

M3120
Incremental encoder
4 x

Technical description

BECKHOFF

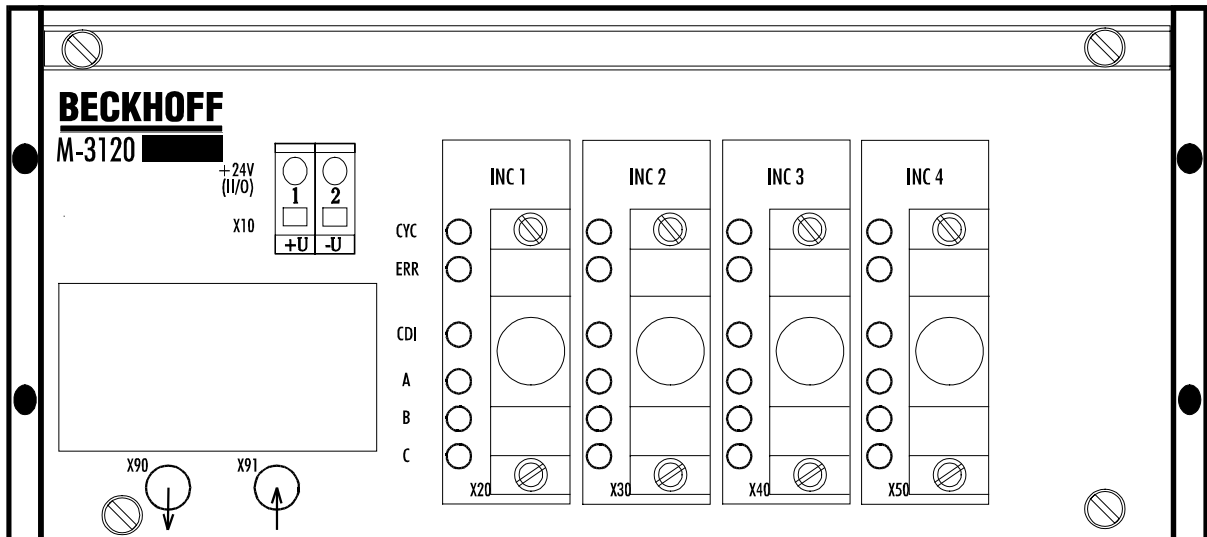
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1. Function description hardware

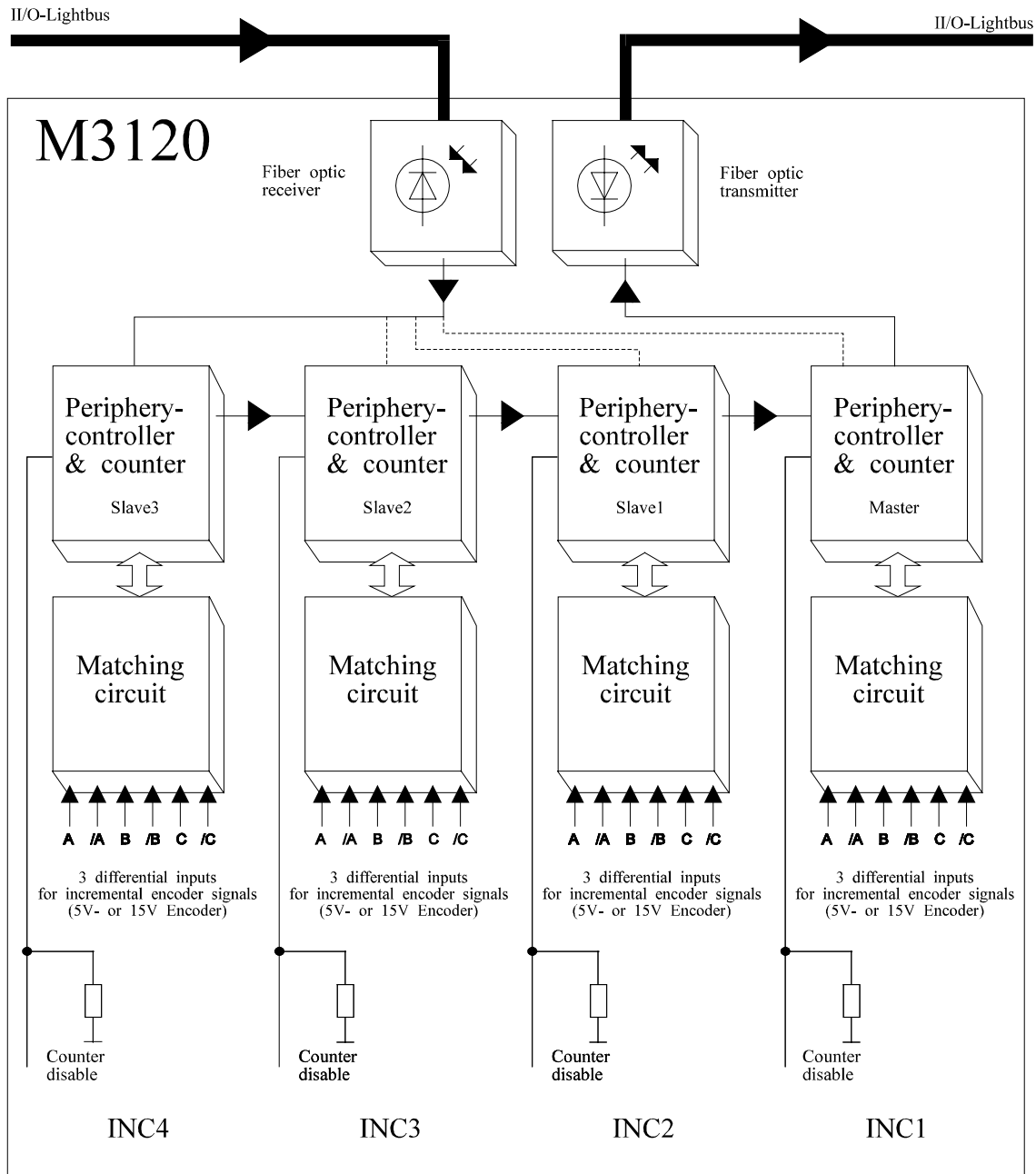


M3120

The periphery module M3120 establishes the connection of four incremental encoders for the II/O-Lightbus system. It contains three separate power supplies for logic (5V) and pick off power supply (5/15V) and the level adjustment from 15 V down to 5V. 5 V or 15 V encoder can be connected to the incremental box M3120, either with or without complementary channels.

All digital functions are integrated in four separate periphery controller (LCA circuit):

- 24 bit UP/DOWN counter with a limiting frequency of 1.25 MHz.
- Input "counter disable"
- 24 bit latch for counter position at zero impulse.
- Squareness decoder with adjustable 1, 2 or 4 times evaluation
- Selective computation of complementary signals (fewer interferences)
- Connection to the II/O-Lightbus with all functions:
 - addressing, interrupt, address counting, decrease transmission intensity, cycle and error LED
- Read, set and activate commands for counter and zero impulse register via fibre optic II/O-Lightbus



Basic circuit diagram

2. Function description software

Counter functions

- The counter commands are sent in data byte D0 to the module M3120.
- In the data byte D0 the counter status byte is received .
- the counter command byte can only be written
- the counter status byte can only be read.

Counter command byte

In order to transmit commands to the module M3120, the following bits of the counter command byte can be set and then written to the data byte D0 of an II/O-Lightbus telegram.

7	6	5	6	3	2	1	0
*	*	*	*	EL	SC	RL	RC

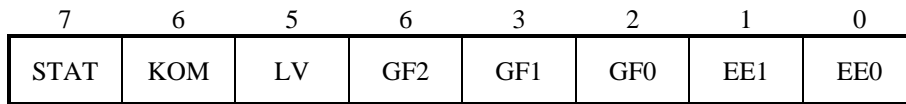
Bit	Value	Signal	Function
0	RC=1	READ COUNTER	Read 24 bit counter (D1 = LOW byte, D2 = MID byte, D3 = HIGH byte)
1	RL=1	READ LATCH	Read 24 bit zero point latch (D1 = LOW byte, D2 = MID byte, D3 = HIGH byte) The zero point value (see EL command) is only valid, if the LATCH VALID bit LV is set in the counter status byte. Only a single read command can be executed at a time. If in a command byte RC=1 and RL=1, then no value is read.
2	SC=1	SET COUNTER	Set counter The counter is only set, if $0001xxxx_b$ is the value in the control byte of the II/O telegram.
3	EL=1	ENABLE LATCH	Activate the zero point latch the counter is stored in a 24 bit register at the first zero impulse after the EL command was transmitted. Using the RL command the value can be read many times at any time, The LV bit is only deleted after the EL command was transmitted. It is only set again, if a zero point value was stored. The EL command is only executed, if $0001xxxx_b$ is the value in the control byte of the II/O telegram.

Bit	Value	Signal	Function
4	-	-	not used
5	-	-	not used
6	-	-	not used
7	-	-	not used

Rem.: The READ, SET and ENABLE commands can be transmitted in any form.

Counter status byte

After an II/O-Lightbus read operation the counter status of the M3120 points to the module in the data byte DO. The bits of the counter command byte stand for the following functions :



Bit	Signal	Function
0	EE0	Evaluation mode; must be selectet inside the D-SUB connector by bridges to GND *)
1	EE1	
2	GF0	a low pass filter is adjustable by software the low pass filter is abjustable to 1250 kHz by hardware
3	GF1	
4	GF2	
5	LV	zero point value valid LV = 0 The EL command was transmitted, but there was no zero impulse yet. LV = 1 the zero point value was latched
6	KOM	COMPLEMENTARY shows, if a bridge is present in the D-SUB connector KOM=0 evaluation of normal pick off signals A, B, C; bridge to GND inside the D-SUB connector KOM=1 additional evaluation of complementary signals; open, no bridges inside the D-SUB connector A, /A, B, /B, C, /C
7	STAT	status signal not in use yet

*)

Evaluation Mode		
EE1	EE0	Evaluation
0	0	1 time
0	1	2 times
1	0	4 times
1	1	-

Rem.: 0 = GND bridge present
 1 = open, no bridge
 inside the D-SUB connector (15 pins)

II/O-Setup entry

After pasting a module M3120 (incremental encoder 4 times) into the II/O-Lightbus, following entries have to be made in the II/O-Setup.

Attention: Incremental encoder INC4 must be the first entry and INC1 the fourth entry in the II/O-Setup Table (look to the example below and to the basic circuit diagram on page 4):

Example:

20.10.94 13:32:18

II/O 1/ 0 Boxen

Lfd	Box	Kom	Bezeichnung	Block	D0	D1	D2	D3	Fnkt
1	1	1	Incremental-Geber	0	A 0	A 1	A 2	A 3	0
2	1	1	INC4 M3120_SLAVE_3	0	E 0	E 1	E 2	E 3	0
3	2	2	Incremental-Geber	0	A 4	A 5	A 6	A 7	0
4	2	2	INC3 M3120_SLAVE_2	0	E 4	E 5	E 6	E 7	0
5	3	3	Incremental-Geber	0	A 8	A 9	A 10	A 11	0
6	3	3	INC2 M3120_SLAVE_1	0	E 8	E 9	E 10	E 11	0
7	4	4	Incremental-Geber	0	A 12	A 13	A 14	A 15	0
8	4	4	INC1 M3120_MASTER	0	E 12	E 13	E 14	E 15	0
9	0	0		0	0	0	0	0	0
10	0	0		0	0	0	0	0	0

Für weitere Informationen bitte die Tasten
 Ctrl <↵>
 betätigen

IIO-Puffer: D0000000 IIO-Adresse: D0000000

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F1	F2	F3	F4	F5	F6	F7	F8	F9	F10
BOX	BOX	ZEILE	KOMM	INTENS	RING	RESET	CDL	SPEI	VORH
EINFÜG	LÖSCH	EINFÜG	EINFÜG	TEST	TEST	I/O	DATEN	TAB	MENÜ

3. Technical data

Pick Off Connection	A, A(inv), B, B(inv), C, C(inv),
Pick Off Voltage	5 V DC / 15 V DC max 1A, resistable against short circuit optional at D-SUB connector
Inputs	"Counter disable"
Input spezification	24 V DC, 10 mA
Input level	0 - 8 V =LOW 15 - 24 V =HIGH
Input delay	0,1 ms RC filter Inputs "Counter disable"
Counter	24 bit binary
Limiting frequency	1 MHz
Squariness decoder	1-2-4 times evaluation
Zero impulse latch	24 bit
Commands	set, read, activate
Data connection	II/O-Lightbus system
Transmission rate	2,5 MBaud, 25µsec for 32 bit
Power supply	24 V DC (±10%)
Input current	0,1 A (without encoder load)

Housing	compact aluminium housing for terminal rail mount
Size (W*H*D)	170*76*68 mm
Weight	600 g
Operating temperature	±0..+55 °C
Storage temperature	-20..+70 °C
EMI resistance	IEC 801 T4, class 4: 2 kV for signal lines 4 kV for power supply lines
Vibration resistance	acc. IEC 68-2-29 (vibration and shock)

4. Installation

The module M3120 is connected to the fibre optic ring using fibre optic connectors (Beckhoff Z1000). The maximum length of the FO cable, leading to the neighbouring boxes, should not be more than 600 m for glass fibre or 45 m for other fibres. These values are only valid if for bending the cable a radius of at least 30 mm is used. If there are no glass fibres used, no special tools are needed for installation of the plugs.

The module M3120 is installed decentralized from the machine. Sensors and actors are connected to the box directly by D-SUB connectors (connector X20, X30, X40, X50).

You can take the power supply for a 5 V or 15 V incremental encoder directly from this S-SUB connectors.

The LEDs show the status of the module.

Configuration

You can select the times of evaluation over bridges to GND inside the D-SUB connector:

EE1	EE0	evaluation
bridge to GND	bridge to GND	1 time
bridge to GND	open, no bridge	2 times
open, no bridge	bridge to GND	4 times
open, no bridge	open, no bridge	-

In case an encoder with single outputs is to be connected, the input "Kom" must be connected to GND (inside the D-SUB connector X20, X30, X40, X50).

In case an encoder with complementary outputs is to be connected, the bridge "JP" has to be removed.

Power supply

A two pin plug in connector is used to establish the 24 V DC power supply. (X10)

Incremental encoder (4 times) M3120

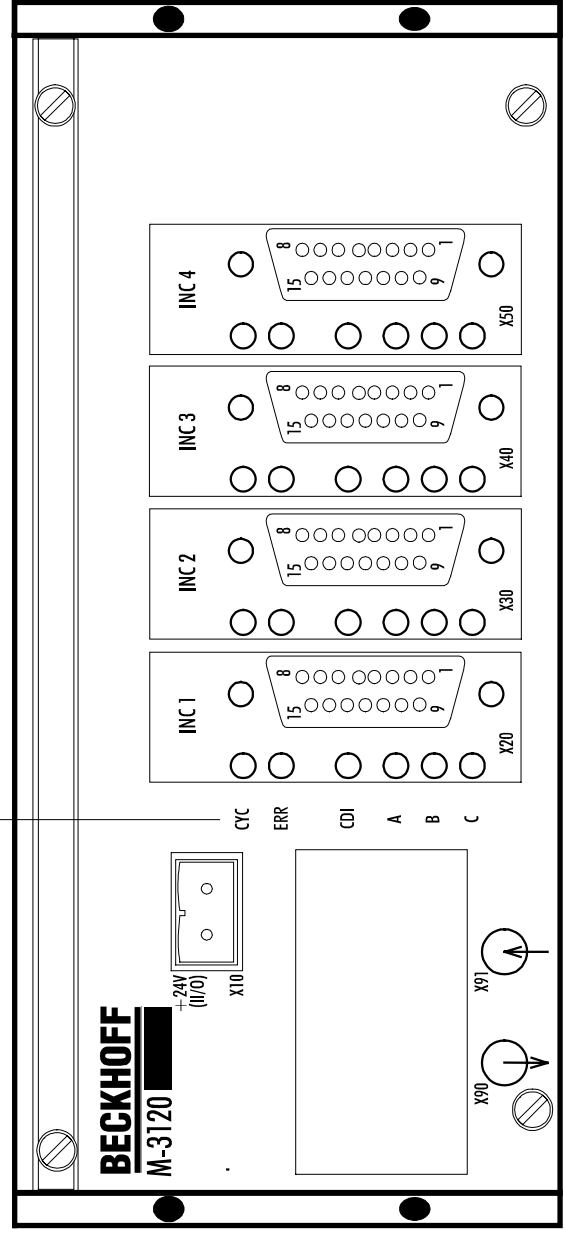
Pin assignment

1	Kom
2	Complementary signal +24V (output)
3	EE1 (evaluation)
4	+5V
Encoder supply	
5	C channel
6	B/ channel
7	GND
8	A channel
9	Counter disable (input)
10	+15V
Encoder supply	
11	EE0 (evaluation)
12	C/ channel
13	GND
14	B channel
15	A/ channel

Connector X20, X30, X40 and X50

Diagnosis LEDs
CYC = LED 'Cycle'
ERR = LED 'Error'

Connector X10
+24V control voltage (Pin1)
GND (Pin2)
GND from connector X10, X20, X30, X40 and X50 connected



Status LEDs
 CDI = LED 'Counter disable'
 A = LED 'A channel' /
 B = LED 'B channel' /
 C = LED 'C channel' /

II/O-Lightbus receiver
 II/O-Lightbus transmitter

5. Connection table

Pin assignment

CONNECTOR X10

Connector	Pin	Signal	Description
X10	1	+U	Control voltage +24V
X10	2	-U	Ground

CONNECTOR X20

Connector	Pin	Signal	Description	
X20	1	Kom	Input complementary signals	INC1
X20	2	+24V	+24V	INC1
X20	3	EE1	Evaluation 1 time, 2 times, 4 times	INC1
X20	4	+5V	+5V encoder supply	INC1
X20	5	C	Channel C	INC1
X20	6	B/	Channel B (inverted)	INC1
X20	7	GND	GND encoder supply	INC1
X20	8	A	Channel A	INC1
X20	9	CDI	Input „Counter disable“	INC1
X20	10	+15V	+15V Encoder supply	INC1
X20	11	EE0	Evaluation 1 time, 2 times, 4 times	INC1
X20	12	C/	Channel C (inverted)	INC1
X20	13	GND	GND	INC1
X20	14	B	Channel B	INC1
X20	15	A/	Channel A (inverted)	INC1

CONNECTOR X30

Connector	Pin	Signal	Description	
X30	1	Kom	Input complementary signals	INC2
X30	2	+24V	+24V	INC2
X30	3	EE1	Evaluation 1 time, 2 times, 4 times	INC2
X30	4	+5V	+5V encoder supply	INC2
X30	5	C	Channel C	INC2
X30	6	B/	Channel B (inverted)	INC2
X30	7	GND	GND encoder supply	INC2
X30	8	A	Channel A	INC2
X30	9	CDI	Input „Counter disable“	INC2
X30	10	+15V	+15V Encoder supply	INC2
X30	11	EE0	Evaluation 1 time, 2 times, 4 times	INC2
X30	12	C/	Channel C (inverted)	INC2
X30	13	GND	GND	INC2
X30	14	B	Channel B	INC2
X30	15	A/	Channel A (inverted)	INC2

CONNECTOR X40

Connector	Pin	Signal	Description	
X40	1	Kom	Input complementary signals	INC3
X40	2	+24V	+24V	INC3
X40	3	EE1	Evaluation 1 time, 2 times, 4 times	INC3
X40	4	+5V	+5V encoder supply	INC3
X40	5	C	Channel C	INC3
X40	6	B/	Channel B (inverted)	INC3
X40	7	GND	GND encoder supply	INC3
X40	8	A	Channel A	INC3
X40	9	CDI	Input „Counter disable“	INC3
X40	10	+15V	+15V Encoder supply	INC3
X40	11	EE0	Evaluation 1 time, 2 times, 4 times	INC3
X40	12	C/	Channel C (inverted)	INC3
X40	13	GND	GND	INC3
X40	14	B	Channel B	INC3
X40	15	A/	Channel A (inverted)	INC3

CONNECTOR X50

Connector	Pin	Signal	Description	
X50	1	Kom	Input complementary signals	INC3
X50	2	+24V	+24V	INC3
X50	3	EE1	Evaluation 1 time, 2 times, 4 times	INC3
X50	4	+5V	+5V encoder supply	INC3
X50	5	C	Channel C	INC3
X50	6	B/	Channel B (inverted)	INC3
X50	7	GND	GND encoder supply	INC3
X50	8	A	Channel A	INC3
X50	9	CDI	Input „Counter disable“	INC3
X50	10	+15V	+15V Encoder supply	INC3
X50	11	EE0	Evaluation 1 time, 2 times, 4 times	INC3
X50	12	C/	Channel C (inverted)	INC3
X50	13	GND	GND	INC3
X50	14	B	Channel B	INC3
X50	15	A/	Channel A (inverted)	INC3