TR electronic

ETHERNET POWERLINK

Linear Encoder Parameter setting

Technical Information

TR - ELA - BA - GB - 0056 - 08 04/05/2016

TR-Electronic GmbH
D-78647 Trossingen
Eglishalde 6
Tel.: (0049) 07425/228-0
Fax: (0049) 07425/228-33
email: info@tr-electronic.de
www.tr-electronic.com

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Document information

Release date / Rev. date:	04/05/2016
Document / Rev. no.:	TR - ELA - BA - GB - 0056 - 08
File name:	TR-ELA-TI-GB-0056-08.docx
Author:	MÜJ

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1 Powerlink interface for Linear-Encoder

The Powerlink measuring system has a 32-bit input register for parameter setting and a 96-bit output register for two magnet positions and the speed output. Additionally, the according status is assigned to the positions.

1.1 Normal operation

Measuring system input register = “0”: Transmission of the position with status.

1.1.1 96-bit input register

IN-data relating to the master (control):

Magnet 1	Magnet 2	Meaning
Bit 0 - 27	Bit 48 - 75	Position
Bit 28 – 29	Bit 76 - 77	Reserve
Bit 30	Bit 78	Set, if no magnet available, value is not plausible
Bit 31	Bit 79	Speed > 2m/s
Bit 32 - 47	Bit 80 - 95	Speed

1.2 Parameter setting operation

Measuring system input register ≠ “0”:

- writing/reading bit is set --> write parameter
- writing/reading bit is not set --> read parameter

1.2.1 32-bit output register

Out-data relating to the master (control):

Bit-No.	Meaning
Bit 31	Error bit The measuring system responses to each parameter setting. If the command can not be executed, the data word will be sent back and additionally the error bit is set.
Bit 30	Writing-/ Reading bit “0” = read parameter, “1” = write parameter
Bit 26-29	Selection of the function
Bit 0-25	Data bits Bit 30 = “1”: Entry of the parameter data for the selected writing function, Bit 30 = “0”: Entry of the parameter data for the selected reading function.

1.2.2 Read parameter

Function	Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	hex
Device type / Serial number	0	0	0	0	0	1	0400 0000
Counting direction / Number of magnets	0	0	0	0	1	0	0800 0000
Resolution	0	0	0	0	1	1	0C00 0000
Preset value 1	0	0	0	1	0	0	1000 0000
Preset – Release 1	0	0	0	1	0	1	1400 0000
Preset value 2	0	0	0	1	1	0	1800 0000
Preset – Release 2	0	0	0	1	1	1	1C00 0000
Offset 1	0	0	1	0	0	0	2000 0000
Preset 1 in reference to zero point	0	0	1	0	0	1	2400 0000
Offset 2	0	0	1	0	1	0	2800 0000
Preset 2 in reference to zero point	0	0	1	0	1	1	2C00 0000
Firmware version / Article-No.	0	0	1	1	0	0	3000 0000
Filter depth	0	0	1	1	0	1	3400 0000
Cycle time	0	0	1	1	1	0	3800 0000
Averaging of speed	0	0	1	1	1	1	3C00 0000

The measuring system acknowledges the output data of the master to the input data with the same content:

- Bit 26 – 31: requested reading function
- Bit 0 – 25: Parameter value of the requested reading function
- Bit 31: only set, if an error is present
- Bit 32 – 95: without meaning

Content of the data bits 0 – 25

Function	Parameter values
Bit 0 – 15 = Serial number Bit 16 – 25 = Device type	LMP-30: Bit 16 – 25 = 30 LP-38: Bit 16 – 25 = 38 LP-46: Bit 16 – 25 = 46
Firmware version / Article-No.	Bit 0 – 15 = Article-No., Bit 16 – 25 = Firmware version
Bit 0 = Counting direction Bit 1 = Number of magnets	Bit 0 = “0”: increasing, Bit 0 = “1”: decreasing Bit 1 = “0”: 1 magnet, Bit 1 = “1”: 2 magnets
Preset value 1 and 2, in reference to magnet 1	“0” = not set “1” = will be set
Preset – Release 1 and 2, in reference to magnet 2	“0” = not enabled “1” = enabled
Filter depth	“1” = no averaging, “2” = averaging of 2 values “4” = averaging of 4 values, “8” = averaging of 8 values
Resolution	“5” = 5 µm “10” = 10 µm “100” = 100 µm
Cycle time	Value in µs
Averaging of speed	“1” = no averaging, “2” = averaging of 2 values “4” = averaging of 4 values, “8” = averaging of 8 values

1.2.3 Write parameter

Function	Bit 31	Bit 30	Bit 29	Bit 28	Bit 27	Bit 26	hex
Counting direction / Number of magnets	0	1	0	0	1	0	48
Resolution	0	1	0	0	1	1	4C
Preset value 1	0	1	0	1	0	0	50
Preset – Release 1	0	1	0	1	0	1	54
Preset value 2	0	1	0	1	1	0	58
Preset – Release 2	0	1	0	1	1	1	5C
Offset 1	0	1	1	0	0	0	60
Offset 2	0	1	1	0	1	0	68
Filter depth	0	1	1	1	0	1	74
Cycle time	0	1	1	1	1	0	78
Averaging of speed	0	1	1	1	1	1	7C

The measuring system acknowledges the output data of the master to the input data with the same content:

- Bit 26 – 31: requested writing function
- Bit 0 – 25: Parameter value of the requested writing function
- Bit 31: only set, if an error is present
- Bit 32 – 95: without meaning

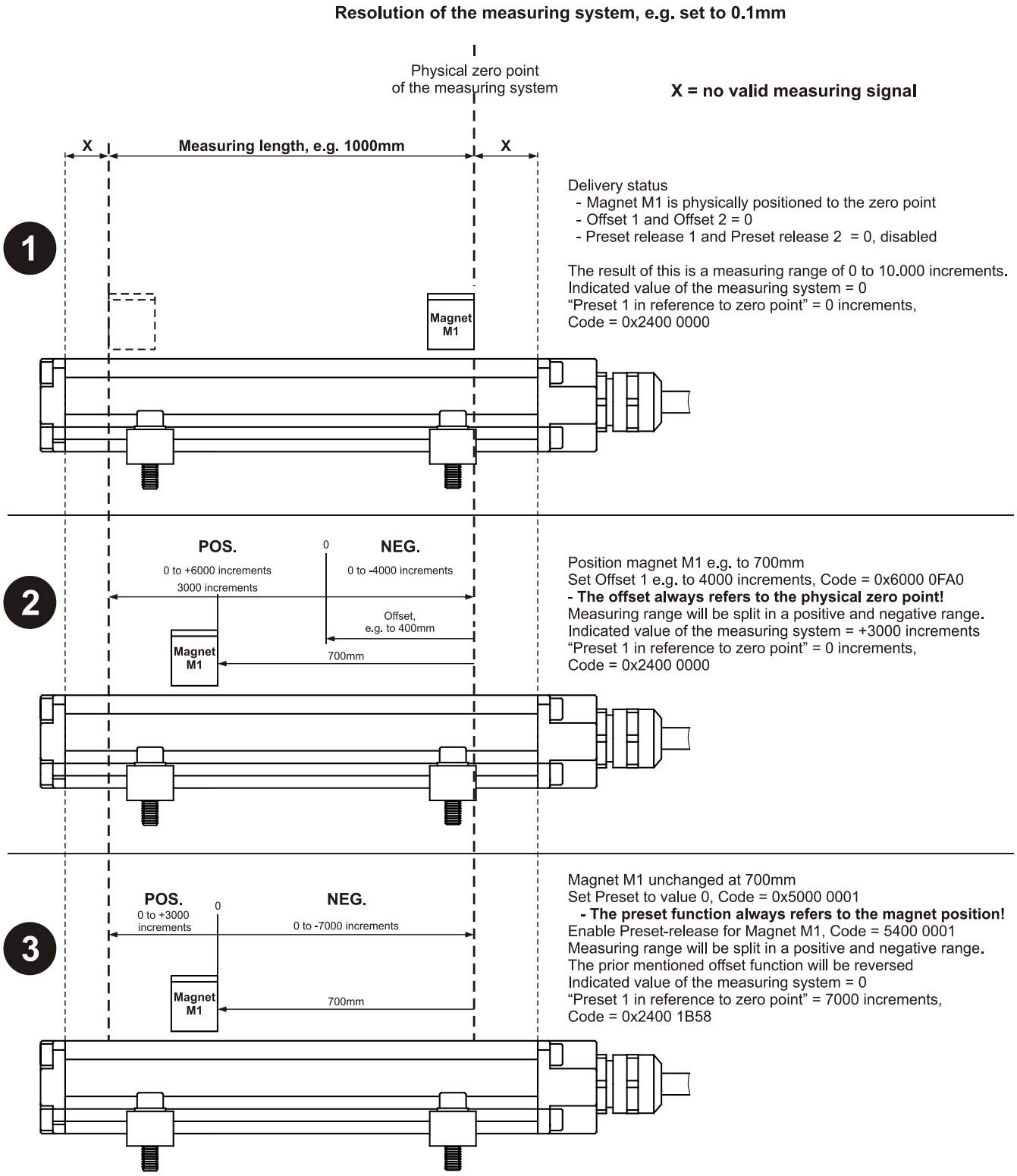
Content of the data bits 0 – 25

Function	Parameter values
Bit 0 = Counting direction Bit 1 = Number of magnets	Bit 0 = “0”: increasing Bit 0 = “1”: decreasing Bit 1 = “0”: 1 magnet Bit 1 = “1”: 2 magnets
Preset value 1 and 2	“0” = not set “1” = will be set
Preset – Release 1 and 2	“0” = not enabled “1” = enabled
Filter depth	“1” = no averaging “2” = averaging of 2 values “4” = averaging of 4 values “8” = averaging of 8 values
Resolution	“5” = 5 µm “10” = 10 µm “100” = 100 µm
Cycle time	Value in µs: 400, 800, 1200, 1600 and 1600
Averaging of speed	“1” = no averaging “2” = averaging of 2 values “4” = averaging of 4 values “8” = averaging of 8 values

1.2.4 Procedure

- Send data word with selected function
- Only clear data word, when measuring system has returned OUT-data of the master to the IN-data of the 96-bit input register.
- Set data word to “0”. After that, the measuring system will output its position.
- Each single parameter setting procedure must be finished with a “0” in the data word!

1.3 Operating method of the Offset and Preset function



2 Bus connection to the “automation studio” (B&R)

```
_LOCAL UDINT position1;
_LOCAL UINT v1;
_LOCAL UDINT identPosition1;
_LOCAL UDINT identV1;
_LOCAL UINT statusPosition1;
_LOCAL UINT statusV1;


_LOCAL UDINT position2;
_LOCAL UINT v2;
_LOCAL UDINT identPosition2;
_LOCAL UDINT identV2;
_LOCAL UINT statusPosition2;
_LOCAL UINT statusV2;


_LOCAL UDINT output1;
_LOCAL UDINT IdentOut1
_LOCAL UINT statusOut1
_LOCAL UDINT parametrieren;



_INIT void init(void)
{
   /*Initialization of the Powerlink encoder with address 2*/

   /*Position Magnet 1 + Status*/
   statusPosition1  = plCECreate("SL1.SS0.IF2.%ID2.0.0",&position1,plCE_CYCLIC_1,&identPosition1);
   /*Speed Magnet 1*/
   statusV1  = plCECreate("SL1.SS0.IF2.%ID2.0.4",&v1,plCE_CYCLIC_1,&identV1);

   /*Position Magnet 2 + Status*/
   statusPosition2  = plCECreate("SL1.SS0.IF2.%ID2.0.6",& position2,plCE_CYCLIC_1,& identPosition2);
   /*Speed Magnet 2*/
   statusV2  = plCECreate("SL1.SS0.IF2.%ID2.0.10",&v2,plCE_CYCLIC_1,&identV2);

   /*32 bit output buffer -> parametrization word*/
   statusOut1  = plCECreate("SL1.SS0.IF2.%QD2.0.0",&output1,plCE_CYCLIC_1,&identOut1);
}



_CYCLIC void cyclic(void)
{
        unsigned long ulMagnet1;
        unsigned long ulMagnet2;
        unsigned long ulCounter=0;

        /* Now, at every cycle the new data are saved in ulMagnet1 and ulMagnet2 */
        ulMagnet1 = position1;
        if(ulMagnet1&0xc0000000)
        {
                 if(ulMagnet1&0x40000000)
                 {
                         /*Value for Magnet1 not plausible, no magnet available*/
                 }
                 if(ulMagnet1&0x80000000)
                 {
                         /*Speed Magnet1 > 2m/s*/
                 }
        }
        else
        {
                /*Value and speed of Magnet1 is plausible*/
        }

        ulMagnet2 = position2;
        if(ulMagnet2&0xc0000000)
        {
                 if(ulMagnet2&0x40000000)
                 {
                         /* Value for Magnet2 not plausible, no magnet available */
                 }
                 if(ulMagnet2&0x80000000)
                 {
                         /*Speed Magnet2 > 2m/s*/
                 }
        }
        else
        {
                /* Value and speed of Magnet2 is plausible */
        }
```

```
        /*Simple example if the count direction should be changed*/
        if(parametrieren==1)/
        {
                /*0x48000001 -> Count direction = decreasing*/
                output1 = 0x48000001;
                ulCounter++;
                if((ulMagnet1==0x48000001)   /*Parameter setting was executed correct*/
                {
                        output1 = 0;            /*Normal read in mode*/
                        parametrieren = 0;
                        ulCounter = 0;
                }
                if(ulMagnet1==0xc8000001)    /*Parameter setting incorrect, bit 31 is set*/
                {
                        output1 = 0;
                        parametrieren = 0;
                        ulCounter = 0;
                        /*Error procedure because parameter setting failed*/
                }
                if(ulCounter==?????)
                {
                        /*Criterion time abort*/
                }
        }
}

_EXIT void exitup(void)
{

   statusPosition1  = plCEDelete(identPosition1);
   statusV1  = plCEDelete(identV1);
   statusPosition2  = plCEDelete(identPosition2);
   statusV2  = plCEDelete(identV2);
   statusOut1 = plCEDelete(identOut1);
}
```

3 Adjustments

3.1 Control software "Automation Studio"

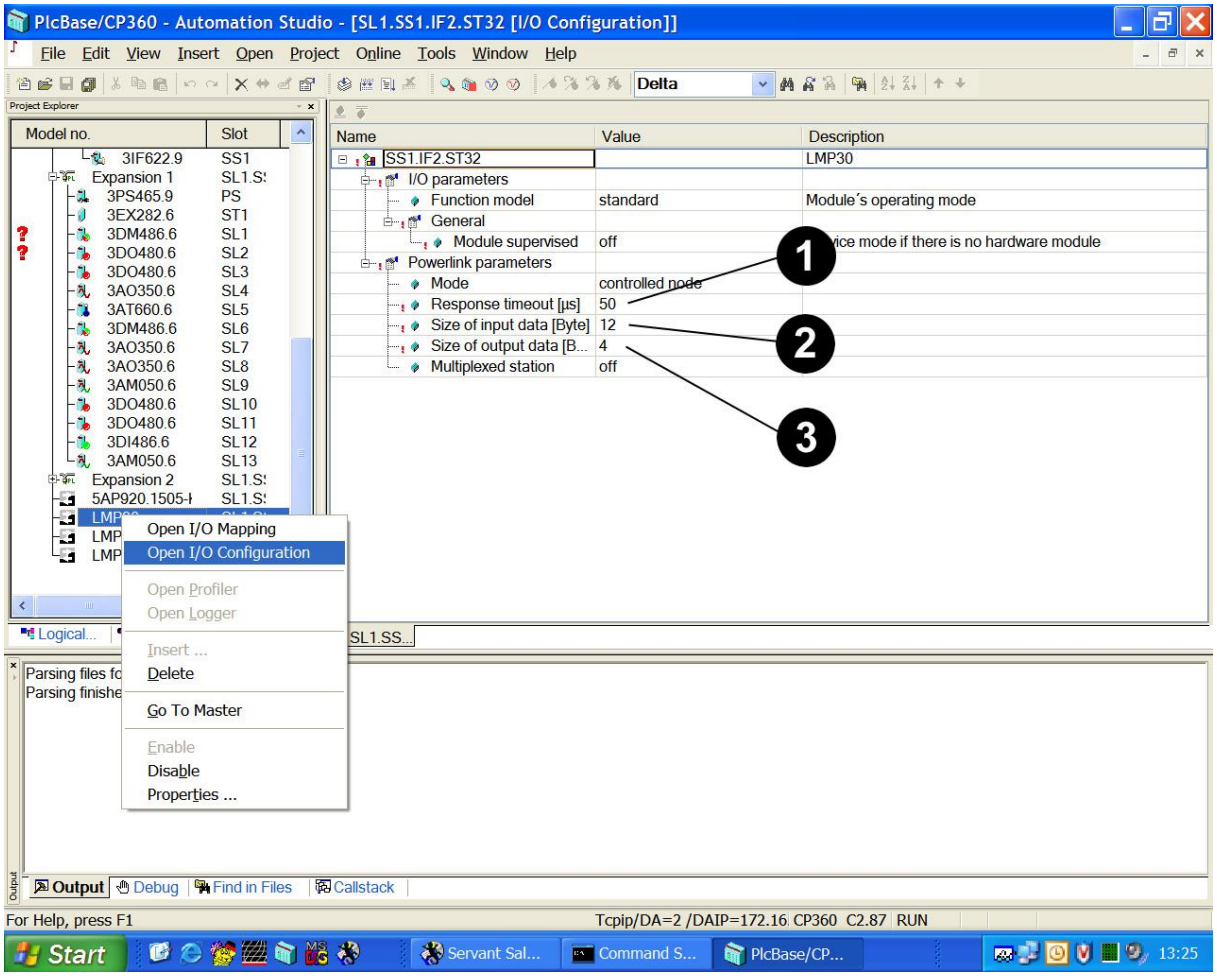
That the control unit can communicate with the measuring system, the following value assignments must be carried out:

❶: Response timeout = 50 µs

❷: Size of input data = 12 byte, output for position and speed

❸: Size of output data = 4 byte, for parameter setting

These parameters are also contained in the configuration file (HWC-file) for the LMP-30 and are predefined with corresponding default values.



3.2 Measuring system

The adjusted cycle time of the measuring system under the function “0x78, Write parameter” must agree with the adjusted bus cycle time in the control software.

Possible cycle times:

- 400 µs
- 800 µs
- 1200 µs
- 1600 µs
- 2000 µs