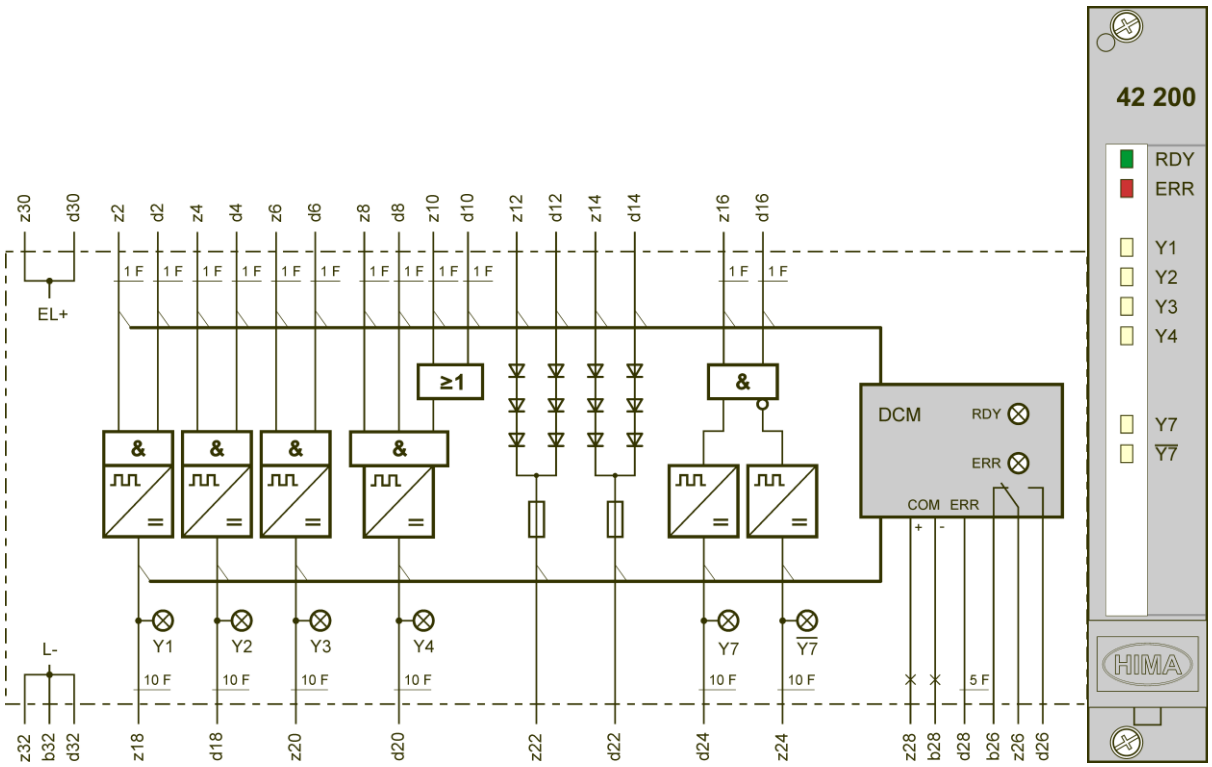
42 200: AND-OR Module

- **Safety-related**
- 4 AND functions, 2 OR functions, 1 blocking/inverting function

The module is TÜV-tested for SIL 4 in accordance with IEC 61508.



Outputs are short-circuit-proof

Figure 1: Block Diagram

All the module functions are monitored by a microcontroller.

If a malfunction occurs, the ERR LED is lit, output d28 is on 1-signal and relay contact z26-d26 opens.

Output z28-b28 is intended for connecting to the communication module, e.g., for transferring data to a distributed control system (DCS).

RDY (Ready) indicates the applied voltage (≥ 20 V).

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English translation of the German original document: HI 804 018 D, 42 200 (1516)

Fuse	0.375 A
Operating data EL+	24 VDC / 115 mA
Space requirement	3 RU, 4 HP

AND element:

▪ Switching time	Approx. 1 ms
▪ Reset time	Approx. 4 ms

Blocking element:

▪ Switching time	Y7 approx. 15 ms Ȳ7 approx. 4 ms
▪ Reset time	Y7 approx. 3 ms Ȳ7 approx. 10 ms

Diodes:

▪ Reverse voltage	≤ 1000 V
▪ Reverse current	≤ 50 mA
▪ Reverse recovery time	typ. 30 µs
▪ Peak value of threshold voltage	3 x 1 V
▪ Forward nominal current	≤ 200 mA

If the direct and the inverted signals in a safety-related controller are further processed, implementation of the blocking/inverting function is mandatory.
It is important that the direct signal after the blocking function is also received at the direct output. The internal circuit structure of the blocking function prevents a 1 signal (or overlapping signal) from being applied to the inverted and the direct output simultaneously.

1 Correct

2 Not recommended

Figure 2: Permissible Wiring

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Communication via Modbus

Reading of Variables

Type BOOL: Function code 1
Type WORD: Function code 3
Events: Function codes 65, 66, 67

Relative address	Data type	Value	Description	Relative event no.
0	WORD	46 H	Module type 42 200	
1	BOOL	0	None	
2	BOOL	1	Module removed	
3	BOOL	1	Communication with module not ok	
4	BOOL	1	Module in slot, communication ok	
5	BOOL	1	Operating voltage too low, no RDY	
6	BOOL	1	Module fault, ERR	
7…8	BOOL	0	None	
9	BOOL	1	1-signal at input z2	0
10	BOOL	1	1-signal at input d2	1
11	BOOL	1	1-signal at input z4	2
12	BOOL	1	1-signal at input d4	3
13	BOOL	1	1-signal at input z6	4
14	BOOL	1	1-signal at input d6	5
15	BOOL	1	1-signal at input z8	6
16	BOOL	1	1-signal at input d8	7
17	BOOL	1	1-signal at input z10	8
18	BOOL	1	1-signal at input d10	9
19	BOOL	1	1-signal at input z12	10
20	BOOL	1	1-signal at input d12	11
21	BOOL	1	1-signal at input z14	12
22	BOOL	1	1-signal at input d14	13
23	BOOL	1	1-signal at input z16	14
24	BOOL	1	1-signal at input d16	15
25…40	BOOL	0	None	
41	BOOL	1	1-signal at output z18 Y1	24
42	BOOL	1	1-signal at output d18 Y2	25
43	BOOL	1	1-signal at output z20 Y3	26
44	BOOL	1	1-signal at output d20 Y4	27
45	BOOL	1	1-signal at output z22	28
46	BOOL	1	1-signal at output d22	29
47	BOOL	1	1-signal at output d24 Y7	30
48	BOOL	1	1-signal at output z24 $\bar{Y}7$	31

Table 1: Module Status via Modbus

Value: 0 always has the opposite meaning
H: Hexadecimal value
Absolute address: A = p * 256 + relative address
Absolute event no.: E = (p - 1) * 32 + relative event no.
p = Slot no. in the subrack

Reading of All Variables

Function code 3, 84 WORDS

Starting with address 2000 H, 3000 H or 4000 H

	WORD 0 (16-bit)		WORD 1 (16-bit)		WORD 2 (16-bit)		WORD 3 (16-bit)	
Relative address	0	8…1	24…17	16…9	40…33	32…25		48…41
Data	Module type	Module status	None	None	None	None	None	Outputs

For error-free data transfer, all 84 WORDS must be read. This ensures that the variables of all the modules within a subrack are transferred. 0 is transferred for unused module slots.

Communication via PROFIBUS DP

Reading of Variables

Relative addresses of WORD and BYTE type

WORD	Bit	BYTE	Bit	Value	Description
0	0…7	0	0…7	46 H	Module type 42 200
	8	1	0	0	None
	9		1	1	Module removed
	10		2	1	Communication with module not ok
	11		3	1	Module in slot, communication ok
	12		4	1	Operating voltage too low, no RDY
	13		5	1	Module fault, ERR
	14		6	0	None
	15		7	0	None
1	0	2	0	1	1-signal at input z2
	1		1	1	1-signal at input d2
	2		2	1	1-signal at input z4
	3		3	1	1-signal at input d4
	4		4	1	1-signal at input z6
	5		5	1	1-signal at input d6
	6		6	1	1-signal at input z8
	7		7	1	1-signal at input d8
	8	3	0	1	1-signal at input z10
	9		1	1	1-signal at input d10
	10		2	1	1-signal at input z12
	11		3	1	1-signal at input d12
	12		4	1	1-signal at input z14
	13		5	1	1-signal at input d14
	14		6	1	1-signal at input z16
	15		7	1	1-signal at input d16
2		4…5		0	None
3	0	6	0	1	1-signal at output z18 Y1
	1		1	1	1-signal at output d18 Y2
	2		2	1	1-signal at output z20 Y3
	3		3	1	1-signal at output d20 Y4
	4		4	1	1-signal at output z22
	5		5	1	1-signal at output d22
	6		6	1	1-signal at output d24 Y7
	7		7	1	1-signal at output z24 $\bar{Y}7$
	8…15	7	0…7	0	None

Table 2: Module Status via PROFIBUS DP

Value: 0 always has the opposite meaning
H: Hexadecimal value

Absolute address WORD: W = 4 * (p - 1) + relative address

Absolute address BYTE: B = 8 * (p - 1) + relative address
p = Slot no. in the subrack