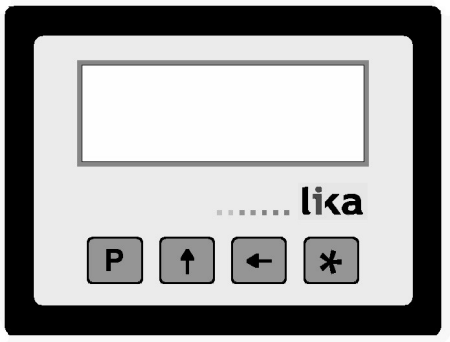
User manual

LD140-M7 + SM25
LD141-M7-R-...
LD142-M7-R-...

Description

This manual describes the LD14x battery display series and the sensors of the SM25 series. The purpose of this system is to display linear or angular displacements on industrial machines and automation systems. The measurement system includes a battery powered LCD display, a magnetic scale and a magnetic sensor. As the sensor is moved along the magnetic scale, it detects the displacement which is shown on the display. The flexibility of the scale allows for use in both linear and angular applications.



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1 - Safety summary

We strongly recommend carefully reading this user manual and following the installation guidelines:

- Sensor head should be installed as close as possible to the display.
- Avoid running the sensor cable near high voltage power cables (e.g. drive cables).
- Avoid mounting the sensor head near capacitive or inductive noise sources such as relays, motors and switching power supplies.

Connect according to "5 - Electrical connections".

2 - Identification

Display and sensor data are shown in the label (order code, serial number). This information is listed in the delivery document as well. For technical features please refer to the product catalogue.

3 - Installation

Install the device according to the protection level provided.
Protect the system against knocks, friction, solvents, temperatures below -0°C (32°F) and over +60°C (+140°F).
Be sure that the system is mounted where hard or sharp objects (e.g. metal chips) do not come into contact with the magnetic scale and the bottom of the sensor head. If these conditions cannot be avoided provide a wiper or pressurized air.

4 - Mounting recommendations

4.1 Display

Push the display into the cut-out without panel clips.
Mount the clips on the display housing and screw it until fixed and stable.
Power supply from 1.5V commercial battery type **C** (or AM2 / BABY / LR14 / MN1400 / SP/HP11).

4.2 Magnetic scale

Refer to the manual supplied with the scale.

4.3 Sensor mounting

4.3.1 Sensor SM25-R (rectangular)

The sensor can be fixed by means of two M3 screws over the buttonholes. Make sure that the gap between the sensor and the scale complies with the values in Figure 1 along the whole measuring length. Avoid contact between the parts. You can check planarity and parallelism between the sensor and the magnetic scale using a feeler gauge.

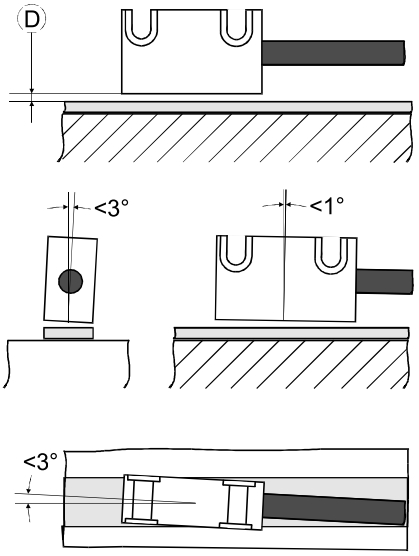


Figure 1

D = 0.1 mm – 1.0 mm

4.3.2 Sensor SM25-C (circular)

The sensor can be fixed in a corresponding mounting hole by means of the two nuts. Make sure that the gap between the sensor and the scale complies with the values in Figure 2 along the whole measuring length. **Please mind the correct alignment of the marker on the tape.** Avoid contact between the parts. You can check planarity and parallelism between the sensor and the magnetic scale using a feeler gauge.

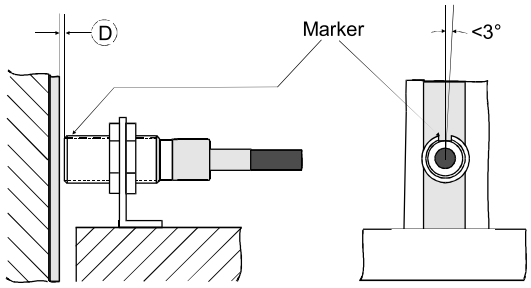


Figure 2

D = 0.1 mm – 1.0 mm

5 - Electrical connections

5.1 SM25 sensor

(only LD140)

Plug in the sensor's Mini-DIN connector (circular) on the backside of the display.

5.2 RS-232 serial interface

(only with option I1)

Connect the PC to the LD14x panel with a NULL MODEM COMPUTER AT CROSS OVER cable (9 pin female - 9 pin female) commercially available.

Electrical cable connection:

Pin PC	Function	Pin LD14x
1		
2	Rx	3
3	Tx	2
4	DTR	6 *
5	GND	5
6	DSR	
7	RTS	8 *
8	CTS	
9		

* Power supply has to be provided to RS-232 interface to save battery life. If not connected to the PC provide (8-15Vdc) power supply to pins 6 or 8. The external supply is not necessary if you use a Modem computer cable!

6 – Set up

6.1 Function of the keys

↑ : UP (select value)
← : Shift links (select digit)
***** : Save (save data)
P : Program (programming/change parameter)

6.2 Key combinations / Quick functions

6.2.1 Set datum (reference)

Press ***** key for 3 sec. to access the reset function ("**rESEt**" will be displayed).
Press **P** key to exit function (no reset).
Press ***** key twice to confirm datum value ("**donE**" will be displayed).
Display value = **rEF** + **OFS1** + **OFSx** (where OFSx is the currently set Offset value).
This function is enabled only if **F_rSt** parameter is set to **"yES"**.

6.2.2 Incremental measurement

Press **P** and ***** keys simultaneously to switch from

absolute (decimal point lit solidly) to incremental (blinking decimal point) measurement and vice versa.
Zero setting in incremental modes (see 6.2.1 Set datum (reference)) does not change the absolute value in the background.
The function is enabled only if **F_rEL** parameter is set to **"yES"**.

6.2.3 Mm/inch display modes
Mm/inch display mode can be changed by pressing ← key for 3 sec. The function is enabled only if **F_mmI** parameter is set to **"yES"**.

6.2.4 Changing the Offset value
Press **P** and ← keys simultaneously to display 1. Offset value (**OFS1**). Use ← and ↑ keys to change the value and save with ***** key. **OFS2** and **OFS3** Offset values can be changed only in setup menu.
Offset function is enable if **F_oFS** parameter is set to **"yES"**.
← key scrolls **OFS1**, **OFS2** and **OFS3** values.
OFS1 = actual value + **OFS1** + **rEF**
OFS2 = actual value + **OFS1** + **OFS2** + **rEF**
OFS3 = actual value + **OFS1** + **OFS3** + **rEF**

6.2.4.1 Fractional offset display
The fractional inch display mode allows to set offset values (**OFS**) in the following way:
- 1st digit blinking → increases 1/64" pressing ↑ key.
- 2nd digit blinking → increases 1/32" pressing ↑ key.
- 3rd digit blinking → increases 1/16" pressing ↑ key.
- 4th digit blinking → increases 1/8" pressing ↑ key.
- 5th digit blinking → increases 1" pressing ↑ key.
- 6th digit blinking → increases 10" pressing ↑ key.

6.2.5 Datum modification
Press **P** and ↑ keys simultaneously to display datum value **rEF**. Use ← and ↑ keys to change the value and save with ***** key.
This function is enabled only if **F_rEF** parameter is set to **"yES"**.

6.3 Setup / Parameter setting
Press **P** key for 3 sec. to enter setup, **"SEtUP"** is displayed.
Press ↑ key to enter **MENU 1** (parameters)
Press ***** key to enter **MENU 2** (RS-232 serial interface)
Press **P** key to access the next Parameter and Parameter setting.
Press **P** key for 3 s to exit the setup at any point.

6.3.1 Default parameters (factory settings)
All default values are written in **BOLD** characters.
The display can be reset to default parameters with the following procedure:
- remove the battery and wait 10 sec.;
- press ***** key (**"dEFPar"** is displayed) while inserting the battery.

6.3.2 Parameter list MENU 1
Unit
Measurement unit [dEC, FrEE, dG1, dG2, IdEC, Ifrct]
It sets the measurement unit and the display mode.
dEC = linear measurement display (decimal)
FrEE = display with conversion factor
dG1 = angular display (-∞..-0.1°..0.0°..+0.1°..+∞)
dG2 = angular display (..359.9°..0.0°..359.9°..0.0°..)
IdEC = inch display mode
Ifrct = fractional inch mode (eg. 12.31.64 = 12" 31/64)
***** = save, **P** = next parameter, **P** for 3 s. = exit

COn
only with **Unit** = FrEE, dG1, dG2
It allows to set a free conversion factor to display non-metric units or angles.
Value range:
FrEE = 0.00001 – **1.00000**
dG1, dG2 = 0.00001 – 9.99999

Example 1
We want to display a 90° angle (from 0° to 90°) with 0.1° resolution on a round table having 785.4 mm circumference.
The measurement length on 360° is 785.4 mm, thus it is 785.4 / 4 = 196.35 on 90.0°.
COn = 900 : 19635 = 0.045836

Example 2
We want to display angles on a magnetic ring having a 114.5 mm diameter.
The circumference is 114.5 * 3.14 = 359.53 mm
COn = 3600 : 35953 = 0.10013
***** = save, **P** = next parameter, **P** for 3 s. = exit

rES

(only with Unit = dEC, FrEE, dG1, dG2, ldEC)
It sets the resolution to be displayed.
Unit = dEC, FrEE, dG1, dG2 = 0.001, 0.005, **0.01**, 0.05, 0.1, 0.5, 1
Unit = ldEC = 0.0001, 0.0005, **0.001**, 0.005, 0.01, 0.05, 0.1
***** = save, **P** = next parameter, **P** for 3 s. = exit

dIr

Counting direction [uP, dn]
uP = up (standard direction)
dn = down (inverted direction)
***** = save, **P** = next parameter, **P** for 3 s. = exit

6.3.3 Additional function of MENU 1

F_mmI

mm/inch function [yES, no]
It enables the mm/inch function (pressing ← key).
yES = enabled
no = disabled
***** = save, **P** = next parameter, **P** for 3 s. = exit

F_rEL

Incremental measurement function [yES, no]
It enables the incremental measurement function (by pressing **P** and ***** keys).
yES = enabled
no = disabled
***** = save, **P** = next parameter, **P** for 3 s. = exit

F_rSt

Datum function [yES, no]
It enables the datum function (pressing ***** key).
yES = enabled
no = disabled
***** = save, **P** = next parameter, **P** for 3 s. = exit

F_rEF

Datum modification function [yES, no]
It enables the reference modification function (pressing **P** and ↑ keys).
yES = enabled
no = disabled
***** = save, **P** = next parameter, **P** for 3 s. = exit

F_oFS

Offset modification function [yES, no]
It enables the offset modification function (pressing **P** and ← keys).
yES = enabled
no = disabled
***** = save, **P** = next parameter, **P** for 3 s. = exit

rEF

Datum value [-999999, 999999]
Absolute reference value for the measuring system. This value is displayed by pressing ***** key for 3 sec. (displayed value includes previously set offset values).
***** = save, **P** = next parameter, **P** for 3 s. = exit

OFS1

Offset1 value [-999999, 999999]
First offset value (e.g. tool correction). This value is added to the current value (see "6.2.4 Changing the Offset value").
***** = save, **P** = next parameter, **P** for 3 s. = exit

OFS2

Offset2 value [-999999, 999999]
Second Offset value. This value is added to the current value and **OFS1**.
***** = save, **P** = next parameter, **P** for 3 s. = exit

OFS3

Offset3 value [-999999, 999999]
Third Offset value. This value is added to the current value, **OFS1** and **OFS2**.
***** = save, **P** = next parameter, **P** for 3 s. = exit

When the setup is carried out the display shows "**rESEt**".
Press ***** key twice to reset the display and quit the setup. **"donE"** will be displayed.
Press **P** key to quit the setup without resetting the display. **"no rSt"** will be displayed.

6.3.4 Parameter list MENU 2

Ad xx

Device address [01, 31]
Setting of device address, only if the device is fitted with serial interface (option I1).

For setting use ← and ↑ keys.
***** = save, **P** = next parameter

H_cntr
Hour meter (1/10 h)
Elapsed time indication (display connected to battery). Resolution is 1/10 hour (6 minutes).
***** = save, **P** = next parameter

7 - RS232 serial interface (option I1)

If the display is provided with RS-232 serial interface, the following commands can be used.

7.1 RS232 parameters

9600 Baud rate, 8Bit, no Parity, 1 Stop bit, Xon/Xoff

7.2 Serial commands

Serial commands must have the following structure:

| A D C M N D = X
where:
|: PC keyboard symbol
AD: device address (00 to 31) 2 digits
CMND: command (see command list)
X: value range (see command list)

Upon receipt of a wrong command the display will answer with the same command + **?** and checksum (e.g. sent command: |02azs → answer |02azs?EF)
Any common terminal program can be used for communication with LD140 (e.g. Hyperterminal). Commands will be send after confirmation by **ENTER** key (carriage return).

Answers have the following structure:

ADCMND:SXXXXXXXXCK
where:
AD: device address
CMND: command
XXXXXXXX: value
CHKS: checksum

The checksum is equal to the least significant byte resulting from the sum of the hex values of all transmitted characters.

Example
The displayed position is 8.29. The position of the device with address 01 is read by means of the |01TPOS command.
The answer is: 01TPOS:+00000829**9F**
The sum of hex values of all characters is as follows:
30+31+54+50+4F+53+3A+2B+30+30+30+30+30+38+32+39 = 39F
The least significant byte of 39F is **9F** which is the checksum.

7.2.1 Command list

(below the device address is indicated with **AD**)

Zero-setting the device address
|**00**RSET
Address of all connected devices is set to zero (0).

Device address [1, 31]
|**00**INIT=X
It sets the address of all connected devices to X.

Display device address
|**00**DADR
It displays the device address until **P** key is pressed.

Change device address [1, 31]
|**AD**RADR=X
It changes the current device address AD to X.
Answer : ADTADR:+XCHKS (CHKS is the checksum and X is the value).

Read actual position
|**AD**TPOS
It reads the current position of the device **AD** (resolution of value is 0.01mm or 0.001 inch depending on settings).

Change counting direction [0, 1]
|**AD**RDIR=X
It sets the counting direction.
X=0 → uP = standard direction
X=1→ dn = inverted direction
Answer: ADTDIR:+0000000XCHKS

Read counting direction
|**AD**TDIR
It reads the current counting direction.
X=0→uP , X=1→dn
Answer: ADTDIR:+0000000XCHKS

Measurement unit [0, 5]
|**AD**RUNI=X
It sets the measurement unit and the display mode.
X=0→ dEC = decimal mode
X=1→ FrEE = display with conversion factor
X=2→ dG1 = angular (-∞..-0,1°..0.0°..+0.1°..+∞)
X=3→ dG2 = angular (..359.9°..0.0°..359.9°..0.0°..)
X=4→ IdEc = decimal inch display mode
X=5→ Ifrct = fractional (es. 12.31.64 = 12" $^{31}/_{64}$)
Answer: ADTUNI:+0000000XCHKS

Read measurement unit
|**AD**TUNI
It reads the state of the measurement unit.
Answer: ADTUNI:+0000000XCHKS

Resolution [1, 5, 10, 50, 100, 500, 1000]
|**AD**RRES=X
It sets the linear resolution in mm or *inch*.
X=1→ 0.001/*0.0001*, X=5→ 0.005/*0.0005*,
X=10→ 0.01/*0.001*, X=50→ 0.05/*0.005*,
X=100→ 0.1/*0.01*, X=500→ 0.5/*0.05*,
X=1000→ 1/*0.1*
Answer: ADTRES:+XCHKS

Read resolution
|**AD**TRES
It reads the current resolution value (see values above).
Answer: ADTRES:+XCHKS

Free conversion factor COn
[with FrEE 0.00001 – 1.00000 / with dG1, dG2 0.00001 – 9.99999]
|**AD**RFRE=X
It sets the free conversion factor **COn** (see 6.3.2 Parameter list MENU 1).
Answer: ADTFCO:+XCHKS

Read COn conversion factor
|**AD**TFCO
It reads the value of the current **COn** factor.
Answer: ADTFCO:+00X.XXXXCHKS

Display mm/inch display mode [0, 1]
|**AD**RMMI=X
It changes the display mode from mm to inch.
X=0→ mm, X=1→inch
Answer: ADTMMI:+0000000XCHKS

Read mm/inch display mode
|**AD**TMMI
It reads the mm/inch display mode state.
X=0→ mm, X=1→ inch
Answer: ADTMMI:+0000000XCHKS

Incremental measurement function [0, 1]
|**AD**RRLA=X
It enables the incremental measurement function (key combination **P** and *****).
X=0→ oFF , X=1→ on
Answer: ADTRAE:+0000000XCHKS

Read incremental measurement
|**AD**TRAE
It reads incremental measurement function state.
X=0→ oFF, X=1→ on
Answer: ADTRAE:+0000000XCHKS

Incremental measurement [0, 1]
|**AD**RRLA=X
It switches from absolute display mode to incremental display mode (relative).
X=0→ oFF, X=1→ on
Answer: ADTRAE:+0000000XCHKS

Read incremental measurement
|**AD**TRLA
It reads the absolute/incremental display mode state.
X=0→ oFF, X=1→ on
Answer: ADTRLA:+0000000XCHKS

Datum function [0, 1]
|**AD**RRSE=X
It enables the Datum function (pressing ***** key).
X=0→ oFF, X=1→ on
Answer: ADTRSE:+0000000XCHKS

Read Datum function
|**AD**TRSE
It reads the Datum function state.
X=0→ oFF, X=1→ on
Answer: ADTRSE:+0000000XCHKS

Datum value modification [0, 1]
|**AD**RRFE=X
It enables the Datum value modification (by key combination **P** and ↑).
X=0→ oFF, X=1→ on
Answer: ADTRFE:+0000000XCHKS

Read Datum value modification
|**AD**TRFE
It reads the Datum value modification state.
X=0→ oFF, X=1→ on
Answer: ADTRFE:+0000000XCHKS

Offset function [0, 1]
|**AD**ROFE=X
It enables the Offset function (by key combination **P** and ←)
X=0→ oFF, X=1→ on
Answer: ADTOFE:+0000000XCHKS

Read Offset function
|**AD**TOFE
It reads the Offset function state.
X=0→ oFF, X=1→ on
Answer: ADTOFE:+0000000XCHKS

Datum value [-999999, 999999]
|**AD**RREF=X
Absolute Reference value for the measurement system (the value has resolution 0.01 mm or 0.001 inch depending on the display settings).
Answer: ADRREF:XCHKS

Read Datum value
|**AD**TREF
It reads the current Datum value.
Answer: ADTREF:XCHKS

Offset1 value [-999999, 999999]
|**AD**ROF1=X
It sets the Offset1 (**OFS1**) value (the value has resolution 0.01).
Answer: ADROF1:XCHKS

Read Offset1 value
|**AD**TOF1
It reads the current Offset1 value.
Answer: ADTOF1:XCHKS

Offset2 value [-999999, 999999]
|**AD**ROF2=X
It sets the Offset2 (**OFS2**) value (the value has resolution 0.01).
Answer: ADROF2:XCHKS

Read Offset2 value
|**AD**TOF2
It reads the current Offset2 value.
Answer: ADTOF2:XCHKS

Offset3 value [-999999, 999999]
|**AD**ROF3=X
It sets the Offset3 (**OFS3**) value (the value has resolution 0.01).
Answer: ADROF3:XCHKS

Read Offset3 value
|**AD**TOF3
It reads the current Offset3 value.
Answer: ADTOF3:XCHKS

8 - Cut-out

8.1 LD140 and LD142

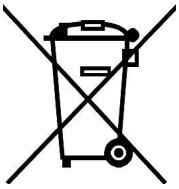
Provide a 94 x 68 mm (w x h) cut-out.

8.2 LD141

Check details on product catalogue.

Rev.	Man.Vers.	Description
0	1.0	1^ issue
	4.1	SW + Manual update
3	4.2	Section "5 - Electrical connections" update
4	4.3	Reset function section "6.2.1 Set datum (reference)" update
5	4.4	General review, section "6.2.2 Incremental measurement" update

Dispose separately



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