LA-66
INTERBUS-S

Interface description

Edition/rev.:	22.01.2001
Document/rev. no.:	TR - ELA - TI - GB - 0001 - 01
Software version:	
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Notation

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″ < > ″ refers to keys on your computer keyboard (e.g. <RETURN>).

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Revision index

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Document produced: 22.01.2001

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1 Introduction

The LA-66 linear absolute encoder with INTERBUS-S interface is designed as a remote bus module with 32 I/O data. This makes it easy to integrate in the bus ring in the same way as a PHOENIX-CONTACT bus terminal. To ensure that the protocol meets INTERBUS-S requirements, an SYPI (serial microprocessor interface) is integrated between the LA-66 linear absolute encoder and the INTERBUS-S.

In the INTERBUS-S ring the LA-66 is detected with the ident number 51 (33 hex) and requires two-word addresses for IN-data and two-word addresses for OUT-data.

2 Mapping of Encoder Data in the Master (Controller)

In the master, the encoder data requires two-word addresses for IN-data and two-word addresses for OUT-data. The position of the data in the controller depends on the physical or logical position of the encoder within the ring. For detailed information, refer to the manual of the master (controller) used. The encoder should be considered to be a PHOENIX I/O bus terminal and the system processes it as such.

2.1 Position of the Encoder Data Within the Two-Word Addresses

OUT-data relative to the master:

Relative word address "1"

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
MSB															LSB

OUT-data relative to the master:

Relative word address "2"

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
MSB															LSB

IN-data relative to the master:

Relative word address "1"

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
MSB															LSB

IN-data relative to the master:

Relative word address "2"

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
MSB															LSB

2.2 Meaning of the OUT-Data (Data from the Master to the Encoder)

Normal Mode:

Service bit 2^{31} is set to "0".
OUT-data that the master outputs to the encoder does not have any effect and the encoder does not accept it.
As a result, in normal mode the encoder only outputs its current position data.

Service Mode:

Service bit 2^{31} is set to "1".
The encoder carries out the master's requested service (e.g. write counting direction or read programmed counting direction).
The system evaluates or ignores the remaining OUT-data 2^{23} to 2^{0} in dependence on the requested service.

Bit 2^{31}:	Service bit	0 = Normal mode 1 = Service mode
Bit 2^{30}:	Read-write bit	0 = Read data 1 = Write data
Bit 2^{29}:	Error bit	1 = Error
Bit 2^{28}:	Reserve	Always 0
Bit 2^{27} to bit 2^{24}:	Service	
Bit 2^{23} to bit 2^{0} :	Data for service if bit 2^{30} = 1, otherwise meaningless	

2.3 Meaning of the IN-Data (Data from the Encoder to the Master)

Normal Mode:

The encoder outputs the current position data and writes it to bits 2^{23} to 2^{0}. Bits 2^{31} to 2^{24} are "0" unless there is an error; in this case, error bit 2^{29} = "1".

Service Mode:

If the master writes data (read-write bit = 1), the system returns the OUT-data to the IN-data (bits 2^{31} to 2^{0}).
If the master reads data (read-write bit = 0), bits 2^{23} to 2^{0} contain the requested data and bits 2^{31} to 2^{24} contain the acknowledgement of the requested service.

If the system could not carry out the service without errors, the error bit is "0". It is only possible to clear a set error bit by carrying out a data check service.

3 Encoder programming

With respective services, the encoder parameters via the INTERBUS-S are transmitted to the LA-66 with a handshake method.

The encoder parameters are saved permanently in the LA-66 in an EEPROM.

Following services can be executed:

3.1 Direction of Counting - Service 01 Hex

Definition of the direction of counting to the end of rod:

	Direction of counting increasing	Direction of counting decreasing
OUT-Data 2^{23} to 2^{0}:	0	1

	Write Data	Read Data
OUT-Data 2^{31} to 2^{24}:	C1 Hex	81 Hex

3.2 Measuring Length in Steps - Service 02 Hex

The resolution of the rod is adjusted via the measuring length in steps.
The measuring length in steps results from the measuring length indicated on the rod (type label) and the desired resolution. Every arbitrary measuring length can be programmed.

$$\text{Measuring Length [S]} = \frac{\text{Measuring Length [mm]}}{\text{Resolution [mm]}}$$

Examples:

Measuring length rod = 500mm, Resolution = 0,01mm -> Measuring Length[S] = 50000 = C350 Hex
Measuring length rod = 500mm, Resolution = 0,1mm -> Measuring length[S] = 5000 = 1388 Hex

	Write Data	Read Data
OUT-Data 2^{31} to 2^{24}:	C2 Hex	82 Hex

3.3 Preset value 1 - Service 04 Hex

Here, the preset value is set to which the LA-66 is adjusted if the external preset input is connected.

	Write Data	Read Data
OUT-Data 2^{31} to 2^{24}**:**	C4 Hex	84 Hex

The value range is 0 to max. FFFFFF Hex.

3.4 Preset Adjustment - Service 06 Hex

Using preset adjustment, you can adjust the encoder to a specific value via the INTERBUS-S ring.

Only writing is possible.

	Write Data
OUT-Data 2^{31} to 2^{24}**:**	C6 Hex

The value range is 0 to max. FFFFFF Hex.

3.5 Read Error Status - Service 08 Hex

Only reading is possible.
On 2^{15} to 2^{0} of the IN data the master receives the error status as the response.
Bits 2^{23} to 2^{16} of the IN data are "0".
Bits 2^{31} to 2^{24} of the IN data feed back the requested service.

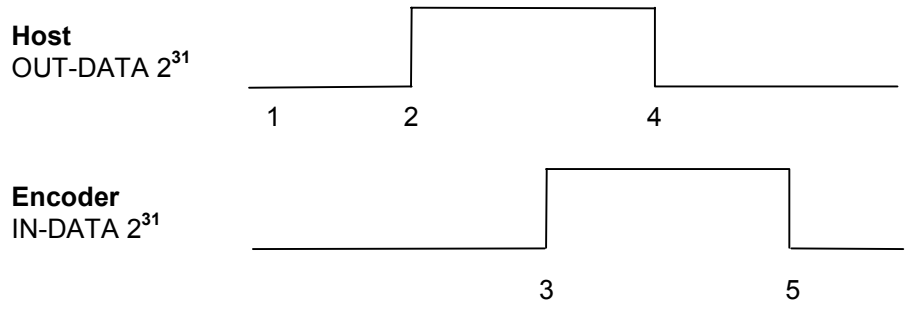
Error Status

2^{0}	Always 0
2^{1}	Always 0
2^{2}	Always 0
2^{3}	Always 0
2^{4}	Always 0
2^{5}	Sensor outside the valid measurement range (magnet)
2^{6}	Always 0
2^{7}	Always 0
2^{8}	Always 0
2^{9}	Always 0
2^{10}	Always 0
2^{11}	Always 0
2^{12}	Always 0
2^{13}	Always 0
2^{14}	Always 0
2^{15}	Always 0

4 Handshake Procedure

The system processes all service requests from the host to the encoder by means of a handshake of the service bit.

Handshake of service bit 2^{31}



1. The host is in normal mode, service bit 2^{31} is 0.
   The IN-data contains the encoder's actual position.

2. The host outputs the data and the service number and sets the service bit to 1.

Note:
To guarantee data consistency between the commissioning card and the PLC, the data and the service number must be output first. One PLC cycle later, the service bit must be set from 0 to 1.
With a read service, OUT data 2^{23} to 2^{0} is meaningless.

3. The encoder detects and processes the service request, provides the appropriate data and reports back to the host system by setting service bit 2^{31}. With a read service, the system returns the OUT data to the IN data.

4. The host system detects execution and ends the service request.
   The system resets service bit 2^{31} and switches back to normal mode.

5. The encoder also detects the end of the service request and also switches to normal mode by resetting service bit 2^{31}. Afterwards, the system continues with the encoder's actual value output.