

# User's guide

**LD300**

**LD301**

**LD302**

**LD303**

**LD305**



- Multifunction display for incremental encoders
- Position display, tachometer, start/stop speed display,...
- Digital, analogue, serial and relay outputs
- Multivoltage supply 24Vdc, 24/42Vac, 115/230Vac

#### Suitable for the following models:

- LD300 display
- LD301 display with analogue output
- LD302 display with two presets and transistor outputs
- LD303 display with serial interface
- LD305 display with two presets, relay outputs and serial interface

#### General Contents

Preliminary information	9
Safety summary	10
Mounting instructions	12
Electrical connections	13
Operating the front keys	18
Operator menu	22
Set up procedure	24
Special functions	40
Parameters list	44

This publication was produced by Lika Electronic s.r.l. 2017. All rights reserved. Tutti i diritti riservati. Alle Rechte vorbehalten. Todos los derechos reservados. Tous droits réservés.

This document and information contained herein are the property of Lika Electronic s.r.l. and shall not be reproduced in whole or in part without prior written approval of Lika Electronic s.r.l. Translation, reproduction and total or partial modification (photostat copies, film and microfilm included and any other means) are forbidden without written authorisation of Lika Electronic s.r.l.

The information herein is subject to change without notice and should not be construed as a commitment by Lika Electronic s.r.l. Lika Electronic s.r.l. reserves the right to make all modifications at any moments and without forewarning.

This manual is periodically reviewed and revised. As required we suggest checking if a new or updated edition of this document is available at Lika Electronic s.r.l.'s website. Lika Electronic s.r.l. assumes no responsibility for any errors or omissions in this document. Critical evaluation of this manual by the user is welcomed. Your comments assist us in preparation of future documentation, in order to make it as clear and complete as possible. Please send an e-mail to the following address [info@lika.it](mailto:info@lika.it) for submitting your comments, suggestions and criticisms.

The logo for Lika Electronic s.r.l. consists of the word "lika" in a bold, lowercase, sans-serif font. The letter "i" has a dot above it. The logo is positioned in the bottom right corner of the page.

# General contents

General contents.....	3
Subject index.....	7
Typographic and iconographic conventions.....	8
Preliminary information.....	9
<b>1 Safety summary.....</b>	<b>10</b>
1.1 Safety.....	10
1.2 Electrical safety.....	10
1.3 Mechanical safety.....	10
<b>2 Identification.....</b>	<b>11</b>
<b>3 Mounting instructions.....</b>	<b>12</b>
<b>4 Electrical connections.....</b>	<b>13</b>
4.1 Power supply.....	14
4.2 Aux. voltage output.....	14
4.3 Inputs A, B and Reset.....	15
4.4 Adjustable analogue output (LD301 model only).....	15
4.5 Optocoupler / transistor outputs (LD302 model only).....	16
4.6 Serial RS-232 / RS-485 interface (LD303 and LD305 models only).....	16
4.7 Relay outputs (LD305 model only).....	17
<b>5 Operating the front keys.....</b>	<b>18</b>
5.1 Normal display state.....	18
5.2 Selection and setting of parameters.....	19
5.2.1 Selecting a parameter.....	19
5.2.2 Changing parameter settings.....	19
5.2.3 Saving settings.....	19
5.2.4 Time-out function.....	19
5.3 Teach operation.....	20
5.4 Setting all registers to "Default" values.....	20
5.5 Code locking of the keypad.....	21
<b>6 Operator menu.....</b>	<b>22</b>
6.1 Overview of basic parameters.....	22
6.2 Operational parameters overview.....	23
<b>7 Set up procedure.....</b>	<b>24</b>
7.1 Basic settings.....	24
<b>tYPE</b> .....	24
<b>rPm</b> .....	24
<b>timE</b> .....	24
<b>timEr</b> .....	24
<b>Count</b> .....	24
<b>SPEEd</b> .....	24
<b>CHAr</b> .....	24
<b>nPn</b> .....	24
<b>PnP</b> .....	24
<b>briGht</b> .....	24
<b>CodE</b> .....	25
<b>no</b> .....	25

All.....	25
P_frEE.....	25
LmodE.....	25
no.....	25
1-qUA.....	25
4-qUA.....	25
7.2 Operational parameters.....	26
7.2.1 RPM, operation as tachometer or frequency counter.....	26
FrEqu.....	26
diSPL.....	26
dPoint.....	26
WAit.....	26
FiltEr.....	26
OFF.....	26
16.....	26
7.2.2 Time, display of baking or processing time (reciprocal speed).....	27
diSfor.....	27
SEC.....	27
min.....	27
mi-SE.....	27
min.00.....	27
FrEqu.....	27
diSPL.....	27
WAit.....	27
FiLtEr.....	27
OFF.....	27
16.....	27
7.2.3 Timer, Stopwatch.....	28
bASE.....	28
SEC.000.....	28
SEC.00.....	28
SEC.0.....	28
SEC.....	28
min.00.....	28
min.0.....	28
H-m-S.....	28
StArt.....	28
Hi_Loo.....	28
St_SP.....	28
A_StSP.....	28
Loo_Hi.....	28
rESEt.....	28
no.....	28
yES.....	28
LAtcH.....	28
no.....	28
yES.....	28
7.2.4 Count, Counter mode.....	29
modE.....	29

A_bdir.....	29
A u b.....	29
A - b.....	29
A_b .1.....	29
A_b .2.....	29
A_b .4.....	29
FActor.....	29
SEt.....	29
rESEt.....	29
no.....	29
front.....	29
E_tErn.....	29
Fr u E.....	29
dPoint.....	29
7.2.5 Speed from differential time between a Start and a Stop input.....	30
timE.....	30
diSPL.....	30
dPoint.....	30
WAIt.....	30
7.2.6 Linearisation points.....	30
7.3 Model LD301: additional settings for the analogue output.....	31
A-ChAr.....	31
-10_10.....	31
0_10.....	31
4_20.....	31
0_20.....	31
OFFSEt.....	31
GAin.....	31
AnAbEG.....	32
AnAEnd.....	32
7.4 Models LD302 & LD305: additional settings for preselections.....	33
CHAR 1.....	33
__r GE.....	33
__r LE.....	33
_n_ GE.....	33
_n_ LE.....	33
_n_ rES.....	33
_n_ SEt.....	33
CHAR 2.....	33
__r GE.....	33
__r LE.....	33
_n_ GE.....	33
_n_ LE.....	33
__r 1-2.....	33
_n_ 1-2.....	33
HYSt 1.....	33
HYSt 2.....	33
PrES_1.....	34
PrES_2.....	34

7.5 Models LD303 & LD305: additional settings for the serial interface.....	35
<b>S-Unit</b> .....	35
<b>S-Form</b> .....	35
7 E 1.....	35
7 E 2.....	35
7 0 1.....	35
7 0 2.....	35
7 no 1.....	35
7 no 2.....	35
8 E 1.....	35
8 0 1.....	35
8 no 1.....	35
8 no 2.....	35
<b>S-bAUd</b> .....	35
9600.....	35
4800.....	35
2400.....	35
1200.....	35
600.....	35
19200.....	35
38400.....	35
<b>S-tim</b> .....	36
<b>S-mod</b> .....	36
PC.....	36
Print1.....	36
Print2.....	36
<b>S-CodE</b> .....	36
7.5.1 PC-Mode.....	37
7.5.2 Printer-Mode.....	39
<b>8 Special functions</b> .....	<b>40</b>
8.1 Linearisation.....	40
8.2 Manual input or "teaching" of the interpolation points.....	42
<b>9 Parameters list</b> .....	<b>44</b>
9.1 General.....	44
9.2 Linearisation.....	45
9.3 Analogue output (model LD301).....	46
9.4 Preselections (models LD302 & LD305).....	46
9.5 Serial interface (models LD303 & LD305).....	46

# Subject index

<b>A</b>		LmodE.....	25
A-ChAr.....	31	<b>M</b>	
AnAbEG.....	32	modE.....	29
AnAEnd.....	32	<b>O</b>	
<b>B</b>		OFFSEt.....	31
bASE.....	28	<b>P</b>	
briGht.....	24	P01_X.....	30
<b>C</b>		P01_Y.....	30
CHAr.....	24	P16_X.....	30
CHAr 1.....	33	P16_Y.....	30
CHAr 2.....	33	PrES_1.....	34
CodE.....	25	PrES_2.....	34
<b>D</b>		<b>R</b>	
diSfor.....	27	rESEt.....	28p.
diSPL.....	26p., 30	<b>S</b>	
dPoint.....	26, 29p.	S-bAUd.....	35
<b>F</b>		S-CodE.....	36
FActor.....	29	S-Form.....	35
FiltEr.....	26	S-mod.....	36
FiLtEr.....	27	S-tim.....	36
FrEqu.....	26p.	S-Unit.....	35
<b>G</b>		SEt.....	29
GAin.....	31	StArt.....	28
<b>H</b>		<b>T</b>	
HYSt 1.....	33	timE.....	30
HYSt 2.....	33	tYPE.....	24
<b>L</b>		<b>W</b>	
LAtch.....	28	WAit.....	26p., 30

# Typographic and iconographic conventions

In this guide, to make it easier to understand and read the text the following typographic and iconographic conventions are used:

- parameters and objects both of the device and the interface are coloured in **GREEN**;
- alarms are coloured in **RED**;
- states are coloured in **FUCSIA**.

When scrolling through the text some icons can be found on the side of the page: they are expressly designed to highlight the parts of the text which are of great interest and significance for the user. Sometimes they are used to warn against dangers or potential sources of danger arising from the use of the device. You are advised to follow strictly the instructions given in this guide in order to guarantee the safety of the user and ensure the performance of the device. In this guide the following symbols are used:

	This icon, followed by the word <b>WARNING</b> , is meant to highlight the parts of the text where information of great significance for the user can be found: user must pay the greatest attention to them! Instructions must be followed strictly in order to guarantee the safety of the user and a correct use of the device. Failure to heed a warning or comply with instructions could lead to personal injury and/or damage to the unit or other equipment.
	This icon, followed by the word <b>NOTE</b> , is meant to highlight the parts of the text where important notes needful for a correct and reliable use of the device can be found. User must pay attention to them! Failure to comply with instructions could cause the equipment to be set wrongly: hence a faulty and improper working of the device could be the consequence.
	This icon is meant to highlight the parts of the text where suggestions useful for making it easier to set the device and optimize performance and reliability can be found. Sometimes this symbol is followed by the word <b>EXAMPLE</b> when instructions for setting parameters are accompanied by examples to clarify the explanation.

# Preliminary information

This guide is designed to provide the most complete information the operator needs to correctly and safely install and operate the LD30x display series.

LD30x is an incremental multi-function display with impulse inputs for connecting incremental encoders or sensors. The user's interface is a multi-function keyboard fitted with 3 keys and a 7-segment and 6-digit LED display.

In the series the following models are available:

- **LD300** is a display only version;
- **LD301** provides an additional analogue output;
- **LD302** further offers two presets and two switching outputs;
- **LD303** is equipped with an RS-232/RS-485 serial interface for connection with a PC;
- **LD305** is equipped with two relay outputs and an RS-232/RS-485 serial interface for connection with a PC.

For technical specifications please refer to the product datasheet.

To make it easier to read the text, this guide can be divided into two main sections.

In the first section (from chapter 1 to chapter 4) general information concerning the safety, the mechanical installation and the electrical connection.

In the second section (from chapter 5 to chapter 9) both general and specific information is given on the operator menu and the setup procedure.

## 1 Safety summary



### 1.1 Safety

- Always adhere to the professional safety and accident prevention regulations applicable to your country during device installation and operation;
- installation and maintenance operations have to be carried out by qualified personnel only, with power supply disconnected and stationary mechanical parts;
- device must be used only for the purpose appropriate to its design: use for purposes other than those for which it has been designed could result in serious personal and/or the environment damage;
- high current, voltage and moving mechanical parts can cause serious or fatal injury;
- warning ! Do not use in explosive or flammable areas;
- failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the equipment;
- Lika Electronic assumes no liability for the customer's failure to comply with these requirements.



### 1.2 Electrical safety

- Turn OFF power supply before connecting the device;
- connect following to explanation in the "4 - Electrical connections" section on page 13;
- in compliance with 2014/30/EU norm on electromagnetic compatibility, following precautions must be taken:
  - before handling and installing the equipment, discharge electrical charge from your body and tools which may come in touch with the device;
  - power supply must be stabilized without noise; install EMC filters on device power supply if needed;
  - always use shielded cables (twisted pair cables whenever possible);
  - avoid cables runs longer than necessary;
  - avoid running the signal cable near high voltage power cables;
  - mount the device as far as possible from any capacitive or inductive noise source; shield the device from noise source if needed;
  - minimize noise by connecting the unit to ground (GND). Make sure that ground (GND) is not affected by noise. The connection point to ground can be situated both on the device side and on user's side. The best solution to minimize the interference must be carried out by the user.



### 1.3 Mechanical safety

- Install the device following strictly the information in the "3 - Mounting instructions" section;
- do not disassemble the unit;
- do not tool the unit;

- delicate electronic equipment: handle with care;
- do not subject the device and the shaft to knocks or shocks;
- respect the environmental characteristics of the device.

## 2 Identification

Device can be identified through the **order code** and the **serial number** printed on the label applied to its body. Information is listed in the delivery document too. Please always quote the order code and the serial number when reaching Lika Electronic for purchasing spare parts or needing assistance. For any information on the technical characteristics of the product, refer to the technical catalogue.



**Warning:** devices having order code ending with "/Sxxx" may have mechanical and electrical characteristics different from standard and be supplied with additional documentation for special connections (Technical info).

## 3 Mounting instructions

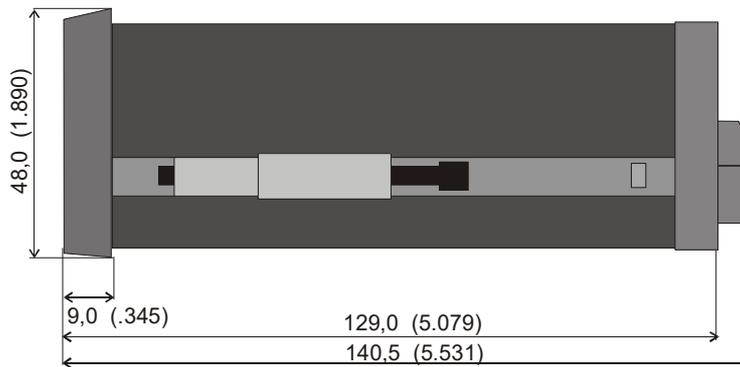
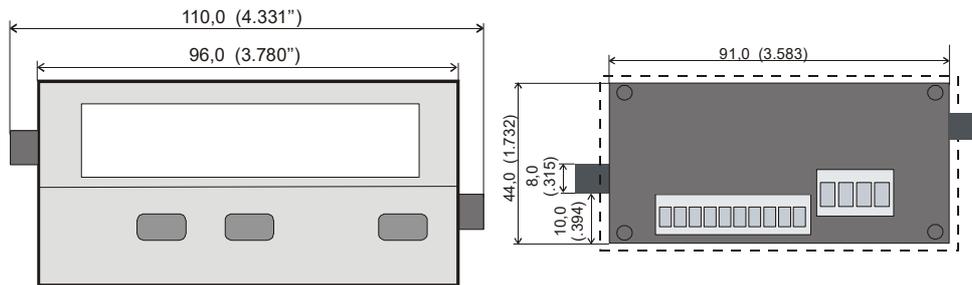


### WARNING

Mount the unit with power supply disconnected.

Mount the display into the provided cut-out (approx. 91 x 44 mm, 3.583 x 1.732") without panel clips.

Install panel clips on the display housing and screw until fixed.



**Panel cut out: 91 x 44 mm (3.583 x 1.732")**

### 4 Electrical connections



#### WARNING

Turn OFF the power supply before connecting the device.

<p><b>LD300</b> <b>Display unit only</b></p> <p>Special versions with TTL inputs (option -M8-) provide a +5V auxiliary output on terminal 7, instead of +24V</p> <p>Units with option -P4- provide 24Vac 42Vac power supply instead of 115Vac 230Vac (option -PM-)</p>	
<p><b>LD301</b> <b>Display unit with analogue output</b></p> <p>Special versions with TTL inputs (option -M8-) provide a +5V auxiliary output on terminal 7, instead of +24V</p> <p>Units with option -P4- provide 24Vac 42Vac power supply instead of 115Vac 230Vac (option -PM-)</p>	
<p><b>LD302</b> <b>Display unit with 2 presets and transistor outputs</b></p> <p>Special versions with TTL inputs (option -M8-) provide a +5V auxiliary output on terminal 7, instead of +24V</p> <p>Units with option -P4- provide 24Vac 42Vac power supply instead of 115Vac 230Vac (option -PM-)</p>	
<p><b>LD303</b> <b>Display unit with serial interface</b></p> <p>Special versions with TTL inputs (option -M8-) provide a +5V auxiliary output on terminal 7, instead of +24V</p> <p>Units with option -P4- provide 24Vac 42Vac power supply instead of 115Vac 230Vac (option -PM-)</p>	

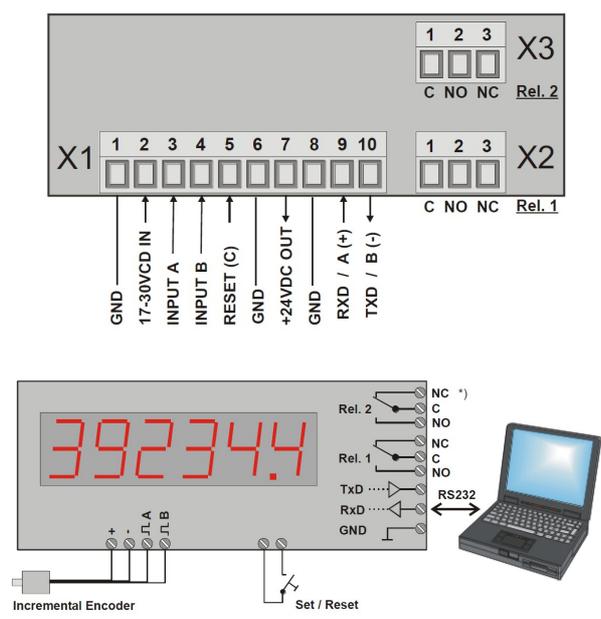
### LD305

#### Display unit with 2 presets, 2 relay outputs and a serial RS-232/RS-485 interface

Special versions with TTL inputs (option -M8-) provide a +5V auxiliary output on terminal 7, instead of +24V

LD305 has -P4- option only, it needs 17Vdc - 30Vdc power supply

\* Contact positions are shown in powerless state



### 4.1 Power supply

The unit accepts DC power supply from 17 V to 30 V when using terminals 1 and 2 and the consumption depends on the level of the supply voltage (typically between 80 mA and 150 mA plus current taken from auxiliary output).

In specific models, for AC supply, terminals 0 Vac, 115 Vac or 230 Vac can be used. The total AC power consumption is 7.5 VA.

Units with option LD30x-P4-... are designed for either 24 Vac or 42 Vac power supply and the screw terminals are marked correspondingly.

LD305 has -P4- option only, i.e. 17Vdc 30Vdc power supply.

The pictures in the previous page show a dotted line for grounding to PE. This connection is not necessary, neither for safety nor for EMC. However, with specific applications, it can be useful to ground the common potential of all signal lines.



#### NOTE

When using this earthing option, please note that:

1. all terminals and potentials marked "GND" will be earthed;
2. you should avoid multiple earthing, e.g. when you use a DC power supply where the Minus is already connected to earth etc. Especially under poor earthing and grounding conditions, multiple earth connections may cause serious EMC problems.

### 4.2 Aux. voltage output

Terminal 7 provides a 24 Vdc / 120 mA max. auxiliary output for supply of sensors and encoders. Units with TTL inputs (option -M8-) provide a 5 Vdc / 120 mA auxiliary output on terminal 7 instead.

## 4.3 Inputs A, B and Reset

In the basic set-up menu (see the "7.1 Basic settings" section on page 24) these inputs can be configured to PNP (switch to +) or to NPN (switch to -). This configuration is valid for all three inputs at a time.

The factory setting is always PNP.

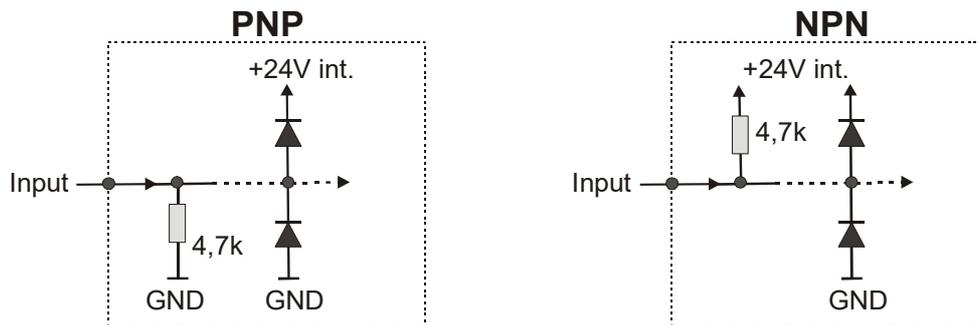
With standard units the input level is always HTL (Low < 2.0 V and High > 9.0 V). Units equipped with option -M8- provide TTL / CMOS level (Low <0.8 V and High >3.5 V).



### NOTE

1. Independently of your setting, all functions of the unit are "active HIGH" and the unit triggers to positive transitions (rising edge).
2. With NPN setting please be aware that an open or unused RESET input is HIGH. Therefore the unit will be kept in a continuous RESET state and will not work, unless you tie the Reset line to GND (terminal 1 or 6).
3. When you use 2-wire NAMUR type sensors, please select NPN, connect the negative wire of the sensor to GND and the positive wire to the corresponding input.

Typical input circuit (standard version with HTL inputs):



The counting inputs A and B are designed for input frequencies up to 100 kHz (with all counter modes) and up to 25 kHz (with all other operating modes).

The minimum pulse duration on the Reset input must be 500 µsec. (maximum frequency 1 kHz)

All inputs are designed to receive impulses from an electronic impulse source. Should you exceptionally need to **use mechanical contacts**, please connect an external capacitor between GND (-) and the corresponding input (+). With a capacity of 10 µF, the maximum input frequency will reduce to 20 Hz and miscounting due to contact bouncing will be eliminated.

## 4.4 Adjustable analogue output (LD301 model only)

A voltage output is available, operating in a range of 0 ... +10 V or -10 V ... +10 V according to setting. Furthermore, a current output 0/4 – 20 mA is available. Both outputs refer to the GND potential and the signal polarity changes with

the sign in the display. The outputs provide a 14-bit resolution and the response time at each change of the measuring value is approx. 7 msec. ( $f_{in} > 143$  Hz). The maximum current of the voltage output is 2 mA and the load on the current output can vary between 0 and max. 270 ohms.

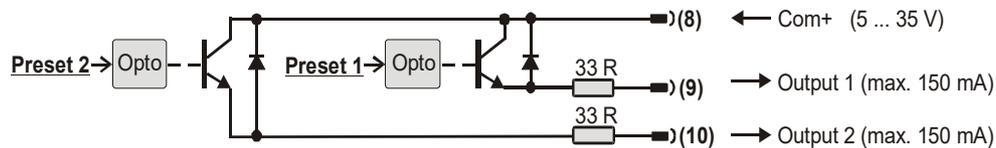


### WARNING

Voltage output and Current output cannot be used together!  
Please never connect mA output and V output simultaneously!

### 4.5 Optocoupler / transistor outputs (LD302 model only)

Outputs provide programmable switching characteristics and are potential-free. Please connect terminal 8 (COM+) to the positive potential of the voltage you want to switch (range 5V ... 30V). You must not exceed the maximum output current of 150 mA. If you switch inductive loads, please provide filtering of the coil by means of an external diode.



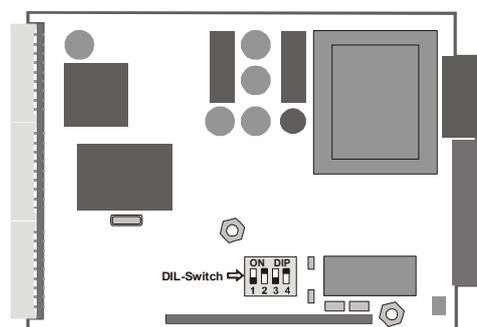
### 4.6 Serial RS-232 / RS-485 interface (LD303 and LD305 models only)

Ex factory the unit is set to RS-232 communication. This setting can be changed to RS-485 (2-wire) by means of an internal DIP switch. To access the DIP switch, please remove the screw terminal connectors and the back panel. Then pull the board to the rear to remove the PCB from its housing.



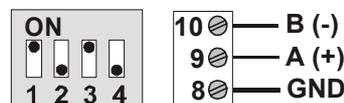
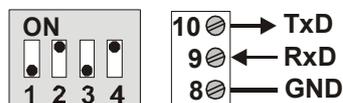
Removal of the back panel

RS-232



Location of the DIP switch

RS-485



**WARNING**

1. Never set DIL switch positions 1 and 2 or DIL switch positions 3 and 4 to ON at the same time!
2. After setting the switch, shift the print carefully back to its housing, in order to avoid damaging the front pins for connection with the front plate.

**4.7 Relay outputs (LD305 model only)**

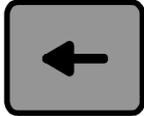
Both relays provide individually programmable switching characteristics. It is strictly recommended to use additional external filtering components when switching inductive loads.

The switching capability of the relays is 250 Vac / 1 A / 250 VA or 100 Vdc / 1 A / 100 W.

The response delay of the relays is by 10 msec. approximately.

## 5 Operating the front keys

For set-up and other operations the unit is fitted with three front keys which will be denominated as follows in the next pages:

		
<b>ENTER</b> (Input)	<b>SET</b> (Setting)	<b>CMD</b> (Command)

The functions of the keys are depending on the current operating state of the unit.

The following three operating states apply:

- Normal display state (see the "5.1 Normal display state" section on page 18)
- Set-up state (see the "5.2 Selection and setting of parameters" section on page 19)
  - Basic set-up (see the "7.1 Basic settings" section on page 24)
  - Operational parameters set-up (see the "7.2 Operational parameters" section on page 26)
- Teach operation (see the "5.3 Teach operation" section on page 20)

### 5.1 Normal display state



#### NOTE

You can only change over to other operation states while the unit is in display state.

Change over to	Key operation
<b>Basic set-up</b>	Keep <b>ENTER</b> and <b>SET</b> down simultaneously for 3 seconds
<b>Operational parameter set-up</b>	Keep <b>ENTER</b> down for 3 seconds
<b>Teach operation</b>	Keep <b>CMD</b> down for 3 seconds

The **CMD** key is only used to execute the Teach procedure with linearisation. For more details please refer to the "8.1 Linearisation" and "8.2 Manual input or "teaching" of the interpolation points" sections on page 40.

## 5.2 Selection and setting of parameters

### 5.2.1 Selecting a parameter

The **ENTER** key will scroll through the menu. The **SET** key allows to select the corresponding item and change the setting or the numeric value. After this, the selection can be saved by pressing the **ENTER** key again, which automatically changes over to the next menu item.

### 5.2.2 Changing parameter settings

With numerical entries, at first the lowest digit will blink. When keeping the **SET** key continuously down, the highlighted digit will scroll in a continuous loop from 0 to 9 and again from 0 to 9; and so on. After releasing the **SET** key, the current value will remain and the next digit will be highlighted (blink). This procedure allows setting all digits to the desired values. After the most significant digit has been set, the low order digit will blink again and you can make corrections if necessary.

With signed parameters, the high order digit will scroll from "0" to "9" (positive) followed by "-" and "-1" (negative).

### 5.2.3 Saving settings

To save the current setting, press the **ENTER** key, which will also automatically scroll forward the menu.



#### NOTE

At any time the unit changes from programming mode to normal display operation, when you keep the **ENTER** key down again for 3 seconds at least.

### 5.2.4 Time-out function

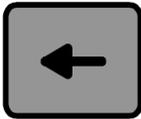
A "time-out" function will automatically terminate every menu level, when for a break period of 10 seconds no key has been pressed. In this case, all changes which have not been confirmed by **ENTER** yet would remain unconsidered.

## 5.3 Teach operation



### NOTE

The time-out function remains disabled during all Teach operations.

Key	Function
	<b>ENTER</b> key will terminate or abort any Teach operation in progress
	<b>SET</b> function is fully similar to normal set-up operation
	<b>CMD</b> key will save the display value in the register and change over to the next interpolation point

For further details on the Teach procedure see the "8.2 Manual input or "teaching" of the interpolation points" section on page 42.

## 5.4 Setting all registers to "Default" values

At any time you can return all settings to the factory default values.



### WARNING

This action will reset all parameters to factory default values and your own settings will be lost. You will have to repeat your individual set-up procedure. Factory default values are shown in the subsequent parameter tables (see the "Parameters list" section on page 44).

To reset the unit to default values:

- switch power off;
- press the **ENTER** key on the front;
- keep **ENTER** down while you power up again.

### 5.5 Code locking of the keypad

When the code locking of the keypad has been switched on (see on page 25), any key access first results as follows:



To access the menu you must press the following key sequence:



within 10 seconds, otherwise the unit will automatically return to the normal display mode.

## 6 Operator menu

The menu provides one section with "Basic Parameters" (see the "7.1 Basic settings" section on page 24) and another section with "Operational Parameters" (see the "7.2 Operational parameters" section on page 26). On the display you will only find those parameters which have been enabled by the basic settings. E.g. when the Linearisation function has been disabled in the basic set-up, the associated linearisation parameters will also not appear in the parameter menu. All parameters, as good as possible, are designated by text fragments. Even though the possibilities of forming texts are very limited with a 7-segment display, this method has proved to be most suitable for simplification of the programming procedure.

The subsequent table shows the general structure of the menu.

Detailed descriptions of all parameters will follow in the "7 - Set up procedure" section on page 24.

### 6.1 Overview of basic parameters

LD300	LD301	LD302	LD303	LD305
Type (Application mode)				
Input characteristics				
Brightness	Brightness	Brightness	Brightness	Brightness
Code	Code	Code	Code	Code
Linearisation mode *				
	Analogue output mode	Preselection mode 1	Serial unit number	Preselection mode 1
	Analogue offset	Preselection mode 2	Serial format	Preselection mode 2
	Analogue gain	Hysteresis 1	Serial baud rate	Hysteresis 1
		Hysteresis 2		Hysteresis 2
				Serial unit number
				Serial format
				Serial baud rate

\* This parameter only appears with "rPm" and "Count" modes.

### 6.2 Operational parameters overview

	Mode "RPM" (Tachometer) page 26	Mode "Time" (Baking Time) page 27	Mode "Timer" (Stopwatch) page 28	Mode "Count" (Counter) page 29	Mode "Speed" (Transition speed) page 30	
LD300	Frequency	Display Format	Base (Resolution)	Counter Mode	Time	
	Display Value	Frequency	Start/Stop	Scaling Factor	Display Value	
	Decimal Point	Display Value	Auto Reset	Set Value	Decimal Point	
	Wait Time	Wait Time	Latch Function	Reset/Set	Wait Time	
	Average Filter	Average Filter		Decimal Point		
LD301	Frequency	Display Format	Base (Resolution)	Counter Mode	Time	
	Display Value	Frequency	Start/Stop	Scaling Factor	Display Value	
	Decimal Point	Display Value	Auto Reset	Set Value	Decimal Point	
	Wait Time	Wait Time	Latch Function	Reset/Set	Wait Time	
	Average Filter	Average Filter		Decimal Point		
	Analogue Begin					
	Analogue End					
LD302	Preselection 1					
	Preselection 2					
	Frequency	Display Format	Base (Resolution)	Counter Mode	Time	
	Display Value	Frequency	Start/Stop	Scaling Factor	Display Value	
	Decimal Point	Display Value	Auto Reset	Set Value	Decimal Point	
	Wait Time	Wait Time	Latch Function	Reset/Set	Wait Time	
	Average Filter	Average Filter		Decimal Point		
LD303	Frequency	Display Format	Base (Resolution)	Counter Mode	Time	
	Display Value	Frequency	Start/Stop	Scaling Factor	Display Value	
	Decimal Point	Display Value	Auto Reset	Set Value	Decimal Point	
	Wait Time	Wait Time	Latch Function	Reset/Set	Wait Time	
	Average Filter	Average Filter		Decimal Point		
	Serial Timer					
	Serial Mode					
Serial Code						
LD305	Preselection 1					
	Preselection 2					
	Frequency	Display Format	Base (Resolution)	Counter Mode	Time	
	Display Value	Frequency	Start/Stop	Scaling Factor	Display Value	
	Decimal Point	Display Value	Auto Reset	Set Value	Decimal Point	
	Wait Time	Wait Time	Latch Function	Reset/Set	Wait Time	
	Average Filter	Average Filter		Decimal Point		
Serial Timer						
Serial Mode						
Serial Code						
All units	P01_H*			P01_H*		
	P01_Y*			P01_Y*		
	...			...		
	P16_H*			P16_H*		
	P16_Y*			P16_Y*		

\* This parameter only appears with "rPm" and "Count" modes when the linearisation function is enabled.

## 7 Set up procedure

For better understanding the following "7.1 Basic settings" and "7.2 Operational parameters" sections explain settings related to the display only model (LD300). Model-specific settings for analogue output model (LD301), Preselections models (LD302 and LD305) and Serial Link models (LD303 and LD305) will be explained separately under sections from "7.3 Model LD301: additional settings for the analogue output" to "7.5 Models LD303 & LD305: additional settings for the serial interface".

### 7.1 Basic settings

Customarily these settings have to be carried out one time only upon the very first use of the unit. The basic set-up selects the desired operation mode of the unit, the input characteristics PNP/NPN and the desired brightness of the LED display.



#### NOTE

To access the Basic Set-up press the **ENTER** and **SET** keys simultaneously for at least 3 seconds.

Menu		Setting range	Default
<b>TYPE</b>	<b>Operation Mode</b> Tachometer, frequency meter (see the "7.2.1 RPM, operation as tachometer or frequency counter" section on page 26). Baking time / processing time indicator (see the "7.2.2 Time, display of baking or processing time (reciprocal speed)" section on page 27). Timer, Stopwatch (see the "7.2.3 Timer, Stopwatch" section on page 28). Counter for position or event (see the "7.2.4 Count, Counter mode" section on page 29). Speed calculation from differential transition time (see the "7.2.5 Speed from differential time between a Start and a Stop input" section on page 30).	rPm time timEr Count SPEED	rPm
<b>CHAR</b>	<b>Switching characteristics of the inputs</b> NPN, switch to "-" PNP, switch to "+"	nPn PnP	PnP
<b>briGht</b>	<b>Brightness of the LED display</b>	20%, 40%, 60%, 80%, 100%	100%

Menu	Setting range	Default
<p><b>CodE</b> Keypad protection code</p> <p>Keypad enabled continuously.</p> <p>Keypad locked for any access.</p> <p>Keypad locked, except for access to preselections 1 and 2 (LD302 &amp; LD305 models only, see the "7.4 Models LD302 &amp; LD305: additional settings for preselections" section on page 33).</p>	<p>no</p> <p>All</p> <p>P_frEE</p>	<p>no</p>
<p><b>LmodE</b> <b>Linearisation mode *</b></p> <p>For details please refer to the "8.1 Linearisation" section on page 40 and to the "8.2 Manual input or "teaching" of the interpolation points" section on page 42.</p> <p>The linearisation is switched off.</p> <p>Linearisation settings for the positive range only (negative values will appear as a mirror).</p> <p>Linearisation over the full numeric range.</p>	<p>no</p> <p>1-qUA</p> <p>4-qUA</p>	<p>no</p>

\* This parameter is only available with "rPm" Tachometer mode and "Count" Counter mode.

## 7.2 Operational parameters

### 7.2.1 RPM, operation as tachometer or frequency counter

(Input A = frequency input, Input B not in use)

Menu		Setting Range	OS*	Default
<b>FrEqu</b>	<b>Frequency</b> Set a typical operating frequency for your application.	1 Hz to 25 000 Hz		<b>1000</b>
<b>diSPL</b>	<b>Display Value</b> Set the value you would like to see on your display with above frequency at the input.	1 ... 99999		<b>1000</b>
<b>dPoint</b>	<b>Decimal Point</b> Select the desired position as shown in the display. no decimal point decimal point at position 1 ----> decimal point at position 5	000000 00000.0 0.00000		<b>000.000</b>
<b>WAit</b>	<b>Wait Time</b> Define a "waiting time", this is the time expressed in seconds that the unit will wait from one input pulse to the next, before it sets the display to zero. The minimum range is limited to 0.1 sec., lower values do not make any sense as the unit should wait forever and show the last result until it receives the next input.   <b>The setting of this parameter automatically limits the minimum input frequency correspondingly. With "WAit" set to e.g. 0.1 sec. the unit will respond to frequencies &gt; 10 Hz only and all lower frequencies will display 0.</b>	0.1 ... 99.9 sec		<b>1.0</b>
<b>FiltEr</b>	<b>Average Filter</b> Selectable average filter to suppress unstable display with unsteady input frequencies.  No filtering  2, 4, 8, 16 = number of floating average cycles.	<b>OFF</b> <b>16</b>	0 1	<b>OFF</b>

\* OS only with LD303 & LD305 models



#### NOTE

LD301 model also provides a signed speed display with the +/- sign changing according to the direction of rotation (see the "7.3 Model LD301: additional settings for the analogue output" section on page 31).

## 7.2.2 Time, display of baking or processing time (reciprocal speed) (Input A = frequency input, Input B not in use)

Menu		Setting Range	OS*	Default
<b>diSFor</b>	<b>Display Format</b> Select between seconds, minutes, minutes and seconds or minutes with two decimal positions. This will also automatically set your decimal point to the proper place.			<b>SEC</b>
	Seconds Minutes Minutes and seconds Minutes with two decimal positions	<b>SEC</b> <b>min</b> <b>mi-SE</b> <b>min.00</b>	0 1 2 3	
<b>FrEqu</b>	<b>Frequency</b> Set a typical operating frequency for your application.	1 Hz to 25 000 Hz		<b>100</b>
<b>diSPL</b>	<b>Display Value</b> Set the value you would like to see on your display with above frequency at the input.	1 ... 999999		<b>100</b>
<b>WAit</b>	<b>Wait Time</b> Define a "waiting time", this is the time in seconds that the unit will wait from one input pulse to the next, before it sets the display to zero. The minimum range is limited to 0.1 sec., lower values do not make any sense as the unit should wait forever and show the last result until it receives the next input.	0.1 ... 99.9 sec		<b>5.0</b>
	<b>The setting of this parameter automatically limits the minimum input frequency correspondingly. With "WAit" set to e.g. 0.1 sec. the unit will respond to frequencies &gt; 10 Hz only and all lower frequencies will display 0.</b>			
<b>FiLteR</b>	<b>Average Filter</b> Selectable averages filter to suppress unstable display with unsteady input frequencies.			<b>OFF</b>
	No filtering. 2, 4, 8, 16 = number of floating average cycles.	<b>OFF</b> <b>16</b>	0 1	

\* OS only with LD303 & LD305 models

## 7.2.3 Timer, Stopwatch

Please note that open NPN inputs are always "HIGH" and open PNP inputs are always "LOW".

Menu		Setting Range	OS*	Default
<b>bAse</b>	<b>Time base / Resolution of the timer</b>			<b>SEC.000</b>
	Milliseconds	<b>SEC.000</b>	0	
	1/100 of a second	<b>SEC.00</b>	1	
	1/10 of a second	<b>SEC.0</b>	2	
	Integer seconds	<b>SEC</b>	3	
	Minutes with two decimal positions	<b>min.00</b>	4	
	Minutes with one decimal position	<b>min.0</b>	5	
	Hours : minutes : seconds	<b>H-m-S</b>	6	
<b>StArt</b>	<b>Start / Stop of time measurement</b>			<b>St_SP</b>
	Time count is active while input A is HIGH. Rising edge on input A starts the count. Rising edge on input B stops the count.	<b>Hi_Loo</b>	0	
	Period time measurement. Repeating display of the time between two rising edges on input A.	<b>St_SP</b>	1	
	Time count is active while input A is LOW.	<b>A_StSP</b>	2	
		<b>Loo_Hi</b>	3	
<b>rESEt</b>	<b>Auto Reset</b>			<b>no</b>
	Time count goes on and never restarts. No automatic Reset. Use the Reset input to set to zero.	<b>no</b>	0	
	Every start initializes a new count starting from zero.	<b>YES</b>	1	
<b>LAtch</b>	<b>Latch Function</b>			<b>no</b>
	Real time display, count visible.	<b>no</b>	0	
	Frozen display of the final count result after every Stop. The timer counts in the background.	<b>YES</b>	1	

\* OS only with LD303 & LD305 models

## 7.2.4 Count, Counter mode

Menu		Setting Range	OS*	Default
<b>modE</b>	<b>Counting Mode</b>			<b>A_b . 1</b>
	Input A counts and input B selects the counting direction (LOW = increment, HIGH = decrement).	<b>A_bdir</b>	0	
	Summing counter, A + B.	<b>A u b</b>	1	
	Differential counter, A - B.	<b>A - b</b>	2	
	Quadrature up/down counter A/B with single edge count (x1).	<b>A_b . 1</b>	3	
	Quadrature up/down counter A/B with double edge count (x2).	<b>A_b . 2</b>	4	
	Quadrature up/down counter A/B with (x4) edge count.	<b>A_b . 4</b>	5	
<b>FActor</b>	<b>Impulse Scaling Factor</b> Example: setting 1.2345 results in display of 12 345 after 10 000 input pulses.	0.0001 ... 9.9999		<b>1.0000</b>
<b>SEt</b>	<b>Set Value</b> Every Reset signal will set the display to the value entered here.	-199 999 ... 999 999		<b>0</b>
<b>rESEt</b>	<b>Reset/Set Enable</b>			<b>Fr u E</b>
	No setting or resetting of the counter is possible.	<b>no</b>	0	
	Set / Reset by the front <b>SET</b> key.	<b>Front</b>	1	
	Set / Reset by remote signal to the Reset input.	<b>E_tErn</b>	2	
	Set / Reset by front <b>SET</b> key and by external input.	<b>Fr u E</b>	3	
<b>dPoint</b>	<b>Decimal Point</b> Select the desired position as shown in the display. no decimal point one decimal position ----> five decimal positions	000000 00000.0 0.00000		<b>000.000</b>

\* OS only with LD303 & LD305 models



### NOTE

- The counting range of the unit is limited from -100000 to 999999. In case of underflow or overflow the unit will display **-----**.
- The counter stores all counting data also in power-down state (EEProm with data retention >10 years).
- With the summing mode (A+B) and the differential mode (A-B) please note that the impulse scaling factor will only affect input A and input B will be scaled with a fixed factor of 1.0000.

## 7.2.5 Speed from differential time between a Start and a Stop input

Input A operates as a start input and input B operates as a Stop input. The differential time between start and stop will be converted into the speed of the passing object.

Menu		Setting Range	Default
<b>time</b>	<b>Time</b> Enter a typical delay time which you expect between the start and stop signals.	000.001 ... 999.999 sec	<b>1.000 sec</b>
<b>diSPL</b>	<b>Display Value</b> Enter the speed you would like to see in the display when an object passes within above time.	000.001 ... 999.999	<b>1.000</b>
<b>dPoint</b>	<b>Decimal Point</b> Select the desired position as shown in the display. no decimal point one decimal position ----> five decimal positions	000000 00000.0 0.00000	<b>000.000</b>
<b>WAit</b>	<b>Wait Time</b> How long should the last result remain in the display before it returns to zero? Set the desired waiting time. With setting "0" the display will freeze and wait until the next measuring cycle.	0.00 ... 9.99	<b>1.00</b>

## 7.2.6 Linearisation points

The linearisation points will only appear with "rPm" or "Count" operation modes when Linearisation is enabled.

Menu		Setting Range	Default
<b>P01_X</b>	<b>Linearisation point 1</b> X value of the first interpolation point.	-199999 ... 999999	<b>999999</b>
<b>P01_Y</b>	<b>Linearisation point 1</b> Y value of the first interpolation point.	-199999 ... 999999	<b>999999</b>
	...		
	...		
<b>P16_X</b>	<b>Linearisation point 16</b> X value of the 16. interpolation point.	-199999 ... 999999	<b>999999</b>
<b>P16_Y</b>	<b>Linearisation point 16</b> Y value of the 16. interpolation point.	-199999 ... 999999	<b>999999</b>

For more details about linearisation please refer to the "8.1 Linearisation" section on page 40.

## 7.3 Model LD301: additional settings for the analogue output

The Basic menu provides the following additional settings:

Menu		Setting Range	OS**	Default
<b>A-ChAr</b>	<b>Analogue characteristics</b> Select one of the following options: +/- 10 V (bipolar) 0-10 V (positive output only) 4-20 mA current output. 0-20 mA current output  When you set the output to +/- 10 Volts, your input signals A/B must be of quadrature type with phase displacement. The polarity of the output follows the sign in the display (operation as a counter - Count mode- or as a speed display -SPEEd mode- with detection of direction of rotation).	- 10_ 10 0_ 10 4_ 20 0_ 20	0 1 2 3	<b>0_ 10</b>
<b>OFFSEt</b>	<b>Analogue Offset *</b> Set this register to "0" when your output range should begin at zero (or 4 mA) If you desire another initial output value, set this register correspondingly. Setting 5.000 means your output will start at 5 Volts instead of zero.	-9.999 ... +9.999		<b>0.000</b>
<b>GAin</b>	<b>Analogue Gain *</b> Set the analogue stroke you desire: setting 1000 means 10 Volts or 20 mA. Setting 200 reduces the stroke to 2 Volts or 4 mA.	00.00 ... 99.99		<b>10.00</b>

\* See the next page for more details.

\*\* OS only with LD303 & LD305 models

### Response time of the analogue output:

Operation mode	Response time analogue output
Tachometer, frequency meter (see the "7.2.1 RPM, operation as tachometer or frequency counter" section on page 26)	330 ms at $f > 3$ Hz $1/f$ at $f < 3$ Hz
Baking time / processing time indicator (see the "7.2.2 Time, display of baking or processing time (reciprocal speed)" section on page 27)	330 ms at $f > 3$ Hz $1/f$ at $f < 3$ Hz
Timer, Stopwatch (see the "7.2.3 Timer, Stopwatch" section on page 28)	7 ms (With latch function after every measurement)
Counter for position or event (see the "7.2.4 Count, Counter mode" section on page 29)	Counter value + 7 ms
Speed calculation from differential transition time (see the "7.2.5 Speed from differential time between a Start and a Stop input" section on page 30)	Runtime + 7 ms

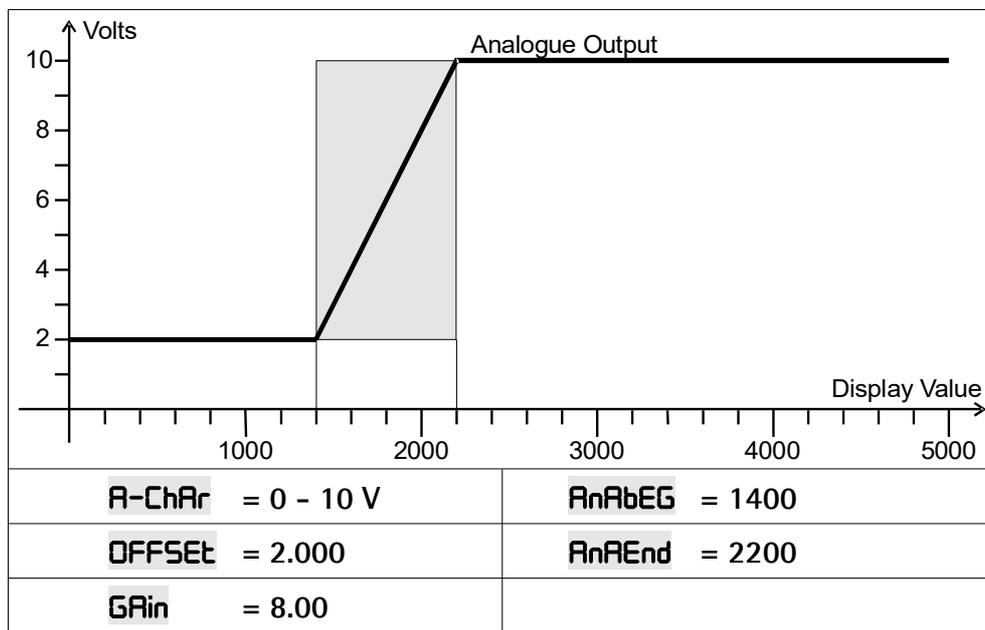
The analogue output behaves as the display output.

The following Operational Parameters provide scaling of the analogue output:

Menu		Setting Range	Default
<b>AnAbEG</b>	<b>Analogue-Begin</b> Start value of the analogue output.	-199999 ... 999999	<b>0</b>
<b>AnAEnd</b>	<b>Analogue-End</b> End value of the analogue output.	-199999 ... 999999	<b>10000</b>

By means of these two parameters any window of the whole display range can be mapped onto the analogue output.

The example below shows how to convert the display range from 1400 to 2200 into an analogue signal of 2 - 10 volts.



**NOTE**

All settings refer to the scaled values which are shown in the display of the unit.

### 7.4 Models LD302 & LD305: additional settings for preselections

The basic set-up menu provides the following additional parameters:

Menu	Range	OS****	Default
<b>CHAR 1</b>	Switching characteristics of output 1		<b>--r GE</b>
	<b>--r GE</b>	0	<b>Greater/Equal:</b> output to switch <b>statically</b> "ON" when display value $\geq$ preset value.
	<b>--r LE</b>	1	<b>Lower/Equal:</b> output to switch <b>statically</b> "ON" when display value $\leq$ preset value.
	<b>_n_ GE</b>	2	<b>Greater/Equal:</b> output to switch <b>dynamically</b> "ON" when display value $\geq$ preset value. (timed pulse output *)
	<b>_n_ LE</b>	3	<b>Lower/Equal:</b> output to switch <b>dynamically</b> "ON" when display value $\leq$ preset value. (timed pulse output *)
	<b>_n_ rES</b>	4	<b>Reset:</b> Timed impulse output *) and automatic Reset to zero when the display value reaches Preset 1.
	<b>_n_ SEt</b>	5	<b>Set:</b> Timed impulse output *) and automatic setting to preset 1 when the display value reaches zero.
<b>CHAR 2</b>	Switching characteristics of output 2		<b>--r GE</b>
	<b>--r GE</b>	0	See <b>CHAR 1</b> .
	<b>--r LE</b>	1	See <b>CHAR 1</b> .
	<b>_n_ GE</b>	2	See <b>CHAR 1</b> .
	<b>_n_ LE</b>	3	See <b>CHAR 1</b> .
	<b>--r 1-2</b>	4	Output switches <b>statically</b> ON when display value $\geq$ <u>Preset 1 - Preset 2</u> **.
	<b>_n_ 1-2</b>	5	Output switches <b>dynamically</b> ON when display value $\geq$ <u>Preset 1 - Preset 2</u> **.
<b>HYS 1</b>	Hysteresis 1: adjustable hysteresis for output 1 ***. Setting range 0 ... 99999 display units.		0
<b>HYS 2</b>	Hysteresis 2: adjustable hysteresis for output 2 ***. Setting range 0 ... 99999 display units.		0

\* Fixed pulse duration of 500 msec (factory adjustable only).

\*\* This feature is meant to generate an anticipation signal with a fixed distance to the preset 1 signal. The anticipation automatically follows the setting of preset 1 (trailing preset).

\*\*\* Switching hysteresis is only active with "rPm" and "timE" operation modes.

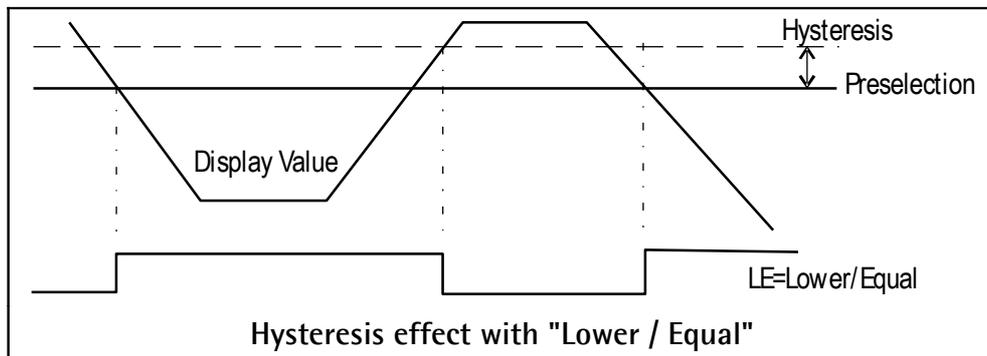
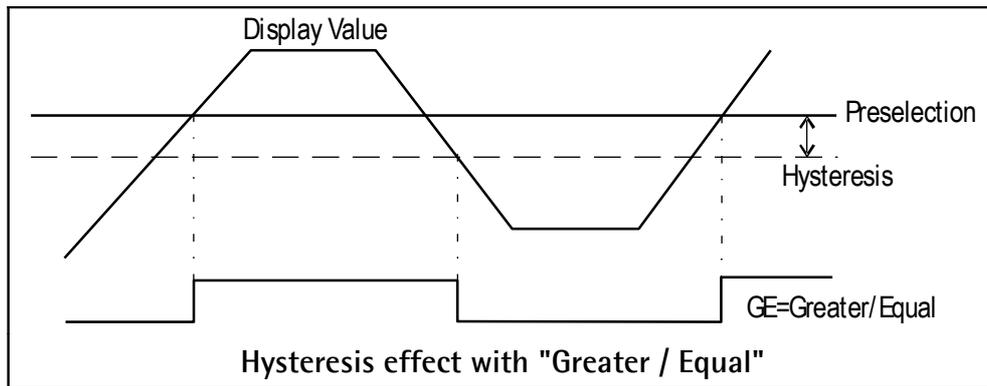
\*\*\*\* OS only with LD303 & LD305 models.

The following operational parameters provide setting of the switching points:

Menu		Setting Range	Default
<b>PrES_1</b>	Preselection 1	-199999 ... 999999	<b>10000</b>
<b>PrES_2</b>	Preselection 2	-199999 ... 999999	<b>5000</b>

The working direction of the Hysteresis depends on the setting of the switching characteristics.

With settings "GE" or "LE" respectively, the following switch points will result:



It is possible to check up on the actual switching state of the outputs at any time.

To do this, just tap on the **ENTER** key shortly.

The display will then show for the next two seconds one of the following information:

Display	Meaning
<b>1_2oFF</b>	Both outputs are actually off.
<b>1_2on</b>	Both outputs are actually on.
<b>1 on</b>	Output 1 is on.                      Output 2 is off.
<b>2on</b>	Output 1 is off.                      Output 2 is on.

## 7.5 Models LD303 & LD305: additional settings for the serial interface

The basic set-up menu contains the main parameters for configuration of the serial interface.

Menu		Setting Range	OS*	Default																				
<b>S-Unit</b>	<b>Serial Unit Number</b> You can assign any address number between 11 and 99 to your unit. The address must <u>not</u> contain a "0" because such numbers are reserved for collective addressing.	0 ... 99		11																				
<b>S-Form</b>	<b>Serial data format</b> The first character indicates the number of Data Bits. The second character specifies the Parity Bit ("even" or "odd" or "none") The third character indicates the number of Stop Bits.	<table border="1"> <tr><td>7 E 1</td><td>0</td></tr> <tr><td>7 E 2</td><td>1</td></tr> <tr><td>7 0 1</td><td>2</td></tr> <tr><td>7 0 2</td><td>3</td></tr> <tr><td>7 no 1</td><td>4</td></tr> <tr><td>7 no 2</td><td>5</td></tr> <tr><td>8 E 1</td><td>6</td></tr> <tr><td>8 0 1</td><td>7</td></tr> <tr><td>8 no 1</td><td>8</td></tr> <tr><td>8 no 2</td><td>9</td></tr> </table>	7 E 1	0	7 E 2	1	7 0 1	2	7 0 2	3	7 no 1	4	7 no 2	5	8 E 1	6	8 0 1	7	8 no 1	8	8 no 2	9		7 E 1
7 E 1	0																							
7 E 2	1																							
7 0 1	2																							
7 0 2	3																							
7 no 1	4																							
7 no 2	5																							
8 E 1	6																							
8 0 1	7																							
8 no 1	8																							
8 no 2	9																							
<b>S-bAUD</b>	<b>Baud rate</b> The following baud rates can be selected.	<table border="1"> <tr><td>9600</td><td>0</td></tr> <tr><td>4800</td><td>1</td></tr> <tr><td>2400</td><td>2</td></tr> <tr><td>1200</td><td>3</td></tr> <tr><td>600</td><td>4</td></tr> <tr><td>19200</td><td>5</td></tr> <tr><td>38400</td><td>6</td></tr> </table>	9600	0	4800	1	2400	2	1200	3	600	4	19200	5	38400	6		9600						
9600	0																							
4800	1																							
2400	2																							
1200	3																							
600	4																							
19200	5																							
38400	6																							

\* OS only with LD303 & LD305 models

The following operational parameters provide setting of the communication profile:

Menu		Setting Range	OS*	Default																
<b>S-tim</b>	<p><b>Serial Timer</b></p> <p>Setting 0.000 allows manual activation of a serial data transmission at any time. All other settings specify the cycle time for automatic transmission (provided the <b>S-mod</b> item is set to "Printer-mode" (see the next item and on page 39).</p> <p>Between two transmission cycles the unit will allow a pause depending on the baud rate. The minimum cycle times for timer transmissions are shown in the table.</p> <table border="1"> <thead> <tr> <th>Baud Rate</th> <th>Minimum Cycle Time [msec]</th> </tr> </thead> <tbody> <tr> <td>600</td> <td>384</td> </tr> <tr> <td>1200</td> <td>192</td> </tr> <tr> <td>2400</td> <td>96</td> </tr> <tr> <td>4800</td> <td>48</td> </tr> <tr> <td>9600</td> <td>24</td> </tr> <tr> <td>19200</td> <td>12</td> </tr> <tr> <td>38400</td> <td>6</td> </tr> </tbody> </table>	Baud Rate	Minimum Cycle Time [msec]	600	384	1200	192	2400	96	4800	48	9600	24	19200	12	38400	6	0.000; 0.010 ... 9.999 sec		<b>0.1 sec</b>
Baud Rate	Minimum Cycle Time [msec]																			
600	384																			
1200	192																			
2400	96																			
4800	48																			
9600	24																			
19200	12																			
38400	6																			
<b>S-mod</b>	<p><b>Serial Mode</b></p> <p>Operation according to communication profile (see the "7.5.1 PC-Mode" section on page 37).</p> <p>Transmission of string type 1 (see the "7.5.2 Printer-Mode" section on page 39).</p> <p>Transmission of string type 2 (see the "7.5.2 Printer-Mode" section on page 39).</p>	<table border="1"> <tbody> <tr> <td><b>PC</b></td> <td>0</td> </tr> <tr> <td><b>Print 1</b></td> <td>1</td> </tr> <tr> <td><b>Print2</b></td> <td>2</td> </tr> </tbody> </table>	<b>PC</b>	0	<b>Print 1</b>	1	<b>Print2</b>	2		<b>PC</b>										
<b>PC</b>	0																			
<b>Print 1</b>	1																			
<b>Print2</b>	2																			
<b>S-Code</b>	<p><b>Serial Register-Code</b></p> <p>It specifies the register code of the data to be transmitted. The most important register codes are the current display value and the serial Set/Reset command code.</p> <table border="1"> <thead> <tr> <th>Register</th> <th>S-Code</th> <th>ASCII</th> </tr> </thead> <tbody> <tr> <td>Actual display value</td> <td>101</td> <td>: 1</td> </tr> <tr> <td>Activate SET /RESET</td> <td>60</td> <td>6 0</td> </tr> </tbody> </table>	Register	S-Code	ASCII	Actual display value	101	: 1	Activate SET /RESET	60	6 0	100 ... 120		<b>101</b>							
Register	S-Code	ASCII																		
Actual display value	101	: 1																		
Activate SET /RESET	60	6 0																		

\* OS only with LD303 & LD305 models

### 7.5.1 PC-Mode

Communication in PC mode allows free readout of all parameters and registers of the unit. The example below shows the details of communication for serial readout of the current display value.



This is the general format of a serial request string:

EOT	AD1	AD2	C1	C2	ENQ
EOT = Control character (Hex 04)					
AD1 = Unit address, High Byte					
AD2 = Unit address, Low Byte					
C1 = Register code, High Byte					
C2 = Register code, Low Byte					
ENQ = Control character (Hex 05)					



#### EXAMPLE

Request for the current display value from unit number 11.

ASCII-Code	EOT	1	1	:	1	ENQ
Hexadecimal	04	31	31	3A	31	05
Binary	0000 0100	0011 0001	0011 0001	0011 1010	0011 0001	0000 0101

Upon a correct request the unit will respond as shown on the right. Leading zeros will be suppressed.

BCC represents a block check character generated from an Exclusive-OR of all characters from C1 through ETX (inclusively).

STX	C1	C2	x x x x x x x	ETX	BCC
STX = Control character (Hex 02)					
C1 = Register code, High Byte					
C2 = Register code, Low Byte					
x x x x x = Register data					
ETX = Control character (Hex 03)					
BCC = Block check character					

With incorrect request strings, the unit only responds STX C1 C2 EOT or just NAK.

Provided the current display value of the unit is "-180" for instance, the full response of the unit will be as shown below:

ASCII	STX	:	1	-	1	8	0	ETX	BCC
Hex	02	3A	31	2D	31	38	30	03	1C
Binary	0000 0010	0011 1010	0011 0001	0010 1101	0011 0001	0011 1000	0011 0000	0000 0011	0001 1100

Again BCC represents the block check character formed from the Exclusive-OR of all characters from C1 through ETX.

Units with serial link also allow setting or resetting the counter by serial command (similar to the external input or front key function). To activate the Reset command, please write "1" in register code "60". To release the Reset command again, write "0" in the same register.



### EXAMPLE

The following strings show how to set or reset a unit with unit No. 11:

#### Reset ON:

<b>ASCII</b>	EOT	AD1	AD2	STX	C1	C2	Data	ETX	BCC
<b>Hex</b>	04	31	31	02	36	30	31	03	34
<b>Binary</b>	0000 0100	0011 0001	0011 0001	0000 0010	0011 0110	0011 0000	0011 0001	0000 0011	0011 0100

#### Reset OFF:

<b>ASCII</b>	EOT	AD1	AD2	STX	C1	C2	Data	ETX	BCC
<b>Hex</b>	04	31	31	02	36	30	30	03	35
<b>Binary</b>	0000 0100	0011 0001	0011 0001	0000 0010	0011 0110	0011 0000	0011 0000	0000 0011	0011 0101

For more details about serial communication please refer to the additional documentation: MAN Serial Protocol IFxx\_LD25x\_LD30x I\_E.pdf.

## 7.5.2 Printer-Mode

The Printer mode allows cyclic or manual activation of transmissions of the specified register data. The corresponding register can be specified by means of parameter **S-CodE**.

Another parameter called **S-mod** allows the selection between two different string types:

"S-mod"	Transmission string type									
"Print1"	Space	Sign	Data						Line feed	Carriage return
		+/-	X	X	X	X	X	X	LF	CR
"Print2"	Sign	Data						Carriage return		
	+/-	X	X	X	X	X	X	CR		

The mode of activation of serial transmissions can be determined as follows:

Cyclic (timed) transmissions	<p>Set the <b>S-tim</b> item (see on page 35) to any value <math>\geq 0.010</math> sec.</p> <p>Select the desired string type next to the <b>S-mod</b> parameter.</p> <p>After exiting the menu the timed transmissions will start automatically.</p>
Manual activation of transmissions	<p>Set the <b>S-tim</b> item (see on page 35) to 0.000.</p> <p>Select the desired string type next to the <b>S-mod</b> parameter.</p> <p>After exiting the menu a transmission can be activated at any time by shortly pressing the <b>ENTER</b> key.</p>

## 8 Special functions

### 8.1 Linearisation

This function allows a non-linear input signal to be converted into a linear representation or vice versa. 16 interpolation points are available, they can be freely arranged over the whole measuring range at any distance. Between two points the unit will interpolate automatically straight lines.

It is advisable to set several points into areas with strong bending and to use only a few points in areas with little bending. "Linearisation Mode" has to be set to either **1-quA** or **4-quA** (see **Lmode** item in the "7.1 Basic settings" section) to enable the linearisation function (see drawing below).

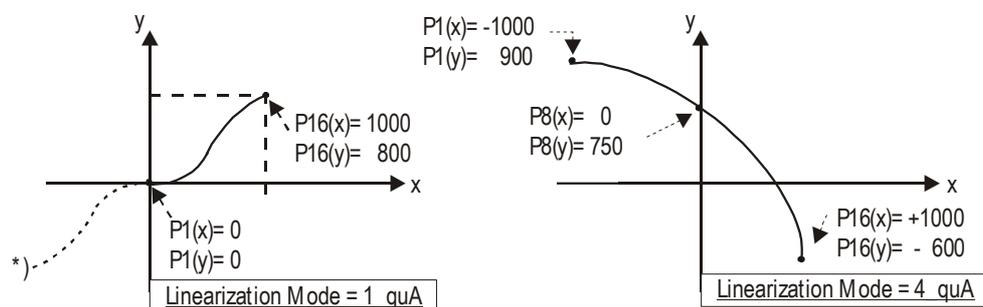
Parameters **P0 L<sub>x</sub>** to **P16 L<sub>x</sub>** select 16 x- coordinates, representing the display values which the unit would normally show in the display. With parameters **P0 L<sub>y</sub>** to **P16 L<sub>y</sub>** you can specify which values you would like to display instead of the corresponding **\_x** values.

This means e.g. that the unit will replace the previous **P02 L<sub>x</sub>** value with the new **P02 L<sub>y</sub>** value.



#### NOTE

- With respect to the consistency of the linearisation, the x- registers have to use continuously increasing values, e.g. the x- registers must conform to the constraint **P0 L<sub>x</sub> < P02 L<sub>x</sub> < ... < P15 L<sub>x</sub> < P16 L<sub>x</sub>**.
- Independently of the selected linearisation mode, the possible setting range of all registers **P0 L<sub>x</sub>, P0 L<sub>y</sub>, ..., P16 L<sub>x</sub>, P16 L<sub>y</sub>** is always -199999 ... 999999.
- With measuring values lower than **P0 L<sub>x</sub>** the display will always show **P0 L<sub>y</sub>**.
- With measuring values higher than **P16 L<sub>x</sub>**, the display will always show **P16 L<sub>y</sub>**.

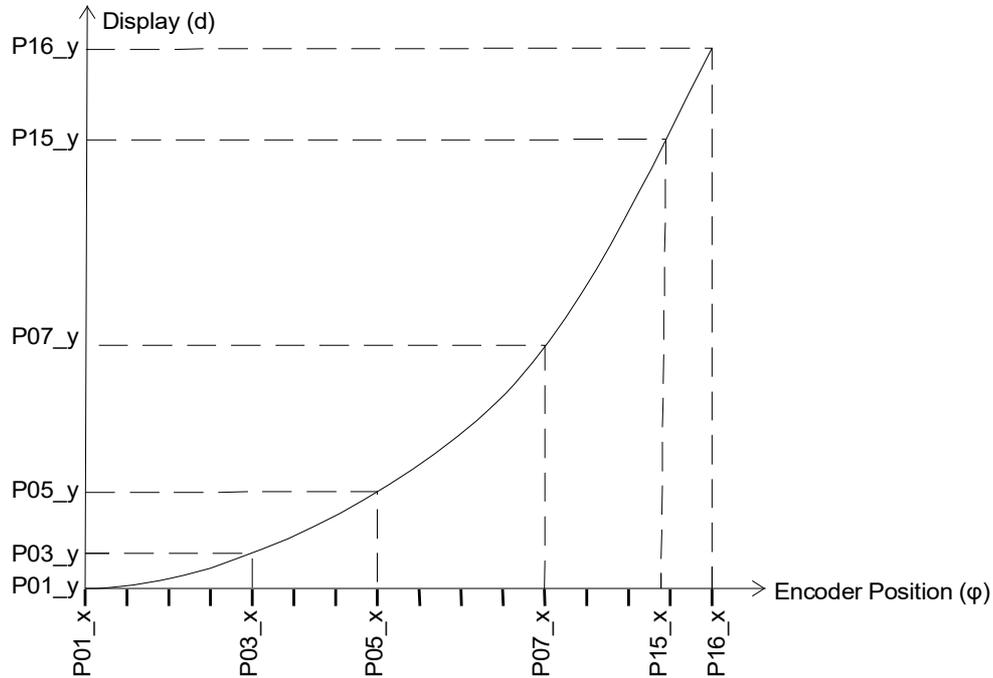
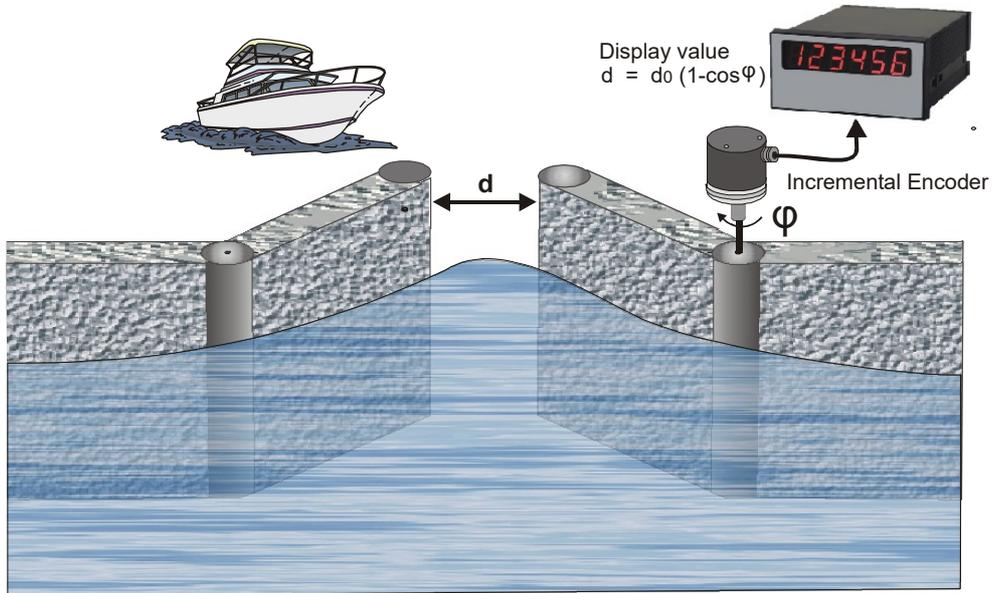


\* Mirror of positive range



## EXAMPLE

The picture below shows a sluiceway where the gate is controlled by means of an incremental encoder. We would like to display the clearance of the gate "d", the existing encoder information is proportional to the angular information  $\varphi$ .



## 8.2 Manual input or "teaching" of the interpolation points

Interpolation points to form the linearisation curve can be entered one after each other, using the same procedure as for all other numeric parameters. This means you will have to enter all parameters **PO 1\_x** to **P 16\_x** and **PO 1\_y** to **P 16\_y** manually using the keypad.



### WARNING

During manual input of interpolation points the unit will not examine the settings **PO 1\_x** to **P 16\_x**. Therefore the operator is responsible for adherence to the constraint **PO 1\_x < PO 2\_x < ... < P 15\_x < P 16\_x**.

In most cases it should however be much more convenient to use the Teach function.

For this method we have to move the encoder, step by step, from one interpolation point to the next. After each step we enter the desired display value through the keypad.

### How to use the "Teach" function

- Please select the desired range of linearisation (see the "7.1 Basic settings" section on page 24).
- Hold down the **CMD** key for 3 seconds, until the display shows **TEACH**. Now the unit has switched over to the Teach mode. To start the teach procedure please press again the **CMD** key within the next 10 seconds. The display will then show **PO 1\_X**.
- With respect to the consistency required for linearisation, all parameters from **PO 1\_x** to **P 16\_y** will be overwritten by suitable initial values first. Initial values for **PO 1\_x** and **PO 1\_y** are -199999 and all other values will start with 999999.
- Press once more **CMD** key to display the current encoder position. Then move the encoder to the first of the desired interpolation points.
- When you read the x-value of your first interpolation point in the display, press **CMD** key again. This will automatically store the current display value in the **PO 1\_x** register. For about 1 second you will read **PO 1\_y** on the display, followed by the same reading again that has been stored previously.
- This display value now can be edited like a regular parameter and you can change it to the desired **PO 1\_y** value.
- When you read the desired **PO 1\_y** value in your display, save it by pressing **CMD** key again. This will cause the display to automatically scroll to the next interpolation point **PO 2\_x**.

- Once we have reached and stored the last interpolation points **P 16\_x/y**, the routine will restart with **PO I\_x** again. You are free to double-check your settings once more or to make corrections.
- To finish the Teach procedure, keep **ENTER** key down for about 2 seconds. In the display you will read **StOP** for a short time and then the unit returns to the normal operation. At the same time all linearisation points have been finally saved.

**NOTE**

- The unit will examine the constraint valid for the x-values of interpolation points. Every interpolation point must be higher than its preceding point. If this constraint is breached, all 6 decimal points will blink automatically as a warning. Pressing the **CMD** key will not store the illegal value, but result in an error text **E.r.r.-L.O.**
- To exit the teach mode again, you have the following two possibilities:
  1. Press the **ENTER** key for 2 seconds. On the display you will read **StOP** for a short time and then the unit will switch back to the normal mode.
  2. Just do nothing. After 10 seconds the unit will switch back to the normal mode automatically. In both cases the parameters of linearisation **PO I\_x** to **P 16\_y** will not change.

## 9 Parameters list

### 9.1 General

Description	Text	Min. value	Max. value	Default value	Positions	Characters	Serial code
See the "7.1 Basic settings" section on page 24							
Unit Type	TYPE	0	4	0	1	0	00
Characteristic	CHAR	0	1	1	1	0	01
Brightness	briGht	0	4	0	1	0	02
Code	CoDE	0	2	0	1	0	03
See the "7.2.1 RPM, operation as tachometer or frequency counter" section on page 26							
Frequency (Hz)	FrEqu	1	25000	1000	5	0	04
Display Value	diSPL	1	99999	1000	5	0	05
Decimal point	dPoint	0	5	3	1	0	06
Wait Time (sec)	WAIt	1	999	10	3	1	07
Average Filter	FIltEr	0	4	0	1	0	08
See the "7.2.2 Time, display of baking or processing time (reciprocal speed)" section on page 27							
Display Format	diSFor	0	3	0	1	0	09
Frequency (Hz)	FrEqu	1	25000	100	5	0	10
Display Value	diSPL	1	999999	100	6	0	11
Wait Time (sec)	WAIt	1	999	50	3	1	12
Average Filter	FIltEr	0	4	0	1	0	13
See the "7.2.3 Timer, Stopwatch" section on page 28							
Base	bASE	0	6	0	1	0	14
Start / Stop	StArt	0	3	1	1	0	15
Auto Reset	rESEt	0	1	0	1	0	16
Latch Function	LAtch	0	1	0	1	0	17
See the "7.2.4 Count, Counter mode" section on page 29							
Count Mode	modE	0	5	3	1	0	18
Factor	FRActoR	1	99999	10000	5	4	19
Set Value	SEt	-199999	999999	0	86	0	20
Reset / Set	rESEt	0	3	3	1	0	21
Decimal point	dPoint	0	5	0	1	0	22
See the "7.2.5 Speed from differential time between a Start and a Stop input" section on page 30							
Measuring Time (sec)	timE	1	999999	1000	6	3	23
Display Value	diSPL	1	999999	1000	6	0	24
Decimal point	dPoint	0	5	0	1	0	25
Wait Time (s)	WAIt	0	999	100	3	1	26

## 9.2 Linearisation

See the "7.2.6 Linearisation points" section on page 30

Description	Text	Min. value	Max. value	Default value	Positions	Characters	Serial code
L_Mode	LmodE	0	2	0	1	0	D2
P1(x)	P01_H	-199999	999999	999999	86	0	A0
P1(y)	P01_Y	-199999	999999	999999	86	0	A1
P2(x)	P02_H	-199999	999999	999999	86	0	A2
P2(y)	P02_Y	-199999	999999	999999	86	0	A3
P3(x)	P03_H	-199999	999999	999999	86	0	A4
P3(y)	P03_Y	-199999	999999	999999	86	0	A5
P4(x)	P04_H	-199999	999999	999999	86	0	A6
P4(y)	P04_Y	-199999	999999	999999	86	0	A7
P5(x)	P05_H	-199999	999999	999999	86	0	A8
P5(y)	P05_Y	-199999	999999	999999	86	0	A9
P6(x)	P06_H	-199999	999999	999999	86	0	B0
P6(y)	P06_Y	-199999	999999	999999	86	0	B1
P7(x)	P07_H	-199999	999999	999999	86	0	B2
P7(y)	P07_Y	-199999	999999	999999	86	0	B3
P8(x)	P08_H	-199999	999999	999999	86	0	B4
P8(y)	P08_Y	-199999	999999	999999	86	0	B5
P9(x)	P09_H	-199999	999999	999999	86	0	B6
P9(y)	P09_Y	-199999	999999	999999	86	0	B7
P10(x)	P10_H	-199999	999999	999999	86	0	B8
P10(y)	P10_Y	-199999	999999	999999	86	0	B9
P11(x)	P11_H	-199999	999999	999999	86	0	C0
P11(y)	P11_Y	-199999	999999	999999	86	0	C1
P12(x)	P12_H	-199999	999999	999999	86	0	C2
P12(y)	P12_Y	-199999	999999	999999	86	0	C3
P13(x)	P13_H	-199999	999999	999999	86	0	C4
P13(y)	P13_Y	-199999	999999	999999	86	0	C5
P14(x)	P14_H	-199999	999999	999999	86	0	C6
P14(y)	P14_Y	-199999	999999	999999	86	0	C7
P15(x)	P15_H	-199999	999999	999999	86	0	C8
P15(y)	P15_Y	-199999	999999	999999	86	0	C9
P16(x)	P16_H	-199999	999999	999999	86	0	D0
P16(y)	P16_Y	-199999	999999	999999	86	0	D1

## 9.3 Analogue output (model LD301)

See the "7.3 Model LD301: additional settings for the analogue output" section on page 31

Description	Text	Min. value	Max. value	Default value	Positions	Characters	Serial code
Analogue Start	RnRbEG	-199999	999999	0	86	0	31
Analogue End	RnREnd	-199999	999999	10000	86	0	32
Analogue Mode	R-ChAr	0	3	1	1	0	33
Offset	OFFSEt	-9999	9999	0	84	3	34
Gain	GRin	0	9999	1000	4	2	35

## 9.4 Preselections (models LD302 & LD305)

See the "7.4 Models LD302 & LD305: additional settings for preselections" section on page 33

Description	Text	Min. value	Max. value	Default value	Positions	Characters	Serial code
Preselection Value 1	PrES_1	-199999	999999	10000	86	0	27
Preselection Value 2	PrES_2	-199999	999999	5000	86	0	28
Preselection Mode 1	CHAr_1	0	5	0	1	0	29
Preselection Mode 2	CHAr_2	0	5	0	1	0	30
Hysteresis 1	HYSt_1	0	99999	0	5	0	31
Hysteresis 2	HYSt_2	0	99999	0	5	0	32

## 9.5 Serial interface (models LD303 & LD305)

See the "7.5 Models LD303 & LD305: additional settings for the serial interface" section on page 35

Description	Text	Min. value	Max. value	Default value	Positions	Characters	Serial code
Serial Timer (s)	S-tim	0	9999	100	4	3	38
Serial Mode	S-mod	0	2	0	1	0	39
Serial Code	S-CodE	100	120	101	3	0	40
Serial Unit Nr	S-Unit	0	99	11	2	0	90
Serial Format	S-Form	0	9	0	1	0	92
Serial Baud rate	S-bAUd	0	6	0	1	0	91

This page intentionally left blank

Document release	Release date	Description
1.0	31.07.2011	First issue
1.1	03.08.2015	"WAIit" & "LmodE" parameters description updated, "Loo_Hi" parameter added, "4.4 Adjustable analogue output (LD301 model only)" section updated, OS range numbers added, revised edition
1.2	08.08.2017	General review, LD305 model added



Dispose separately

**lika**

**Lika Electronic**

Via S. Lorenzo, 25 • 36010 Carrè (VI) • Italy

Tel. +39 0445 806600

Fax +39 0445 806699



info@lika.biz • www.lika.biz