored.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	04_{16}							
2	T	–	circuit					

Tab. 4-152.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	04_{16}							
2	T	result						

Tab. 4-153.

4.6.10 Write parameter (WRITE_P)

The AS-i slave parameter value transferred with the command is passed on to the addressed AS-i slave.

The parameter is stored in the AS-i Master only temporarily and is not stored as a configured parameter in the EEPROM!

The AS-i slave transfers its current parameter value in the response (parameter echo). This can deviate from the value that has just been written according to the AS-i master specification.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	02_{16}							
2	T	–	circuit					
3	–		B	slave address				
4	–				parameter			

Tab. 4-154.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	02_{16}							
2	T	result						
3	–				slave response			

Tab. 4-155.

Meaning of bit B:

B = 0 Single AS-i slave or A-slave

B = 1 B-slave

4.6.11 Read parameter (READ_PI: Read_Parameter)

This call returns the current parameter value (actual parameter) of an AS-i slave sent by the AS-i Master. This value must not be confused with the parameter echo that is supplied by the AS-i slave as a response to the write_p job.

This command can not be used for a directly reading of an AS-i parameter out of an AS-i slave.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	03_{16}							
2	T	–	circuit					
3	–		B	slave address				

Tab. 4-156.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	03_{16}							
2	T	result						
3	–				PI			

Tab. 4-157.

Meaning of bit B:

B = 0 Single AS-i slave or A-slave

B = 1 B-slave

Issue date: 7.6.2013

4.6.12 Set permanent parameter (SET_PP)

With this call, a parameter value for the specified AS-i slave is configured. The value is stored permanently in the EEPROM of the gateway.

The configured parameter value is transferred only when the AS-i slave is activated after turning on the power supply on the AS-i Master.

<table>
<tr><th colspan="9">Request</th></tr>
<tr><th>byte</th><th>2^7</th><th>2^6</th><th>2^5</th><th>2^4</th><th>2^3</th><th>2^2</th><th>2^1</th><th>2^0</th></tr>
<tr><td>1</td><td colspan="8">43_{16}</td></tr>
<tr><td>2</td><td>T</td><td>–</td><td colspan="6">circuit</td></tr>
<tr><td>3</td><td colspan="2">–</td><td>B</td><td colspan="5">slave address</td></tr>
<tr><td>4</td><td colspan="4">–</td><td colspan="4">PP</td></tr>
</table>

Tab. 4-158.

<table>
<tr><th colspan="9">Response</th></tr>
<tr><th>byte</th><th>2^7</th><th>2^6</th><th>2^5</th><th>2^4</th><th>2^3</th><th>2^2</th><th>2^1</th><th>2^0</th></tr>
<tr><td>1</td><td colspan="8">43_{16}</td></tr>
<tr><td>2</td><td>T</td><td colspan="7">result</td></tr>
</table>

Tab. 4-159.

4.6.13 Get permanent parameter (GET_PP)

With this call, a slave-specific parameter value stored on the EEPROM of the AS-i Master is read.

<table>
<tr><th colspan="9">Request</th></tr>
<tr><th>byte</th><th>2^7</th><th>2^6</th><th>2^5</th><th>2^4</th><th>2^3</th><th>2^2</th><th>2^1</th><th>2^0</th></tr>
<tr><td>1</td><td colspan="8">01_{16}</td></tr>
<tr><td>2</td><td>T</td><td>–</td><td colspan="6">circuit</td></tr>
<tr><td>3</td><td colspan="2">–</td><td>B</td><td colspan="5">slave address</td></tr>
</table>

Tab. 4-160.

<table>
<tr><th colspan="9">Response</th></tr>
<tr><th>byte</th><th>2^7</th><th>2^6</th><th>2^5</th><th>2^4</th><th>2^3</th><th>2^2</th><th>2^1</th><th>2^0</th></tr>
<tr><td>1</td><td colspan="8">01_{16}</td></tr>
<tr><td>2</td><td>T</td><td colspan="7">result</td></tr>
<tr><td>3</td><td colspan="4">–</td><td colspan="4">PP</td></tr>
</table>

Tab. 4-161.

Meaning of bit B:

B = 0 Single AS-i slave or A-slave

B = 1 B-slave

4.6.14 Set auto address enable (SET_AAE)

This call can enable or disable the "automatic address programming" function.

The AUTO_ADDR_ENABLE bit is stored permanently; in other words, it is retained after a warm/hot restart on the AS-i master.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$0B_{16}$							
2	T	–	circuit					
3	Auto_Address_Enable							

Tab. 4-162.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$0B_{16}$							
2	T	result						

Tab. 4-163.

Issue date: 7.6.2013

4.6.15 Change slave address (SLAVE_ADDR)

With this call, the AS-i address of an AS-i slave can be modified.

This call is mainly used to add a new AS-i slave with the default address "0" to the AS-Interface. In this case, the address is changed from "AS-i slave address old" = 0 to "AS-i slave address new".

This change can only be made when the following conditions are fulfilled:

1. An AS-i slave with "AS-i slave address old" exists.
2. If the old AS-i slave address is not equal to 0, an AS-i slave with address "0" cannot be connected at the same time.
3. The "AS-i slave address new" must have a valid value.
4. An AS-i slave with "AS-i slave address new" must not exist.

Information!

When the AS-i slave address is changed, the AS-i slave is not reset, in other words, the output data of the AS-i slave are retained until new data are received at the new address.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$0D_{16}$							
2	T	–	circuit					
3	–		B	source address				
4	–		B	target address				

Tab. 4-164.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$0D_{16}$							
2	T	result						

Tab. 4-165.

Meaning of bit B:

B = 0 Single AS-i slave or A-slave

B = 1 B-slave

4.6.16 Write AS-i slave extended ID1 (WRITE_XID1)

With this call, the extended ID1 code of an AS-i slave with address "0" can be written directly via the AS-i cable. The call is intended for diagnostic purposes and is not required in the normal master mode.

The AS-i master passes the extended ID1 code on to the AS-i slave without any plausibility check.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$3F_{16}$							
2	T	–	circuit					
3	–				xID1			

Tab. 4-166.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$3F_{16}$							
2	T	result						

Tab. 4-167.

4.7 Other commands

4.7.1 Overview of the commands

Values for command

see page	Command	Value	Meaning	Req Len	Res Len
page 92	IDLE	00_{16}	no request	2	2
page 92	READ_IDI	41_{16}	read IDI	2	36
page 93	WRITE_ODI	42_{16}	write ODI	34	2
page 94	READ_ODI	56_{16}	read ODI	2	34
page 95	SET_OFFLINE	$0A_{16}$	set Off-Line_Mode	3	2
page 96	SET_DATA_EX	48_{16}	set Data_Exchange_Active	3	2
page 96	REWRITE_DPRAM[1]	78_{16}	rewrite DPRAM	3	3
page 97	BUTTONS	75_{16}	disable push buttons	3	2
page 97	FP_PARAM	$7D_{16}$	functional Profile Parameter	≥3	≥2
page 98	FP_DATA[2]	$7E_{16}$	functional profile data	≥3	≥2
page 99	EXT_DIAG[3]	71_{16}	ExtDiag generation	6	2
page 100	RD_EXT_DIAG[4]	$7B_{16}$	read ExtDiag Settings	2	7
page 101	INVERTER	$7C_{16}$	configure inverter slaves	12	4
page 102	MB_OP_CTRL_WR_FLAGS	85_{16}	write flags	≥5	2
page 103	MB_OP_CTRL_RD_FLAGS	86_{16}	read flags	4	≥3
page 103	RD_MFK_PARAM	59_{16}	read SEW MFK21 parameter	6	≥3
page 104	MB_OP_CTRL_RESET_CT	89_{16}	reset control cycle time	2	2
page 105	MB_OP_CTRL_RD_PRM	88_{16}	read control parameter	4	18
page 106	MB_OP_CTRL_WR_PRM	87_{16}	write control parameter	20	2
page 107	MB_OP_CTRL_STATUS	83_{16}	read control status information	2	12
page 108	MB_OP_CTRL_CONTROL	82_{16}	write control status flags	3	2
page 109	MB_OP_NAME	72_{16}	read device name	2	34
page 110	MB_OP_READ_SERIAL	76_{16}	read serial number	2	6

Tab. 4-168.

1. The command REWRITE_DPRAM is valid only for the use with AS-i 3.0 Module OEM Master.
2. There are improved versions of these commands. We don‘t recommend to use the old one any more.
3. The command EXT_DIAG is valid only for the use with AS-i 3.0 PROFIBUS Gateways.
4. The command RD_EXT_DIAG is valid only for the use with AS-i 3.0 PROFIBUS Gateways.

Issue date: 7.6.2013

4.7.2 IDLE

When the value of "command" is zero, no request will be fulfilled.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	00_{16}							
2	T	–	circuit					

Tab. 4-169.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	00_{16}							
2	T	result						

Tab. 4-170.

4.7.3 Read input data image (READ_IDI)

With this call, the input data values of all AS-i slaves are read out of the AS-i Master in addition to the cyclic data exchange. Though the command READ_IDI transmits all execution control flags (byte 3 and byte 4).

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	41_{16}							
2	T	–	circuit					

Tab. 4-171.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	41_{16}							
2	T	result						
3	–							Pok
4	OR	APF	NA	CA	AAv	AAs	s0	Cok
5	–				slave 1A			
6	slave 2A				slave 3A			
…	…							
36	slave 30B				slave 31B			

Tab. 4-172.

Pok	Periphery_Ok
S0	LDS.0
AAs	Auto_Address_Assign
AAv	Auto_Address_Available

Issue date: 7.6.2013

CA	Configuration_Active
NA	Normal_Operation_Active
APF	APF
OR	Offline_Ready
Cok	Config_Ok
AAe	Auto_Address_Enable
OL	Offline
DX	Data_Exchange_Active

4.7.4 Write output data image (WRITE_ODI)

With this call the output data values of all AS-i slaves are written in addition to the cyclic data exchange.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	42_{16}							
2	T	–	circuit					
3	–				slave 1A			
4	slave 2A				slave 3A			
…	…							
34	slave 30B				slave 31B			

Tab. 4-173.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	42_{16}							
2	T	result						

Tab. 4-174.

4.7.5 Read output data image (READ_ODI)

With this call, the output data values of all AS-i slaves is being read out of the AS-i Master.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	56_{16}							
2	T	–	circuit					

Tab. 4-175.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	56_{16}							
2	T	result						
3	–				slave 1A			
	slave 2A				slave 3A			
…	…							
34	slave 30B				slave 31B			

Tab. 4-176.

Issue date: 7.6.2013

4.7.6 Set offline mode (SET_OFFLINE)

This call switches between online and offline mode.

The online mode is the normal operating state for the AS-i master. The following jobs are processed cyclically:

- During the data exchange phase, the fields of the output data are transferred to the slave outputs for all AS-i slaves in the LAS. The addressed AS-i slaves submit the values of the slave inputs to the master when the transfer was free of errors.
- This is followed by the inclusion phase in which existing AS-i slaves are searched and newly added AS-i slaves are entered in the LDS or LAS.
- In the management phase, jobs by the user such as writing parameters are executed.

In the offline mode, the AS-i Master processes jobs by the user only. (Jobs that involve the immediate addressing of an AS-i slave are rejected with an error). There is no cyclic data exchange with the AS-i slaves.

When offline, the AS-i circuit is in a safe state.

The OFFLINE = TRUE bit is not permanently stored; in other words, following a cold/warm restart, the AS-i Master is once again in the online mode.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$0A_{16}$							
2	T	–	circuit					
3	Off-Line							

Tab. 4-177.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$0A_{16}$							
2	T	result						

Tab. 4-178.

The master changes to the offline phase, if there is a 1 written in byte 3.

The master will change to online mode if there is a 0 written in byte 3.

4.7.7 Release data exchange (SET_DATA_EX)

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	48_{16}							
2	T	–	circuit					
3	Data_Exchange_Active							

Tab. 4-179.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	48_{16}							
2	T	result						

Tab. 4-180.

4.7.8 Rewrite DPRAM (REWRITE_DPRAM)

!!!

The command REWRITE_DPRAM is valid only for the use with AS-i 3.0 Module OEM Master.

This command is used for the rewriting of the DPRAM.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	78_{16}							
2	T	–	circuit					

Tab. 4-181.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	78_{16}							
2	T	result						

Tab. 4-182.

4.7.9 BUTTONS

With this call, the use of the buttons can be enabled/disabled.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	75_{16}							
2	T	–	circuit					
3	Buttons disabled							

Tab. 4-183.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	75_{16}							
2	T	result						

Tab. 4-184.

4.7.10 FP_PARAM

This command is used for parametrization of "functional profiles".

The content of the request and response bytes depends on the called function (see chap. <Functional Profiles>).

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7D_{16}$							
2	T	–	circuit					
3	function							
4	request byte 1							
…	…							
n	request byte n-3							

Tab. 4-185.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7D_{16}$							
2	T	result						
3	response byte 1							
…	…							
n	response byte n-2							

Tab. 4-186.

4.7.11 FP_DATA

This command is used for the data exchange with "functional profiles".

The content of the request and response bytes depends on the called function (see chap. <Functional Profiles>).

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T	–	circuit					
3	function							
4	request byte 1							
…	…							
n	request byte n-3							

Tab. 4-187.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T	result						
3	reponse byte 1							
…	…							
n	response byte n-2							

Tab. 4-188.

4.7.12 EXT_DIAG

!!!
The command EXT_DIAG is valid only for the use with AS-i 3.0 PROFIBUS Gateways.

With this call, the conditions when to set the ExtDiag bit can be selected.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	71_{16}							
2	T	–	circuit					
3	CF							
4	APF							
5	PF							
6	CS							

Tab. 4-189.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	71_{16}							
2	T	result						

Tab. 4-190.

CF ExtDiag is set, if ConfigError ≡ 1
APF ExtDiag is set, if APF ≡ 1
PF ExtDiag is set, if PeripheryFault ≡ 1
CS ExtDiag is set, if LCS is not empty

4.7.13 RD_EXT_DIAG

!!!
The command RD_EXT_DIAG is valid only for the use with AS-i 3.0 PROFIBUS Gateways.

With this call, the conditions when the ExtDiag bit is set can be read.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7B_{16}$							
2	T	–	circuit					

Tab. 4-191.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	75_{16}							
2	T	result						
3	CF							
4	APF							
5	PF							
6	CS							
7	FD							

Tab. 4-192.

CF ExtDiag is set, if ConfigError ≡ 1

APF ExtDiag is set, if APF ≡ 1

PF ExtDiag is set, if PeripheryFault ≡ 1

CS ExtDiag is set, if LCS is not empty

FD Diagnostic will be updated only if this is dictated by the PROFIBUS norm.
Diagnostic date are not up to date when in doubt.

Issue date: 7.6.2013

4.7.14 Inverter

With this call, an AS-i slave for frequency inverters is switched from cyclical mode to the transmission mode of four 16-bit values, in order to operate again with the selected AS-i destination parameter.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7C_{16}$							
2	T	–	circuit					
3	slave address							
4	destination parameter							
5	value 1, high byte							
6	value 1, low byte							
7	value 2, high byte							
8	value 2, low byte							
9	value 3, high byte							
10	value 3, low byte							
11	value 4, high byte							
12	value 4, low byte							

Tab. 4-193.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7C_{16}$							
2	T	result						

Tab. 4-194.

4.7.15 Write Flag

Use this command to write the flag of a control program.

The control program of devices with control functions takes on data from the PB interface.

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	85_{16}							
2	T	–	circuit					
3	start address							
4	number of bytes n							
5	flags byte 1							
...	...							
n+4	flags byte n							

Tab. 4-195.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	85_{16}							
2	T	result						

Tab. 4-196.

4.7.16 Read Flag

Use this command to read out the flags of a control program.

The control program of devices with control functions takes on data from the superior fieldbus interface.

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	86_{16}							
2	T	–	circuit					
3	start address							
4	number of bytes n							

Tab. 4-197.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	86_{16}							
2	T	result						
3	data 1							
...								
n+2	data n							

Tab. 4-198.

4.7.17 READ_MFK_PARAM

Use this command to read multiple commands of a SEW MFK21 slave.

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	59_{16}							
2	T	–	circuit					
3	slave							
4	index high							
5	index low							
6	number (n)							

Tab. 4-199.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	59_{16}							
2	T	result						
3	prm byte (index)							
4	prm byte (index+1)							
n+2	prm byte (index+n-1)							

Tab. 4-200.

4.7.18 Reset control cycle time (MB_OP_CTRL_RESET_CT)

This command is used to reset the average and maximum cycle time of a control program and to restart evaluation of the cycle times for devices having control functionality.

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	89_{16}							
2	T	–	circuit					

Tab. 4-201.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	89_{16}							
2	T	result						

Tab. 4-202.

4.7.19 Read control parameter (MB_OP_CTRL_RD_PRM)

This command is used to read out 16 parameter bytes of a control program starting at any start address for devices having control functionality.

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	89_{16}							
2	T	–						–
3	start address, low byte[1]							
4	start address, high byte[1]							

Tab. 4-203.

1. The address range for the parameter bytes extends from 0 to 1024. This means the value for the start address can be maximum 1008.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	89_{16}							
2	T	result						
3	data byte 1							
…	…							
18	data byte 16							

Tab. 4-204.

Issue date: 7.6.2013

4.7.20 Write control parameter (MB_OP_CTRL_WR_PRM)

This command is used to write 16 parameter bytes of a control program starting at any start address for devices having control functionality.

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	87_{16}							
2	T	–						–
3	start address, low byte[1]							
4	start address, high byte[1]							
5	data byte 1							
…	…							
20	data byte 16							

Tab. 4-205.

1. The address range for the parameter bytes extends from 0 to 1024. This means the value for the start address can be maximum 1008.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	87_{16}							
2	T	result						

Tab. 4-206.

Issue date: 7.6.2013

4.7.21 Read control status information (MB_OP_CTRL_STATUS)

This command is used to read out the status information using the control program for devices having control functionality.

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	83_{16}							
2	T	–						–

Tab. 4-207.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	83_{16}							
2	T	result						
3	CA	reserved			AS	reserved	RS	CR
4	reserved							
5	average cycle time, low byte							
6	average cycle time, high byte							
7	maximal cycle time, low byte							
8	maximal cycle time, high byte							
9	used stack memory in bytes, low byte							
10	used stack memory in bytes, high byte							
11	maximal stack memory in bytes, low byte							
12	maximal stack memory in bytes, high byte							

Tab. 4-208.

CR: Control run

RS: Control reset

AS: Control Auto-Start

CA: Control active

4.7.22 Write control status flags (MB_OP_CTRL_CONTROL)

This command is used to rewrite the Control Status flags in RAM for devices having control functionality. The Control Auto-Start bit is also sent to non-volatile memory.

<table>
<tr><th colspan="9">Request</th></tr>
<tr><td>Byte</td><td>2^7</td><td>2^6</td><td>2^5</td><td>2^4</td><td>2^3</td><td>2^2</td><td>2^1</td><td>2^0</td></tr>
<tr><td>1</td><td colspan="8">82_{16}</td></tr>
<tr><td>2</td><td>T</td><td>–</td><td colspan="5"></td><td>–</td></tr>
<tr><td>3</td><td>CA</td><td colspan="3">reserved</td><td>AS</td><td>reserved</td><td>RS</td><td>CR</td></tr>
</table>

Tab. 4-209.

<table>
<tr><th colspan="9">Response</th></tr>
<tr><td>Byte</td><td>2^7</td><td>2^6</td><td>2^5</td><td>2^4</td><td>2^3</td><td>2^2</td><td>2^1</td><td>2^0</td></tr>
<tr><td>1</td><td colspan="8">82_{16}</td></tr>
<tr><td>2</td><td>T</td><td colspan="7">result</td></tr>
</table>

Tab. 4-210.

CR:	Control run
RS:	Control reset
AS:	Control Auto-Start
CA:	Control aktiv

4.7.23 Read device name (MB_OP_NAME)

This command is used to read out the device name. 32 bytes are always transmitted.

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	72_{16}							
2	T	–	circuit					

Tab. 4-211.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	72_{16}							
2	T	result						
3	response byte 1							
...	...							
34	response byte 32							

Tab. 4-212.

4.7.24 Read serial number (MB_OP_READ_SERIAL)

This command is used to read out the serial number.

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	76_{16}							
2	T	–	circuit					

Tab. 4-213.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	76_{16}							
2	T	result						
3	response low byte							
...	...							
6	response high byte							

Tab. 4-214.

4.8 Functional Profiles

4.8.1 Overview of the commands

Values for command

see page	Command	Value	Meaning	Req Len	Res Len
page 112	"Safety at Work" list	00_{16}	slaves with released safety function, response contains EcFlags	3	8
page 114	"Safety at Work" list	$0D_{16}$	slaves with released safety function, response doesn‘t contain EcFlags	3	6
page 115	"Safety at Work" diagnostic[1]	02_{16}	monitor diagnostic	5	n
page 120	Device Index Identifier	$1C_{16}$	Read the device identifer in plan text	7	n
page 122	integrated AS-i sensors: Warnings	03_{16}	sensors with deleted D1 bit	3	10
page 123	Integrated AS-i sensors: Availability	04_{16}	sensors with deleted D2 bit	3	6
page 124	language-select	$0E_{16}$	read display language	4	3
page 125	replacement of safety slaves input data	$0F_{16}$	read safety input slave "interpretation data"	3	4
page 126	list of safety slaves	10_{16}	read addresses of safety slaves	3	6
page 127	function $1E_{16}$	$7E_{16}$	read AS-i current maximal value	3	4
		$7D_{16}$	reset AS-i current maximal value	3	2
page 129	function $1F_{16}$	$7E_{16}$	read AS-i current limit value	3	3
		$7D_{16}$	write AS-i current limit value	4	2
page 130	function 26_{16}	$7E_{16}$	read ripple voltage maximal value	3	6
		$7D_{16}$	reset ripple voltage maximal value	3	4
page 132	function 27_{16}	$7E_{16}$	read ripple voltage limit value	3	4
		$7D_{16}$	reset ripple voltage limit value	4	2
page 134	function 17_{16}	$7E_{16}$	read S-7.5 slave information	4	7
page 135	function 22_{16}	$7E_{16}$	read the type of power supply	3	3
		$7D_{16}$	write the type of power supply	4	2

Tab. 4-215.

1. There are improved versions of these commands. We don‘t recommend to use the old one any more.

4.8.2 "Safety at Work" List 1

Information!

This function has been implemented only for reasons of the downwards compatibility.

By AS-i 3.0 Masters, the state of the "safety input slaves" is specified on the image of the input data (0000 released).

4.8.2.1 Slave list with Ec-Flags

(Function: $\boldsymbol{00_{16}}$***)***

List of "safety at work input slaves" ("AS-i Safety at Work") being in released state.

Safety at work input slaves have the profile S-7.B or S-0.B (IO = 0 or 7, ID = B, see chap. <Read actual configuration (READ_CDI)>.

The "Safety at Work" list 1 is a bit list which contains a bit for each possible slave address (1 - 31). This list is written in the bytes 5 until 8 in the response of the command of the command interface. Additionally, the reponse contains the ec-flags of the AS-i master in the bytes 3 and 4 (see chap. <Get Flags (GET_FLAGS)>.

The bits of the "Safety at Work" list 1 are set if the safety function of the slave is activated (e.g. emergency button pressed). The bit is only set at security slaves when both contacts are released, otherwise the bits have the value 0. "Normal" (non-security) slaves also have the value 0.

Since the safety monitor is also being activated when a safety slave is missing or if the AS-i circuit is shut off (offline active), the ec-flags will also be transmitted. It is sufficient however to monitor the group error message Cok (configuration error). As long as no configuration error, the list of the "safety at work input slaves" can be used.

Configured safety slaves which are not available, and available slaves sending a wrong code sequence, will not be entered in this list.

With the bit "O", the sequence of the bits within the "Safety at Work" list 1 can be chosen.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T	O	circuit					
3	00_{16}							

Tab. 4-216.

Response (if O ≡ 0)								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T	result						
3	–							Pok
4	OR	APF	NA	CA	AAv	AAs	S0	Cok
5	7	6	5	4	3	2	1	-
6	15	14	13	12	11	10	9	8
7	23	22	21	20	19	18	17	16
8	31	30	29	28	27	26	25	25

Tab. 4-217.

Response (if O ≡ 1)								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T	result						
3	–							Pok
4	OR	APF	NA	CA	AAv	AAs	S0	Cok
5	-	1	2	3	4	5	6	7
…	…							
8	24	25	26	27	28	29	30	31

Tab. 4-218.

Pok	Periphery_Ok
S0	LDS.0
AAs	Auto_Address_Assign
AAv	Auto_Address_Available
CA	Configuration_Active
NA	Normal_Operation_Active
APF	APF
OR	Offline_Ready
Cok	Config_Ok

Example for O ≡ 0:

Configuration OK,
periphery OK (no peripheral fault,
2 safety slaves with released safety function,
AS-i addresses 4 and 10
1 safety slave with unreleased safety function,
AS-i address 5.

Reponse: 7E 00 01 25 10 04 00 00

Issue date: 7.6.2013

4.8.2.2 Slave list without Ec-Flags

(Function: $0D_{16}$)

There is a function $0D_{16}$ in addition to the function 00_{16}. The function $0D_{16}$ has no Ec-Flags in the response. The response falls short for 2 bytes.

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T	O	circuit					
3	0Dh							

Tab. 4-219.

Response (by O ≡ 0)								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T	response						
3	7	6	5	4	3	2	1	–
4	15	14	13	12	11	10	9	8
5	23	22	21	20	19	18	17	16
6	31	30	29	28	27	26	25	24

Tab. 4-220.

Response (by O ≡ 1)								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T	response						
3	–	1	2	3	4	5	6	7
4	8	9	10	11	12	13	14	15
5	16	17	18	19	20	21	22	23
6	24	25	26	27	28	29	30	31

Tab. 4-221.

4.8.3 "Safety at Work" Monitor diagnostic

(Function: 02_{16})

Since the "Safety at Work" monitor can generate more than 32 Byte diagnostic data, these must be read with several command interface calls. The byte 5 declares the start index in the field of the diagnostic data.

If the start index is 0, new data is fetched from the monitor. Otherwise, the function will respond out of the memory; the data can be read consistently.

Issue date: 7.6.2013

4.8.3.1 Setting of the AS-i diagnostic

Information!

The function unsorted diagnostic is available only with monitors in the version 2.0 and higher.

The function sorted diagnostic is available with all monitors.

The setting of the AS-i diagnostic takes place in the window "Information about monitor and bus" of the configuration software ASIMON for the AS-i safety monitor.

- Call up the menu "Edit/Information about monitor and bus".

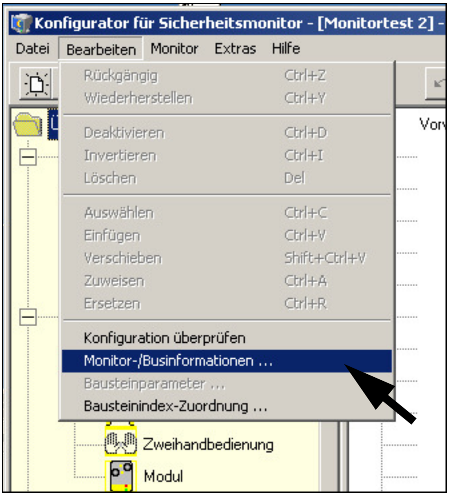

Fig. 4-1. Calling of Information about monitor and bus

- Set the function range in the window Information about monitor and bus

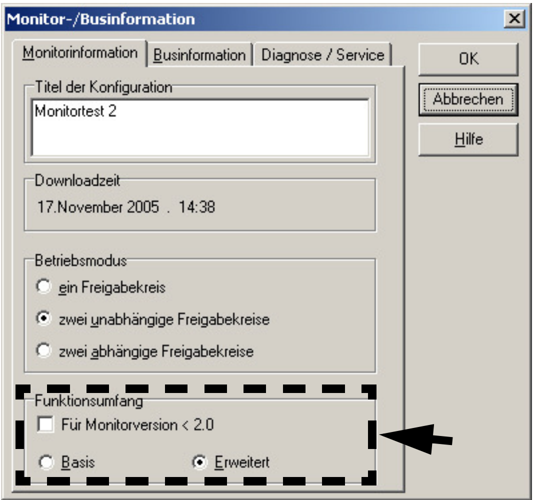

Fig. 4-2. Setting of function range

- Select in the window Information about monitor and bus the tab Diagnostic/ Service
- Select within the range Data selection sorted (sorted by OSSD) or unsorted (all devices)

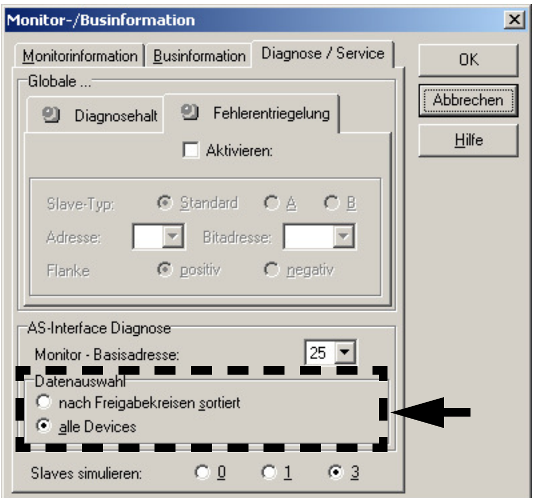

Fig. 4-3. Data selection (sorted/unsorted)

Issue date: 7.6.2013

4.8.3.2 Enhanced diagnostic

Since the "Safety at Work" monitor diagnostic is longer than the maximum size of the command interface, it must be read with several adjacent requests.

The byte 5 (‘index’) declares the start index in the array of diagnostic data. If this start index is 0, the whole diagnostic is fetched from the monitor and stored to an internal buffer. Otherwise, the AS-i Master will respond out of the internal buffer. Thus, even though several requests are necessary to read the whole buffer, data integrity is maintained.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T	L[1]	U[2]	circuit				
3	02_{16}							
4	slave address							
5	index							

Tab. 4-222.

1. L=1 long diagnostic for advanced monitor.
2. U=1 unsorted diagnostic (all devices).

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T	result						
3	diagnostic byte #index+0							
4	diagnostic byte #index+1							
…	…							
n	diagnostic byte #index+n-3							

Tab. 4-223.

The diagnostic array is set up as follows:

Safety Monitor Diagnostic Array "*basic function range*" and "*sorted by OSSD*"								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
0	00_{16}							
1	state of monitor							
2	state of OSSD 1							
3	state of OSSD 2							
4	number of devices *not green*, OSSD1							
5	number of devices *not green*, OSSD2							
6	device index 32, OSSD 1							

Tab. 4-224.

Safety Monitor Diagnostic Array "*basic function range*" and "*sorted by OSSD*"								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
7	color of device 32, OSSD 1							
8	device index 33, OSSD 1							
9	color of device 33, OSSD 1							
…	…							
68	device index 63, OSSD 1							
69	color of device 63, OSSD 1							
70	device index 32, OSSD 2							
71	color of device 32, OSSD 2							
…	…							
132	device index 63, OSSD 2							
133	color of device 63, OSSD 2							

Tab. 4-224.

Safety Monitor Diagnostic Array "*enhanced function range*" and "*sorted by OSSD*"								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
0	00_{16}							
1	state of monitor							
2	state of OSSD1							
3	state of OSSD2							
4	number of devices "not-green", OSSD1							
5	number of devices "not-green", OSSD2							
6	device index 32, OSSD1							
7	color of device 32, OSSD1							
8	device index 33, OSSD1							
…	…							
133	color of device 95, OSSD1							
134	device index 32, OSSD2							
…	…							
261	color of device 95, OSSD2							

Tab. 4-225.

Safety Monitor Diagnostic Array "*basic function range*" and "*all devices*"								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
0	00_{16}							
1	state of monitor							
2	state of OSSD1							

Tab. 4-226.

Issue date: 7.6.2013

Safety Monitor Diagnostic Array "*basic function range*" and "*all devices*"								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
3	state of OSSD2							
4	number of devices "not-green"							
5	—							
6	device index 32							
7	color of device 32							
8	device index 33							
9	color of device 33							
…	…							
68	device index 63							
69	color of device 63							
70	device index 32							
71	assignment of device 32 to OSSD							
…	…							
132	device index 63							
133	assignment of device 63 to OSSD							

Tab. 4-226.

Safety Monitor Diagnostic Array "*enhanced function range*" and "*all devices*"								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
0	00_{16}							
1	state of monitor							
2	state of OSSD1							
3	state of OSSD2							
4	number of devices number of devices "not-green"							
5	—							
6	device index 32							
7	color of device 32							
8	device index 33							
…	…							
133	color of device 95							
134	device index 32							
135	assignment of device 32 to OSSD2							
…	…							
261	assignment of device 95 to OSSD							

Tab. 4-227.

Possible assignment:

00_{16}: preprocessing

01_{16}: OSSD 1

02_{16}: OSSD 2

03_{16}: OSSD 1+2

80_{16}: device does not exist

Information!

See chap. <Command 7: Read „Safety monitor diagnostic (sorted acc. to OSSD)“> for a description of the codes used for monitor state, OSSD state, device colors and assignments to OSSDs and the "Safety-at-Work" monitor documentation.

4.8.3.3 Device Index Identifier

(Function: 1C$_{16}$)

Use this command to read the device identifier in plain text.

The value "address" is the AS-i address. The safety monitor integrated in the gateway is approchaed with the address 0. With the help of the diagnostic sorting it can be indicated whether the sorting is made normal or by device index. The maximum number of the transmitted bytes in the response is 34.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T			circuit				
3	$1C_{16}$							
4	address							
5	device index high							
6	device index low							
7	sorting							

Tab. 4-228.

Response								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T	result						
3	reserved						DA	BI
4	device identifier #character 1							
5	device identifier #character 2							
…	…							
n-1	device identifier #character n-3							
n	0							

Tab. 4-229.

Issue date: 7.6.2013

"Sorting" has the following meaning:

0:	sorting by devices
1:	AS-i sorting

The bit DA has the following meaning:

DA = 0:	device is activated
DA = 1	device is deactivated

The bit BI has the following meaning:

BI = 0:	device index is in use
BI = 1:	device index is not in use

4.8.4 Integrated AS-i Sensors: Warnings

(Function: 03_{16})

List of integrated AS-i sensors according to profile S-1.1 (without extended addressing) or profile S-3.A.1 (with extended addressing), by which the input data bit D1 ("Warning") being deleted.

For creating of this list CDI and IDI are used only. Integrated AS-i slaves which are projected but not existing therefore are not entered here.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T	O	circuit					
3	03_{16}							

Tab. 4-230.

Response (if O ≡ 0)								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T	result						
3	7A	6A	5A	4A	3A	2A	1A	0
…	…							
10	31B	30B	29B	28B	27B	26B	25B	24B

Tab. 4-231.

Response if O ≡ 1)								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T	result						
3	0	1A	2A	3A	4A	5A	6A	7A
…	…							
10	24A	25A	26A	27A	28A	29A	30A	31A

Tab. 4-232.

Issue date: 7.6.2013

4.8.5 Integrated AS-i Sensors: Availability

(Function: 04_{16})

List of the integrated slaves according to profile S-1.1 whose input data bits D2 ("Availability") are deleted.

For creating this list, CDI and IDI are used only. Integrated AS-i slaves which are projected but not existing therefore are not entered here.

Request								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T	O	circuit					
3	04_{16}							

Tab. 4-233.

Response (if O ≡ 0)								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T	result						
3	7	6	5	4	3	2	1	0
…	…							
6	31	30	29	28	27	26	25	24

Tab. 4-234.

Response (if O ≡ 1)								
byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T	result						
3	0	1	2	3	4	5	6	7
…	…							
6	24	25	26	27	28	29	30	31

Tab. 4-235.

Issue date: 7.6.2013

4.8.6 Language-select

(Function $0E_{16}$)

Use this function to set the display language.

Set:

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7D_{16}$							
2	T	–	circuit					
3	$0E_{16}$							
4	language[1]							

Tab. 4-236.

1. Value: 0= default (no changes), 1= english, 2= german, 3= french, 4= italian, 5= spain.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7D_{16}$							
2	T	result						

Tab. 4-237.

Read:

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T	–	circuit					
3	$0E_{16}$							

Tab. 4-238.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T	result						
3	language[1]							

Tab. 4-239.

1. Value: 0= default (no changes), 1= english, 2= german, 3= french, 4= italian, 5= spanish.

Issue date: 7.6.2013

4.8.7 Replacement of Safety Slaves input data

(Function $0F_{16}$)

Use this function to replace safety slaves input data with "interpretation data". If the function is active, so have safety slaves input data the following meaning:

Bit 0, 1: 00=channel 1 has released, 11=channel 1 has not released.

Bit 2, 3: 00=channel 2 has released, 11=channel 2 has not released.

Information!

This command replaces the old command MB_FP_LSS_ENABLE.

Set:

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7D_{16}$							
2	T	–	circuit					
3	$0F_{16}$							
4	safety slaves[1]							

Tab. 4-240.

1. Value: 0= no substitute value, 1=substitute value for safety slaves.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7D_{16}$							
2	T	result						

Tab. 4-241.

Read:

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T	–	circuit					
3	$0F_{16}$							

Tab. 4-242.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T	result						
4	safety slaves[1]							

Tab. 4-243.

1. Value: 0= no substitute value, 1=substitute value for safety slaves.

4.8.8 List of Safety Slaves

(Function 10_{16})

Use this function to find out the addresses of safety slaves.

Read:

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T	O[1]	circuit					
3	10_{16}							

Tab. 4-244.

1. O = orientation.

Response (by O ≡ 0)								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T	result						
3	7	6	5	4	3	2	1	0
…	…							
6	31	30	29	28	27	26	25	24

Tab. 4-245.

Response (bei O ≡ 1)								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T	result						
3	0	1	2	3	4	5	6	7
…	…							
6	24	25	26	27	28	29	30	31

Tab. 4-246.

4.8.9 Read/reset maximum value of the AS-i current

(Function $1E_{16}$)

!!!
The function $1E_{16}$ is valid only for the use with masters which support this function.
Please see the user manual of the master for further information.

This function is used to read and reset the current and maximum value of the measured AS-i current for the selected AS-i circuit.

Read:

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T	–						circuit
3	$1E_{16}$							

Tab. 4-247.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T	result						
3	current value of the AS-i current							
4	maximum value of the AS-i current							

Tab. 4-248.

Reset:

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7D_{16}$							
2	T	–						circuit
3	$1E_{16}$							

Tab. 4-249.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7D_{16}$							
2	T	result						

Tab. 4-250.

Issue date: 7.6.2013

4.8.10 Read/write limit value for the AS-i current

(Function $1F_{16}$)

!!!
The function $1F_{16}$ is valid only for the use with masters which support this function.
Please see the user manual of the master for further information.

This function is used to read out and specify the limit value for the maximum AS-i current of the selected AS-i circuit.

Read:

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T	–						circuit
3	$1F_{16}$							

Tab. 4-251.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T	result						
3	limit value for the AS-i current							

Tab. 4-252.

Write:

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7D_{16}$							
2	T	–						circuit
3	limit value for the AS-i current (max. 40)							

Tab. 4-253.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7D_{16}$							
2	T	result						

Tab. 4-254.

Issue date: 7.6.2013

4.8.11 Read/reset ripple voltage maximal value

(Function 26_{16})

!!!
The function 26_{16} is valid only for the use with masters which support this function.
Please see the user manual of the master for further information.

This function is used to read out and reset the instantaneous- and maximal value of the meassured ripple voltage of the power supply [1LSB = 1 mV].

Read:

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T	–						circuit
3	26_{16}							

Tab. 4-255.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T	result						
3	instantaneous ripple voltage high byte							
4	instantaneous ripple voltage low byte							
5	maximal ripple voltage high byte							
6	maximal ripple voltage low byte							

Tab. 4-256.

Reset:

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7D_{16}$							
2	T	–						circuit
3	26_{16}							

Tab. 4-257.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7D_{16}$							
2	T	result						
3	last maximal ripple voltage high byte							
4	last maximal ripple voltage low byte							

Tab. 4-258.

4.8.12 Read/write ripple voltage limit value

(Function 27_{16})

!!!
The function 27_{16} is valid only for the use with masters which support this function.
Please see the user manual of the master for further information.

This function is used to read out and/or set the limit value for the maximal ripple voltage of the power supply [1LSB = 1 mV]. The analysis of the ripple voltage is deactivated with a limit value of 0 mV. The maximal limit value is 999 mV.

Read:

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T	–						circuit
3	27_{16}							

Tab. 4-259.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T	result						
3	limit value ripple voltage high byte							
4	limit value ripple voltage low byte							

Tab. 4-260.

Write:

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7D_{16}$							
2	T	–						circuit
3	27_{16}							
4	limit value ripple voltage high byte							
5	limit value ripple voltage low byte							

Tab. 4-261.

Issue date: 7.6.2013

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7D_{16}$							
2	T	result						

Tab. 4-262.

4.8.13 Read information for a slave acc. to profile S-7.5

(Function 17_{16})

!!!
The function 17_{16} is valid only for the use with masters which support this function.
Please see the user manual of the master for further information.

This function is used to read out information for a slave according to profile S-7.5.

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T	–						circuit
3	17_{16}							
4	slave address (1-31 and/or 33-63 for B-slaves)							

Tab. 4-263.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T	result						
3	slave vendor id; high byte							
4	slave vendor id; low byte							
5	slave device id; high byte							
6	slave device id; low byte							
7	slave configuration							

Tab. 4-264.

4.8.14 Read/write type of power supply

(Function 22_{16})

!!!
The function 22_{16} is valid only for the use with masters which support this function. Please see the user manual of the master for further information.

This function is used to read out and specify the type of power supply for the master (AS-i power supply or grounded 24 VDC).

Read:

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T	–						circuit
3	22_{16}							

Tab. 4-265.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7E_{16}$							
2	T	result						
3	ST							

Tab. 4-266.

Write:

Request								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7D_{16}$							
2	T	–						circuit
3	22_{16}							
4	ST							

Tab. 4-267.

Response								
Byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	$7D_{16}$							
2	T	result						

Tab. 4-268.

ST: Type of supply voltage; 0: grounded 24VDC; unaqual 0: AS-i power supply

4.9 Safety diagnostics

Diagnostics data can be obtained in many ways in the current generation of Safety Monitors.

A detailed diagnostics via the command interface is the most complex way. Therefore before, please take a look at an overview of the simple diagnostic possibilities:

4.9.1 Safety Control Status

Many current AS-i Gateways with or without integrated Safety Monitor offer in the fieldbus configuration, the module "Safety Control Status". Following diagnostic data are given cyclically:

Coding of status bytes

bit [0 ... 3]	state or color	description
00_{16}	green permanent lighting	output on
01_{16}	green flashing	time is running at **Stop1**
02_{16}	yellow permanent lighting	start-up / restart interlock active
03_{16}	yellow flashing	external test required / acknowledgement /start delay active
04_{16}	red permanent lighting	output off
05_{16}	red flashing	error
06_{16}	grey or off	output not projected
07_{16}	reserved	
bit [6]	state or color	
0	no device is flashing yellow	
1	at least one device is flashing yellow	
bit [7]	state or color	
0	no device is flashing red	
1	at least one device is flashing red	

Tab. 4-269.

Issue date: 7.6.2013

Safety Control-Status

length	description
2 byte E 1 byte A	Safety Ctrl/Status (OSSD 2)
4 byte E 1 byte A	Safety Ctrl/Status (OSSD 4)
6 byte E 2 byte A	Safety Ctrl/Status (OSSD 6)
8 byte E 2 byte A	Safety Ctrl/Status (OSSD 8)
10 byte E 3 byte A	Safety Ctrl/Status (OSSD 10)
12 byte E 3 byte A	Safety Ctrl/Status (OSSD 12)
14 byte E 4 byte A	Safety Ctrl/Status (OSSD 14)
16 byte E 4 byte A	Safety Ctrl/Status (OSSD 16)

Tab. 4-270.

Information!

Additional information on diagnostics via Safety Control Status in PROFIBUS Gateways can be found in system manual "AS-i 3.0 PROFIBUS Gateways with integr. safety monitor".

Alternatively, you can read out the Safety Control Status via the transparent input data of the AS-i base address of the monitor (for OSSD 1-8) on the profile 7.5.5

Channel ’0’ of the transparent input data describes the state of the two AS-i circuits (traffic light status).

The upper 8 bits describe the state of AS-i circuit 2, the lower the state of AS-i circuit 1.

Channels 1 and 2 contain the colors of release circuits 1 – 8.

Channel 3 displays summary information about red and yellow flashing devices in the reference to release circuits.

Transparent input data

channel	2^{15}	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^{9}	2^{8}
0	AS-i circuit 2							
	AU	RT	GE	GN		UA	DA	EF
1	state OSSD 4				state OSSD 3			
2	state OSSD 8				state OSSD 7			
3	OSSD8		OSSD7		OSSD6		OSSD5	
	RF	YF	RF	YF	RF	YF	RF	YF

Tab. 4-271.

channel	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}
0	AS-i circuit 1							
		RT	GE	GN		UA	DA	EF
1	state OSSD 2				state OSSD 1			
2	state OSSD 6				state OSSD 5			
3	OSSD4		OSSD3		OSSD2		OSSD1	
	RF	YF	RF	YF	RF	YF	RF	YF

Tab. 4-272.

Channel ’0’ of the transparent input data describes the state of both AS-i circuits. The upper 8 bits describe the state of AS-i circuit 2, the lower the state of AS-i circuit 1.

Channels 1 and 2 contain the colors of release circuits (currently only 2 colors are supported).

Finally the summary information appear on device colors of the release circuits in channel 3.

All items are described as follows:

EF	earth fault	Earth fault is present 1: earth fault is present 0: earth fault is *not* present
DA	duplicate address	Duplicate address is present 1: duplicate address on AS-i 0: *no* duplicate address on AS-i
GN	green	Error free or almost error free communication < 1% telegram repetitions
GE	warning	More frequent repetitions, which should be clarified depending upon application 1% - 5% telegram repetitions
RT	error	Fatal disturbances > 5% telegram repetitions

UA	UAS-i	AS-i voltage is sufficient 1: AS-i voltage is sufficient 0: AS-i voltage is *not* sufficient
AU	AUX 24 V	24 V for safe outputs supply is present 1: 24 V for safe outputs supply is present 0: 24 V for safe outputs supply is *not* present

Channels 1 and 2 describe the states of the respective OSSDs of the monitor.

Coding of the OSSD's state

Code bit [3 ... 0]	Status resp. color	Description
0	Green continuous	Output on
1	Green flashing	Delay time is running at stop category 1
2	Yellow continuous	Start-up/restart-disable active
3	Yellow flashing	External test necessary / acknowledgement / start delay active
4	Red continuous	Output off
5	Red flashing	Error
6	Grey resp. off	Output not projected

Tab. 4-273.

Channel 3 describes if warnings or disturbances occured in one or more devices assigned this OSSD. This means:

YF	yellow flashing	At least one of devices assigned to this OSSD is in the state yellow flashing.
RF	red flashing	At least one of devices assigned to this OSSD is in the state red flashing.

Binary data

	D3	D2	D1	D0
monitor -> master (input)	serial communication	serial communication	1: output '2' is switched off or green flashing	1: output '1' is switched off or green flashing
master -> monitor (output)	change from '0' to '1' resets the error-traffic light AS-i 2	change from '0' to '1' resets the error-traffic light AS-i 1	serial communication	serial communication

Tab. 4-274.

Information!

Additional information on diagnostics via Profile S-7.5.5 can be found in system manual "AS-i 3.0 PROFIBUS Gateways with integr. safety monitor".

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4.9.2 State of safe inputs via I/O-data

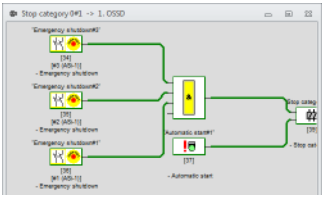
The state of the safe inputs can be received out of cyclical process data in the control. On the basis of bit sequences the input status can be concluded:

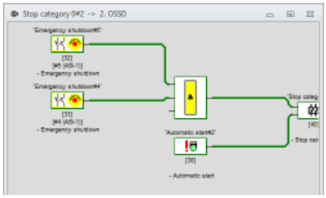
bit sequence 0000:	2-channel switched-off, module regularly released
Bit Sequence 0011 Or 1100:	1-channel switched-off, module disturbed, as only partly or not operated within the synchronisation time.

The code sequences are in the process data usually replaced by 1111 (see chapter "REPLACEMENT VALUE" in respective system manual of the AS-i Gateway).

4.9.3 Graphical diagnostics on Windows PC via ASIMON

The diagnostics via the PC software ASIMON shows particularly clear the schematic representation of the state of the release circuits as well as of the linked devices. In the ethernet based gateways, diagnostics works using the IP address of the gateway, otherwise using the RS 232 diagnostic interface.





Information!

Additional information on diagnostics via the ASIMON Software can be found in system manual "ASIMON 3 G2 Configuration software for Microsoft Windows", chap.6.

4.9.4 Diagnostics via display

Information!

Additional information on diagnostics via the display can be found in respective system manual ot the AS-i Monitor.

4.9.5 Diagnostics via command interface

You get detailed diagnostics, e.g. an overview of device colors via acyclic data (see section <Acyclic commands>), accessible via the command interface, either through a direct command (e.g. command 14, see chapter <Command 14: Read "Safety monitor diagnostic">) or via a "Vendor Specific Object".

You get the trigger time to query the acyclic commands for example out of the Safety Control Status (bit 6 and 7, red or yellow flashing device in the particular release circuit).

Information!

Examples for reading diagnostics via a command interface, see the chapter <Example for the readout of the safety monitor with ACYC_TRANS> .

A "Vendor Specific Object" will be found via the acyclic transfer command "S-7.5 Transfer" (command 5) (see chapter <Command 5: „Transfer S-7.5“>).

In the following lists for the safety-relevant diagnostics Vendor Specific Objects.

4.9.5.1 Analyser status AS-i circuit 1 - Vendor Specific Object 1

Read only

This object contains for all 62 possible slaves a bit-pair that reflects the state of the slaves at this address:

byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	3/3A	3/3A	2/2A	2/2A	1/1A	1/1A	–	–
2	7/7A	7/7A	6/6A	6/6A	5/5A	5/5A	4/4A	4/4A
…	…							
16	31B	31B	30B	30B	29B	29B	28B	28B

Tab. 4-275.

bit	traffic light colors
11	red
10	yellow
01	green
00	no slave

4.9.5.2 Analyser status AS-i circuit 2 - Vendor Specific Object 2

Read only

This object contains for all 62 possible slaves a bit-pair that reflects the state of the slaves at this address:

byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	3/3A	3/3A	2/2A	2/2A	1/1A	1/1A	–	–
2	7/7A	7/7A	6/6A	6/6A	5/5A	5/5A	4/4A	4/4A
…	…							
16	31B	31B	30B	30B	29B	29B	28B	28B

Tab. 4-276.

bit	traffic light colors
11	red
10	yellow
01	green
00	no slave

Issue date: 7.6.2013

4.9.5.3 Device colors OSSD 1 - Vendor Specific Object 3

Read only

This object contains colors for all devices assigned to OSSD 1 plus additional information for all other OSSDs.

If not all 255 devices are occupied, the monitor can reduce the S-7.5.5 telegram to save transmission time.

byte	meaning
1	bit 0 0=configuration operation, 1=protective operation bit 3 ... 1 reserved, 0 bit 4 state 1.Y1, EDM1 (0=open) bit 5 state 1.Y2, Start1 (0=open) bit 6 state 2.Y1, EDM2 (0=open) bit 7 state 2.Y2, Start2 (0=open)
2	relay state output 1+2 bit 3 … 0 state output 1 bit 7 … 4 state output 2
3 … 8	…
9	relay state output 15+16 bit 3 … 0 state output 15 bit 7 … 4 state output 16
10	coding of the bit fields for existing devices. Device 7 … 0
11 … 40	…
41	coding of the bit fields for existing devices. Device 248 … 255
42	colors device 1+2 bit 3 … 0 colors device 1 bit 7 … 4 colors device 2
43 … 168	...
169	device 255+256 bit 3 … 0 colors device 255 bit 7 … 4 colors device 256

Tab. 4-277.

Coding of the bit fields for existing devices:

These numbers indicate the position of the bits that correspond to the respective device.

0:	device is *not* present
1:	device is present

Issue date: 7.6.2013

byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	7	6	5	4	3	2	1	0
2	15	14	13	12	11	10	9	8
…	…							
32	255	254	253	252	251	250	249	248

Tab. 4-278.

Coding of states and colors

Code bit [2..0]	State or colors
0	green permanent lighting
1	green flashing
2	yellow permanent lighting
3	yellow flashing
4	red permanent lighting
5	red flashing
6	grey or off
7	nicht vorhanden
bit 3	0: device is *not* available in this release circuit 1: device is available in this release circuit

Tab. 4-279.

Issue date: 7.6.2013

4.9.5.4 Device colors OSSD 1 with device index assignment - Vendor Specific Object 4

This object contains the device colors and additional information about the OSSDs together with the device index assignment from the configuration.

byte	meaning
1	bit 0 0=configuration operation, 1=protective operation bit 3 ... 1 reserved, 0 bit 4 state 1.Y1, EDM1 (0=open) bit 5 state 1.Y2, Start1 (0=open) bit 6 state 2.Y1, EDM2 (0=open) bit 7 state 2.Y2, Start2 (0=open)
2	relay-state output 1+2 bit 3 … 0 State output 1 bit 7 … 4 State output 2
3 …8	…
9	relay-state output 15+16 bit 3 … 0 state output 15 bit 7 … 4 state output 16
10	coding of the bit fields for existing devices. Device 7 … 0
11 … 40	…
41	coding of the bit fields for existing devices. Device 248 … 255
42	colors device 1+2 bit 3 … 0 colors device 1 bit 7 … 4 colors device 2
43...168	...
169	device 255+256 bit 3 … 0 colors device 255 bit 7 … 4 colors device 256

Tab. 4-280.

Coding of the bit fields for existing devices:

These numbers indicate the position of the bits that correspond to the respective device.

0:	device is *not* present
1:	device is present

byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	7	6	5	4	3	2	1	0
2	15	14	13	12	11	10	9	8
…	…							
32	255	254	253	252	251	250	249	248

Tab. 4-281.

Coding of states and colors:

Code bit [2..0]	State or colors
0	green permanent lighting
1	green flashing
2	yellow permanent lighting
3	yellow flashing
4	red permanent lighting
5	red flashing
6	grey or aus
7	green/yellow
bit 3	0: device is *not* available in this release circuit 1: device is available in this release circuit

Tab. 4-282.

4.9.5.5 Device colors at switch off OSSD 1 - Vendor Specific Object 5

This object contains colors for all devices and additional information about all release circuits at the time of the most recent switch-off of release circuit 1. Additionally, information identifying all devices assigned to release circuit 1 is transferred.

byte	meaning
1	bit 0 0=configuration operation, 1=protective operation bit 3 … 1 reserved, 0 bit 4 state 1.Y1, EDM1 (0=open) bit 5 state 1.Y2, Start1 (0=open) bit 6 state 2.Y1, EDM2 (0=open) bit 7 state 2.Y2, Start2 (0=open)
2	relay-state output 1+2 bit 3 … 0 State output 1 bit 7 … 4 State output 2
3 … 8	…
9	relay-state output 15+16 bit 3 … 0 State output 15 bit 7 … 4 State output 16
10	coding of the bit fields for existing devices. Device 7 … 0
11 … 40	…
41	coding of the bit fields for existing devices. Device 248 … 255
42	Bit-field for devices that changed during the last step. Device 7 … 0
43 …72	…
73	Bit-field for devices that changed during the last step. Device 248 … 255
74	colors device 1+2 bit 3 … 0 colors device 1 bit 7 … 4 colors device 2
75 … 200	…
201	device 255+256 bit 3 … 0 colors device 255 bit 7 … 4 colors device 256

Tab. 4-283.

Bit-field for devices that changed during the last step.

These numbers indicate the position of the bits that correspond to a respective device:

0:	device *not* changed during the last step
1:	device changed during the last step

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byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	7	6	5	4	3	2	1	0
2	15	14	13	12	11	10	9	8
…	…							
32	255	254	253	252	251	250	249	248

Tab. 4-284.

Coding of the bit fields for existing devices:

These numbers indicate the position of the bits that correspond to the respective device.

0:	device is *not* present
1:	device is present

byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	7	6	5	4	3	2	1	0
2	15	14	13	12	11	10	9	8
…	…							
32	255	254	253	252	251	250	249	248

Tab. 4-285.

Coding of states and colors:

Code bit [2..0]	State or colors
0	green permanent lighting
1	green flashing
2	yellow permanent lighting
3	yellow flashing
4	red permanent lighting
5	red flashing
6	grey or off
7	green/yellow
bit 3	0: device is *not* available in this release circuit 1: device is available in this release circuit

Tab. 4-286.

4.9.5.6 Device colors at switch off OSSD 1 with device index-assignment - Vendor Specific Object 6

This object contains colors for all devices and additional information about all release circuits at the time of the most recent switch-off of release circuit 1, sorted by the diagnostics index. Additionally, information identifying all devices assigned to release circuit 1 is transferred.

byte	meaning
1	bit 0 0=configuration operation, 1=protective operation bit 3 … 1 reserved, 0 bit 4 state 1.Y1, EDM1 (0=open) bit 5 state 1.Y2, Start1 (0=open) bit 6 state 2.Y1, EDM2 (0=open) bit 7 state 2.Y2, Start2 (0=open)
2	relay-state output 1+2 bit 3 … 0 State output 1 bit 7 … 4 State output 2
3 … 8	…
9	relay-state output 15+16 bit 3 … 0 state output 15 bit 7 … 4 state output 16
10	coding of the bit fields for existing devices. Device 7 … 0
11 … 40	…
41	coding of the bit fields for existing devices. Device 248 … 255
42	Bit-field for devices that changed during the last step. Device 7 … 0
43 … 72	…
73	bit-field for devices, die sich im letzten Schritt geändert haben. device 248 … 255
74	colors device 1+2 bit 3 … 0 colors device 1 bit 7 … 4 colors device 2
75 … 200	…
201	device 255+256 bit 3 … 0 colors device 255 bit 7 … 4 colors device 256

Tab. 4-287.

Bit-field for devices that changed during the last step.

These numbers indicate the position of the bits that correspond to a respective device:

0:	device *not* changed during the last step
1:	device changed during the last step

byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	7	6	5	4	3	2	1	0
2	15	14	13	12	11	10	9	8
…	…							
32	255	254	253	252	251	250	249	248

Tab. 4-288.

Coding of the bit fields for existing devices:

These numbers indicate the position of the bits that correspond to the respective device.

0:	device is *not* present
1:	device is present

byte	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	7	6	5	4	3	2	1	0
2	15	14	13	12	11	10	9	8
…	…							
32	255	254	253	252	251	250	249	248

Tab. 4-289.

4.9.5.7 Vendor-Specific Object 7 … 70

The objects 7 … 70 correspond to the objects 3 … 6, but refer to the following release circuits. The table displays the associations.

OSSD	Device Colors	Device colors with device index	Device colors at switch off	Device colors with device index assignment
Vorverarb.	object 3	object 4	-	-
1	object 7	object 8	object 9	object 10
2	object 11	object 12	object 13	object 14
3	object 15	object 16	object 17	object 18
4	object 19	object 20	object 21	object 22
5	object 23	object 24	object 25	object 26
6	object 27	object 28	object 29	object 30
7	object 31	object 32	object 33	object 34
8	object 35	object 36	object 37	object 38
9	object 39	object 40	object 41	object 42
10	object 43	object 44	object 45	object 46
11	object 47	object 48	object 49	object 50
12	object 51	object 52	object 53	object 54
13	object 55	object 56	object 57	object 58
14	object 59	object 60	object 61	object 62
15	object 63	object 64	object 65	object 66
16	object 67	object 68	object 69	object 70

Tab. 4-290.

Issue date: 7.6.2013

5. Command Interface Examples

5.1 Reading 16-bit input values

This example describes the command (RD_7X_IN) for reading of four 16-bit input channels of an AS-i input slave acc. to 16-bit slave profile.

Prozessing as cyclic DP/V0 data exchange:

Used ID/module in the GSD file: 12-byte management.

Meaning of the bytes:

request: RD_7X_IN	
byte 1	50_{hex} (RD_7X_IN)
byte 2	00_{hex} (master 1, single master)
byte 3	$1D_{hex}$ (slave address 29)
byte 4	00_{hex}
…	…
byte 12	00_{hex}

Tab. 5-291.

Response	
byte 1	00_{hex} (or old values)
byte 2	00_{hex} (or old values)
byte 3	00_{hex} (or old values)
byte 4	00_{hex} (or old values)
…	…
byte 12	00_{hex} (or old values)

Tab. 5-292.

The call of the command interaface has not been answered with the valid values since the toggle bit has not been set.

Set of toggle bit:

request	
byte 1	50_{hex}
byte 2	80_{hex} (toggle bit, result)
byte 3	$1D_{hex}$ (slave address 29)
byte 4	00_{hex}
…	…
byte 12	00_{hex}

Tab. 5-293.

Result: See chap. <Commands of the Command Interface>.

Response	
byte 1	50_{hex}
byte 2	80_{hex} (toggle bit, master1)
byte 3	16-bit channel 1 high $byte_{hex}$
byte 4	16-bit channel 1 low $byte_{hex}$
byte 5	16-bit channel 2 high $byte_{hex}$
byte 6	16-bit channel 2 low $byte_{hex}$
byte 7	16-bit channel 3 high $byte_{hex}$
byte 8	16-bit channel 3 low $byte_{hex}$
byte 9	16-bit channel 4 high $byte_{hex}$
byte 10	16-bit channel 4 low $byte_{hex}$
byte 11	00_{hex} not used
byte 12	00_{hex} not used

Tab. 5-294.

To get the input data again, the T-bit has to be reset again. If a command of the command interface with DP/V1 is being carried out, setting the toggle bit is not necessary.

5.2 Store current configuration to the AS-i master

1. Switch master to configuration mode.
2. Write the current slave configuration to the master.
3. Switch master to protected mode.
4. Wait until master is in normal (protected) operation mode.

12-byte management

1. Switch master to config mode.

request: SET_OP_MODE	
byte 1	$0C_{hex}$ (SET_OP_MODE)
byte 2	00_{hex} (T = 0, master 1, single master)
byte 3	01_{hex} (= config mode)
byte 4	00_{hex}
…	…
byte 12	00_{hex}

Tab. 5-295.

Response	
byte 1	00_{hex} (or old values)
byte 2	00_{hex} (or old values)
…	…
byte 12	00_{hex} (or old values)

Tab. 5-296.

No result because toggle bit = 0.

Set the toggle bit:

request: SET_OP_MODE	
byte 1	$0C_{hex}$ (SET_OP_MODE)
byte 2	80_{hex} (T = 1, master 1, single master)
byte 3	01_{hex} (= config mode)
byte 4	00_{hex}
…	…
byte 12	00_{hex}

Tab. 5-297.

Response	
byte 1	$0C_{hex}$
byte 2	80_{hex} (T = 1, result = 0)
byte 3	00_{hex} (or old values)
…	…
byte 12	00_{hex} (or old values)

Tab. 5-298.

Master is now in configuration mode.

Result = 0 ⇒ No error, for other result codes see chap. <Commands of the Command Interface>.

2. Write the actual slave configuration to the master.

request: STORE_CDI	
byte 1	07_{hex} (STORE_CDI)
byte 2	00_{hex} (T = 0, master 1, single master)
byte 3	00_{hex}
…	…
byte 12	00_{hex}

Tab. 5-299.

Response	
byte 1	00_{hex} (or old values)
byte 2	00_{hex} (or old values)
…	…
byte 12	00_{hex} (or old values)

Tab. 5-300.

No result because toggle bit = 0.

Set the toggle bit:

request: STORE_CDI	
byte 1	07_{hex} (STORE_CDI)
byte 2	80_{hex} (T = 0, master 1, single master)
byte 3	00_{hex}
…	…
byte 12	00_{hex}

Tab. 5-301.

Response	
byte 1	00_{hex}
byte 2	80_{hex} (T = 1, result = 0)
byte 3	00_{hex} (or old values)
…	…
byte 12	00_{hex} (or old values)

Tab. 5-302.

The current configuration data has been written.

3. Set master to protected mode.

request: SET_OP_MODE	
byte 1	$0C_{hex}$ (SET_OP_MODE)
byte 2	00_{hex} (T = 0, master 1, single master)
byte 3	00_{hex} (= protected mode)
byte 4	00_{hex}
…	…
byte 12	00_{hex}

Tab. 5-303.

Response	
byte 1	00_{hex} (or old values)
byte 2	00_{hex} (or old values)
…	…
byte 12	00_{hex} (or old values)

Tab. 5-304.

No result because toggle bit = 0.

Set the toggle bit:

request: SET_OP_MODE	
byte 1	$0C_{hex}$ (SET_OP_MODE)
byte 2	80_{hex} (T = 1, master 1, single master)
byte 3	00_{hex} (= protected mode)
byte 4	00_{hex}
…	…
byte 12	00_{hex}

Tab. 5-305.

Response	
byte 1	$0C_{hex}$
byte 2	80_{hex} (T = 1, result = 0)
byte 3	00_{hex} (or old values)
…	…
byte 12	00_{hex} (or old values)

Tab. 5-306.

The master has now been ordered to switch to the protected mode. It must be maintained now until the master changes into the operation mode.

4. Wait until master is in normal operation mode (and protected mode).

Reading out the flags until NA (Normal Operation Active) has been set.

request: GET_FLAGS	
byte 1	47_{hex} (GET_FLAGS)
byte 2	00_{hex} (T = 0, master 1, single master)
byte 3	00_{hex}
…	…
byte 12	00_{hex}

Tab. 5-307.

Response	
byte 1	00_{hex} (or old values)
byte 2	00_{hex} (or old values)
…	…
byte 12	00_{hex} (or old values)

Tab. 5-308.

No result because toggle bit = 0.

Setting the toggle bit:

request: GET_FLAGS	
byte 1	47_{hex} (GET_FLAGS)
byte 2	00_{hex} (T = 0, master 1, single master)
byte 3	00_{hex}
byte 4	00_{hex}
…	…
byte 12	00_{hex}

Tab. 5-309.

response								
byte 1	47_{hex}							
byte 2	80_{hex} (T = 1, result = 0)							
byte 3	-	-	-	-	-	-	-	POK
byte 4	OR	APF	NA	CA	AAv	AAs	S0	COK
byte 5						AAe	OL	DX
byte 6	00_{hex}							
…								
byte 12	00_{hex}							

Tab. 5-310.

The flag NA has to be set before the application is started. In case it is not set, the flags have to be read out until this flag has been set to 1.

The flag NA indicates that the master is in normal operation mode.

Normal operation mode is necessary to run the application safely.

5.3 Store new configuration for all slaves

1. Switch master in configuration mode.
2. Write slave configuration to master.
3. Write new list of projected slaves (*LPS*).
4. Write permanent parameter (*PP*) to master.
5. Switch master to protected mode.
6. Wait until master is in normal operation Mode (and protected mode).

12-byte management

1. Set master in config mode.

request: SET_OP_MODE	
byte 1	$0C_{hex}$ (SET_OP_MODE)
byte 2	00_{hex} (T = 0, master 1, single master)
byte 3	01_{hex} (= config mode)
byte 4	00_{hex}
…	…
byte 12	00_{hex}

Tab. 5-311.

response	
byte 1	00_{hex} (or old values)
byte 2	00_{hex} (or old values)
byte 3	00_{hex} (or old values)
byte 4	00_{hex} (or old values)
…	…
byte 12	00_{hex} (or old values)

Tab. 5-312.

No result because toggle bit = 0.

Set the toggle bit:

request: SET_OP_MODE	
byte 1	$0C_{hex}$ (SET_OP_MODE)
byte 2	80_{hex} (T = 1, master 1, single master)
byte 3	01_{hex} (= config mode)
byte 4	00_{hex}
…	…
byte 12	00_{hex}

Tab. 5-313.

Issue date: 7.6.2013

response	
byte 1	$0C_{hex}$
byte 2	80_{hex} (T = 1, result = 0)
byte 3	00_{hex} (or old values)
byte 4	00_{hex} (or old values)
…	…
byte 12	00_{hex} (or old values)

Tab. 5-314.

The master is now in configuration mode.

Result: See chap. <Commands of the Command Interface>.

2. Write single configuration to master.

Writing a configuration of an AS-i slave to the master.

For example:

16 bit input 4 CH at address 4 (Slave data sheet)
ID: 3_{hex}
ID2: E_{hex}
IO: 7_{hex}
ID1: F_{hex}

request: SET_PCD	
byte 1	25_{hex} (SET_PCD)
byte 2	00_{hex} (T = 0, master 1, single master)
byte 3	04_{hex} (slave address to write to master)
byte 4	EF_{hex} (ID + IO to configurate)
byte 5	37_{hex} (xID2 + xID1 to configurate)
byte 6	00_{hex}
…	…
byte 12	00_{hex}

Tab. 5-315.

response	
byte 1	00_{hex} (or old values)
byte 2	00_{hex} (or old values)
byte 3	00_{hex} (or old values)
byte 4	00_{hex} (or old values)
…	…
byte 12	00_{hex} (or old values)

Tab. 5-316.

Issue date: 7.6.2013

No result because toggle bit = 0.

Set the toggle bit:

request: SET_PCD	
byte 1	$0C_{hex}$ (SET_PCD)
byte 2	80_{hex} (T = 1, master 1, single master)
byte 3	04_{hex} (slave address to write to master)
byte 4	EF_{hex} (ID + IO to configurate)
byte 5	37_{hex} (ID + IO to configurate)
byte 6	00_{hex}
…	…
byte 12	00_{hex}

Tab. 5-317.

response	
byte 1	25_{hex}
byte 2	80_{hex} (T = 1, result = 0)
byte 3	00_{hex} (or old values)
byte 4	00_{hex} (or old values)
…	…
byte 12	00_{hex} (or old values)

Tab. 5-318.

The single slave configuration for the 16-bit module is written.

This command must be repeated for all 31 A-slaves and all 31 B-slaves. If you don't connect a slave to an address, write F_{hex} for ID, IO, ID1, ID2.

3. Write new list of projected slaves.

Write the complete LPS of your AS-i circuit.

Every bit in the LPS corresponds to one slave after the following scheme:

byte0/Bit 0: slave 0/0A - can not be set!
byte1/Bit 1: slave 1/1A
...
byte3/Bit 7: slave 31/31A
byte4/Bit 0: slave 0B - can not be set!
byte4/Bit 1: slave 1B
...
byte7/Bit 7: slave 31B
The slave is projected if the bit is set.

Example above:16-bit module at address 4 ⇒ Set bit 4/byte 0:

request: SET_LPS	
byte 1	29_{hex} (SET_LPS)
byte 2	00_{hex} (T = 0, master 1, single master)
byte 3	00_{hex}
byte 4	10_{hex} (LDS byte 0)
byte 5	00_{hex} (LDS byte 1)
…	…
byte 11	00_{hex} (LDS byte 7)
byte 12	00_{hex}

Tab. 5-319.

response	
byte 1	00_{hex} (or old values)
byte 2	00_{hex} (or old values)
…	…
byte 12	00_{hex} (or old values)

Tab. 5-320.

No result because toggle bit = 0.

Setting the toggle bit:

request: SET_LPS	
byte 1	29_{hex}
byte 2	80_{hex} (T = 1, master 1, single master)
byte 3	00_{hex}
byte 4	10_{hex} (LDS byte 0)
byte 5	00_{hex} (LDS byte 1)
…	…
byte 11	00_{hex} (LDS byte 7)
byte 12	00_{hex}

Tab. 5-321.

response	
byte 1	29_{hex}
byte 2	80_{hex} (T = 1, result = 0)
byte 3	00_{hex} (or old values)
…	…
byte 12	00_{hex} (or old values)

Tab. 5-322.

The new list of protected slaves (LPS) is written.

4. Write permanent parameter (power on parameter) to master.

Example as above:16 bit module at address 4 with PP = 07_{hex}

request: SET_PP	
byte 1	43_{hex} (SET_PP)
byte 2	00_{hex} (T = 0, master 1, single master)
byte 3	04_{hex} (slave address to write to master)
byte 4	07_{hex} (PP to write (use low nibble))
byte 5	00_{hex} (LDS byte 1)
…	…
byte 12	00_{hex}

Tab. 5-323.

response	
byte 1	00_{hex} (or old values)
byte 2	00_{hex} (or old values)
…	…
byte 12	00_{hex} (or old values)

Tab. 5-324.

No result because toggle bit = 0.

Setting the toggle bit:

request: SET_PP	
byte 1	43_{hex} (SET_PP)
byte 2	80_{hex} (T = 0, master 1, single master)
byte 3	04_{hex} (slave address to write to master)
byte 4	07_{hex} (PP to write (use low nibble)
byte 5	00_{hex}
…	…
byte 12	00_{hex}

Tab. 5-325.

response	
byte 1	43_{hex}
byte 2	80_{hex} (T = 1, Result = 0)
byte 3	00_{hex}
…	…
byte 12	00_{hex}

Tab. 5-326.

The permanent parameter for the 16 bit module is written.

This command must be repeated for all 31 A-slaves and all 31 B-slaves. If you don't connect a slave to an address, write the default value to the master (F_{hex}) as a permanent parameter.

5. Switch Master to Protected Mode.

request: SET_OP_MODE	
byte 1	$0C_{hex}$ (SET_OP_MODE)
byte 2	00_{hex} (T = 0, master 1, single master)
byte 3	00_{hex} (= protected mode)
byte 4	00_{hex}
…	…
byte 12	00_{hex}

Tab. 5-327.

response	
byte 1	00_{hex} (or old values)
byte 2	00_{hex} (or old values)
…	…
byte 12	00_{hex} (or old values)

Tab. 5-328.

No result because toggle bit = 0.

Setting the toggle bit:

request: SET_OP_MODE	
byte 1	$0C_{hex}$ (SET_OP_MODE)
byte 2	80_{hex} (T = 1, master 1, single master)
byte 3	00_{hex} (= protected mode)
byte 4	00_{hex}
…	…
byte 12	00_{hex}

Tab. 5-329.

response	
byte 1	$0C_{hex}$
byte 2	80_{hex} (T = 1, result = 0)
byte 3	00_{hex} (or old values)
…	…
byte 12	00_{hex} (or old values)

Tab. 5-330.

The master has now been ordered to switch to protected mode.

6. Wait until master is in normal (protected) operation mode.

Read out the flags, until the NA (Normal Operation Active) has been set.

request: GET_FLAGS	
byte 1	47_{hex} (GET_FLAGS)
byte 2	00_{hex} (T = 0, master 1, single master)
byte 3	00_{hex}
…	…
byte 12	00_{hex}

Tab. 5-331.

response	
byte 1	00_{hex} (or old values)
byte 2	00_{hex} (or old values)
…	…
byte 12	00_{hex} (or old values)

Tab. 5-332.

No result because toggle bit = 0.

Setting the toggle bit:

request: GET_FLAGS	
byte 1	47_{hex} (GET_FLAGS)
byte 2	00_{hex} (T = 0, master 1, single master)
byte 3	00_{hex}
byte 4	00_{hex}
…	…
byte 12	00_{hex}

Tab. 5-333.

response								
byte 1	47_{hex}							
byte 2	80_{hex} (T = 1, result = 0)							
byte 3	-	-	-	-	-	-	-	POK
byte 4	OR	APF	NA	CA	AAv	AAs	S0	COK
byte 5						AAe	OL	DX
byte 6	00_{hex}							
…								
byte 12	00_{hex}							

Tab. 5-334.

The flag NA has to be set before the application is started. In case it is not set, the flags have to be read out until this flag has been set to 1.

The flag NA indicates that the master is in normal operation mode.

Normal operation mode is necessary to run the application safely.

The flag NA indicates that the master is in the normal operating mode which is necessary for the application to run safely.

5.4 Example for the readout of the safety monitor with ACYC_TRANS

5.4.1 Example for monitors with 2 release circuits

Command interface length = 2+36

1. Start request:

request	
byte 1	0x4E (WR_ACYC_TRANS)
byte 2	0x80 (master 1)
byte 3	0x00 (integrated safety monitor)
byte 4	0x00 (puffer index high)
byte 5	0x00 (puffer index low)
byte 6	0x0A (safety monitor diagnostics)
byte 7	0x00 (number of bytes to send)

Tab. 5-335.

response	
byte 1	0x4E (WR_ACYC_TRANS)
byte 2	0x80 (OK)

Tab. 5-336.

2. Poll for the response (busy):

request	
byte 1	0x4F (RD_ACYC_TRANS)
byte 2	0x00 (master 1)
byte 3	0x00 (integrated safety monitor)
byte 4	0x00 (puffer index high)
byte 5	0x00 (puffer index low)

Tab. 5-337.

response	
byte 1	0x4F (RD_ACYC_TRANS)
byte 2	0x00 (OK)
byte 3	0xFF (busy -> refresh)

Tab. 5-338.

3. Read response (data part 1):

request	
byte 1	0x4F (RD_ACYC_TRANS)
byte 2	0x80 (master 1)
byte 3	0x00 (integrated safety monitor)
byte 4	0x00 (puffer index high)
byte 5	0x00 (puffer index low)

Tab. 5-339.

response	
byte 1	0x4F (RD_ACYC_TRANS)
byte 2	0x80 (OK)
byte 3	0x0A (safety monitor diagnostics)
byte 4	0x01 (length of the response buffer *high*)
byte 5	0x06 (length of the response buffer *low*) 262
byte 6	0x00 (fixed)
byte 7	state of monitor
byte 8	state of OSSD1
byte 9	state of OSSD2
byte 10	number of devices "not-green"
byte 11	reserved
byte 12	0x20 (device index 32)
byte 13	device color 32
byte 14	0x21 (device index 33)
byte 15	device color 33
...	
byte 36	0x2C (device index 44)
byte 37	device color 44
byte 38	0x2D (device index 45)

Tab. 5-340.

4. Read response (data part 2):

request	
byte 1	0x4F (RD_ACYC_TRANS)
byte 2	0x00 (master 1)
byte 3	0x00 (integrated safety monitor)
byte 4	0x00 (puffer index high)
byte 5	0x24 (puffer index low) 36

Tab. 5-341.

response	
byte 1	0x4F (RD_ACYC_TRANS)
byte 2	0x00 (OK)
byte 3	device color 45
byte 4	0x2E (device index 46)
byte 5	device color 46
...	
byte 36	0x3E (device index 62)
byte 37	device color 62
byte 38	0x3F (device index 63)

Tab. 5-342.

5. Read response (data part 3):

request	
byte 1	0x4F (RD_ACYC_TRANS)
byte 2	0x80 (master 1)
byte 3	0x00 (integrated safety monitor)
byte 4	0x00 (puffer index high)
byte 5	0x48 (puffer index low) 72

Tab. 5-343.

response	
byte 1	0x4F (RD_ACYC_TRANS)
byte 2	0x80 (OK)
byte 3	device color 63
byte 4	0x40 (device index 64)
byte 5	device color 64
...	
byte 36	0x50 (device index 80)
byte 37	device color 80
byte 38	0x51 (device index 81)

Tab. 5-344.

6. Read response (data part 4):

request	
byte 1	0x4F (RD_ACYC_TRANS)
byte 2	0x00 (master 1)
byte 3	0x00 (integrated safety monitor)
byte 4	0x00 (puffer index high)
byte 5	0x6C (puffer index low) 108

Tab. 5-345.

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response	
byte 1	0x4F (RD_ACYC_TRANS)
byte 2	0x00 (OK)
byte 3	device color 81
byte 4	0x52 (device index 82)
byte 5	device color 82
...	
byte 30	0x5F (device index 95)
byte 31	device color 95
byte 32	0x20 (device index 32)
byte 33	device alocation 32
byte 34	0x21 (device index 33)
byte 35	device alocation 33
byte 36	0x22 (device index 34)
byte 37	device alocation 34
byte 38	0x23 (device index 35)

Tab. 5-346.

7. Read response (data part 5):

request	
byte 1	0x4F (RD_ACYC_TRANS)
byte 2	0x80 (master 1)
byte 3	0x00 (integrated safety monitor)
byte 4	0x00 (puffer index high)
byte 5	0x90 (puffer index low) 144

Tab. 5-347.

response	
byte 1	0x4F (RD_ACYC_TRANS)
byte 2	0x80 (OK)
byte 3	device alocation 35
byte 4	0x24 (device index 36)
byte 5	device alocation 36
...	
byte 36	0x34 (device index 52)
byte 37	device alocation 52
byte 38	0x35 (device index 53)

Tab. 5-348.

8. Read response (data part 6):

request	
byte 1	0x4F (RD_ACYC_TRANS)
byte 2	0x00 (master 1)
byte 3	0x00 (integrated safety monitor)
byte 4	0x00 (puffer index high)
byte 5	0xB4 (puffer index low) 180

Tab. 5-349.

response	
byte 1	0x4F (RD_ACYC_TRANS)
byte 2	0x00 (OK)
byte 3	device alocation 53
byte 4	0x36 (device index 54)
byte 5	device alocation 54
...	
byte 36	0x46 (device index 70)
byte 37	device alocation 70
byte 38	0x47 (device index 71)

Tab. 5-350.

9. read response (data part 7):

request	
byte 1	0x4F (RD_ACYC_TRANS)
byte 2	0x80 (master 1)
byte 3	0x00 (integrated safety monitor)
byte 4	0x00 (puffer index high)
byte 5	0xD8 (puffer index low) 216

Tab. 5-351.

response	
byte 1	0x4F (RD_ACYC_TRANS)
byte 2	0x80 (OK)
byte 3	device alocation 71
byte 4	0x48 (device index 72)
byte 5	device alocation 72
...	
byte 36	0x58 (device index 88)
byte 37	device alocation 88
byte 38	0x59 (device index 89)

Tab. 5-352.

10. Read response (data part 8):

request	
byte 1	0x4F (RD_ACYC_TRANS)
byte 2	0x00 (master 1)
byte 3	0x00 (integrated safety monitor)
byte 4	0x00 (puffer index high)
byte 5	0xFC (puffer index low) 252

Tab. 5-353.

response	
byte 1	0x4F (RD_ACYC_TRANS)
byte 2	0x00 (OK)
byte 3	device alocation 89
byte 4	0x5A (device index 90)
byte 5	device alocation 90
byte 6	0x5B (device index 91)
byte 7	device alocation 91
byte 8	0x5C device index 92)
byte 9	device alocation 92
byte 10	0x5D (device index 93)
byte 11	device alocation 93
byte 12	0x5E (device index 94)
byte 13	device alocation 94
byte 14	0x5F (device index 95)
byte 15	device alocation 95

Tab. 5-354.

5.4.2 Example for internal monitors with 16 OSSDs

Command interface length = 36 bytes.

1. Start request:

request	
byte 1	0x4E (WR_ACYC_TRANS)
byte 2	0x80 (master 1)
byte 3	0x00 (integrated safety monitor)
byte 4	0x00 (buffer index high)
byte 5	0x00 (buffer index low)
byte 6	0x0E (safety monitor diagnostics)
byte 7	0x03 (number of bytes to send)
byte 8	0x00 (actual diagnosis)[1]
byte 9	0x01 (release ciruit 1)[1]
byte 10	0x00 (complete diagnosis)[1]

Tab. 5-355.

1. See also chap. <Command 14: Read "Safety monitor diagnostic">.

response	
byte 1	0x4E (WR_ACYC_TRANS)
byte 2	0x80 (OK)

Tab. 5-356.

2. Poll for the response (busy):

request	
byte 1	0x4F (RD_ACYC_TRANS)
byte 2	0x00 (master 1)
byte 3	0x00 (integrated safety monitor)
byte 4	0x00 (buffer index high)
byte 5	0x00 (buffer index low)

Tab. 5-357.

response	
byte 1	0x4F (RD_ACYC_TRANS)
byte 2	0x00 (OK)
byte 3	0xFF (busy -> refresh)

Tab. 5-358.

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3. Read response (data part 1).

request	
byte 1	0x4F (RD_ACYC_TRANS)
byte 2	0x00 (master 1)
byte 3	0x00 (integrated safety monitor)
byte 4	0x00 (buffer index high)
byte 5	0x00 (buffer index low)

Tab. 5-359.

response	
byte 1	0x4F (RD_ACYC_TRANS)
byte 2	0x00 (OK)
byte 3	0x0E (diagnosis/shutdown-historie)
byte 4	0x01 (length byte n high)[1]
byte 5	0x06 (lentgth byte n low)[1]
byte 6	0x00
byte 7	state of monitor[2]
byte 8	release circuit type[2]
byte 9	release circuit info[2]
byte 10	state of release circuit[2]
byte 11	device color 0
byte 12	device color 1
...	...
byte 36	device color 25

Tab. 5-360.

1. See also chap. <Structure of the response buffer>.
2. See also chap. <Command 14: Read "Safety monitor diagnostic">.

4. Read response (data part 2):

request	
byte 1	0x4F (RD_ACYC_TRANS)
byte 2	0x80 (master 1)
byte 3	0x00 (integrated safety monitor)
byte 4	0x00 (buffer index high)
byte 5	0x22 (buffer index low)

Tab. 5-361.

response	
byte 1	0x4F (RD_ACYC_TRANS)
byte 2	0x80 (OK)
byte 3	device color 26

Tab. 5-362.

response	
byte 4	device color 27
byte 5	device color 28
...	
byte 36	device color 59

Tab. 5-362.

5. Read response (data part 3):

request	
byte 1	0x4F (RD_ACYC_TRANS)
byte 2	0x00 (master 1)
byte 3	0x00 (integrated safety monitor)
byte 4	0x00 (buffer index high)
byte 5	0x44 (buffer index low)

Tab. 5-363.

response	
byte 1	0x4F (RD_ACYC_TRANS)
byte 2	0x00 (OK)
byte 3	device color 60
byte 4	device color 61
byte 5	device color 62
...	
byte 36	device color 93

Tab. 5-364.

6. Read response (data part 4):

request	
byte 1	0x4F (RD_ACYC_TRANS)
byte 2	0x80 (master 1)
byte 3	0x00 (integrated safety monitor)
byte 4	0x00 (buffer index high)
byte 5	0x66 (buffer index low)

Tab. 5-365.

response	
byte 1	0x4F (RD_ACYC_TRANS)
byte 2	0x80 (OK)
byte 3	device color 94
byte 4	device color 95
byte 5	device color 96

Tab. 5-366.

response	
...	
byte 36	device color 127

Tab. 5-366.

7. Read response (data part 5):

request	
byte 1	0x4F (RD_ACYC_TRANS)
byte 2	0x00 (master 1)
byte 3	0x00 (integrated safety monitor)
byte 4	0x00 (buffer index high)
byte 5	0x88 (buffer index low)

Tab. 5-367.

response	
byte 1	0x4F (RD_ACYC_TRANS)
byte 2	0x00 (OK)
byte 3	device color 128
byte 4	device color 129
byte 5	device color 130
...	
byte 36	device color 161

Tab. 5-368.

8. Read response (data part 6):

request	
byte 1	0x4F (RD_ACYC_TRANS)
byte 2	0x080 (master 1)
byte 3	0x00 (integrated safety monitor)
byte 4	0x00 (buffer index high)
byte 5	0xAA (buffer index low)

Tab. 5-369.

response	
byte 1	0x4F (RD_ACYC_TRANS)
byte 2	0x80 (OK)
byte 3	device color 162
byte 4	device color 163
byte 5	device color 164
...	
byte 36	device color 195

Tab. 5-370.

9. Read response (data part 7):

request	
byte 1	0x4F (RD_ACYC_TRANS)
byte 2	0x00 (master 1)
byte 3	0x00 (integrated safety monitor)
byte 4	0x00 (buffer index high)
byte 5	0xCC (buffer index low)

Tab. 5-371.

response	
byte 1	0x4F (RD_ACYC_TRANS)
byte 2	0x00 (OK)
byte 3	device color 196
byte 4	device color 197
byte 5	device color 198
...	
byte 36	device color 229

Tab. 5-372.

10. Read response (data part 8):

request	
byte 1	0x4F (RD_ACYC_TRANS)
byte 2	0x80 (master 1)
byte 3	0x00 (integrated safety monitor)
byte 4	0x00 (buffer index high)
byte 5	0x44 (buffer index low)

Tab. 5-373.

response	
byte 1	0x4F (RD_ACYC_TRANS)
byte 2	0x80 (OK)
byte 3	device color 230
byte 4	device color 231
byte 5	device color 232
...	
byte 28	device color 255
byte 29	0x00 (not used)
...	
byte 36	0x00 (not used)

Tab. 5-374.

5.4.3 Example for external monitors with 16 OSSDs

1. Start the request.

byte 1	0x4E (WR_ACYC_TRANS)
byte 2	0x80 (circuit1)
byte 3	Slave: 15 (safety monitor address: 21 (dec))
byte 4	0x00 (puffer index high)
byte 5	0x00 (puffer index low)
byte 6	5 (7.5.5. transfer command)
byte 7	0x03 (number)
byte 8	0x12 (command "read request")
byte 9	Vendor specific object 7 – device color
byte 10	length: 1

Tab. 5-375.

2. Poll for the response (busy).

byte 1	0x4F (READ_ACYC_TRANS)
byte 2	0x80 (circuit 1)
byte 3	Slave: 15 (safety monitor address: 21 (dec))
byte 4	0x00 (puffer index high)
byte 5	0x00 (puffer index low)
byte 6	5 (7.5.5. transfer command)
byte 7	0x03 (number)
byte 8	0x12 (command "read request")
byte 9	vendor specific object 7 – Device Farbe
byte 10	length: 1

Tab. 5-376.

3. Poll for the response (busy).

byte 1	bit 0=1 device does not exist, bit1 = 1 device deactivated
byte 2	length byte high
byte 3	length byte low
byte 4	data 0
…	…
byte n	data n-3

Tab. 5-377.

5.4.4 Example device index identifier (read identifier as plain text)

1. Start the request.

byte 1	0x4E
byte 2	0x80 (0x00, toggle bit)
byte 3	0x15 (address of ext. safety monitor , i.e. Adr. 21)
byte 4	0x00 (puffer index high)
byte 5	0x00 (puffer index low)
byte 6	0x10 (command 16 - device identifier)
byte 7	0x03 (number of following bytes)
byte 8	0x00 (device index high byte)
byte 9	0x00 (device index low byte)
byte 10	0x00 (output sorted (1) / unsorted (0)

Tab. 5-378.

2. Read the response.

byte 1	0x4F
byte 2	0x00 (0x80, toggle bit)
byte 3	0x10 (command 16 - device identifier)
byte 4	0x00 (response length high byte (n bytes identifier + 2 byte device Index))
byte 5	0x0B (response length low byte (n bytes identifier + 2 byte device Index))
byte 6	0x4E (identifier byte 1 (ASCII mark 'N'))
…	…
byte 15	0x31 (identifier byte 11 (ASCII mark '1'))
byte 16	0x00 (device index (0...255) high byte)
byte 17	0x00 (device index (0...255) low byte)

Tab. 5-379.

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