User manual

MC150

Description

This manual describes the MC150 display series. The purpose of this device is to display linear or angular displacements on industrial machines and automation systems. The device can be connected to standard Push-Pull or Line Driver incremental encoders or magnetic sensors.

Chapters

1 – Safety summary

For the electrical connections, we recommend to closely follow these electrical instructions. In particular, according to the 89/336/EEC norm on electromagnetic compatibility, following precautions must be taken:

- Measurement system (sensor) should be installed as close as possible to the display.
- Always use shielded and twisted cables if possible.
- Avoid running the sensor cable near high voltage power cables (e.g. drive cables).
- Install EMC filters on sensor power supply if needed.
- Avoid mounting sensor near capacitive or inductive noise sources such as relays, motors, and switching power supplies.
- Static discharge can damage internal sensitive electronic components. Before handling and installing, discharge electrical charge from your body and tools which may come in touch with the device.

Connect according to the chapter 5: "Electrical connections".

2 – Identification

The device can be identified by the label's data (ordering code, serial number). This information is listed in the delivery document. For technical features of the product to make reference at the technical catalogue.
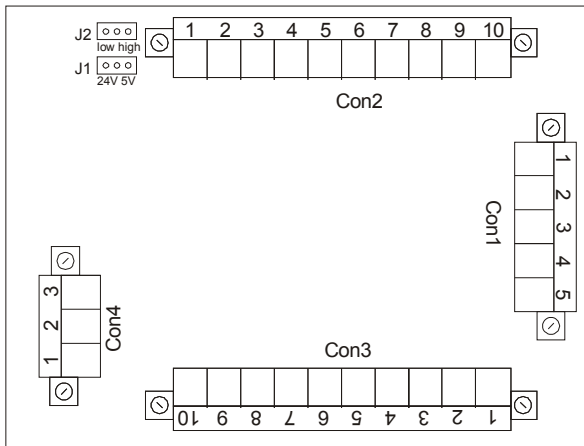
3 – Installation

Install the device according to the protection level provided. Protect the system against knocks, friction, solvents and respect the environmental characteristics of the product.
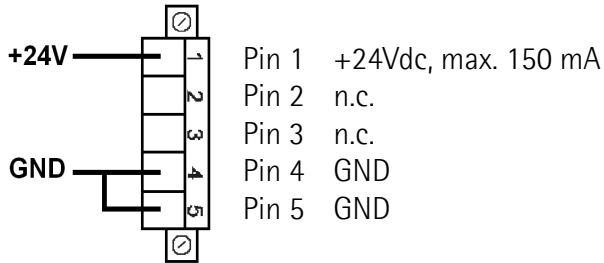
4 – Mounting recommendations

Push the display into the cut-out (approx. 90 x 66 mm^2) without panel clips.
Install panel clips on the display's housing and screw until fixed.
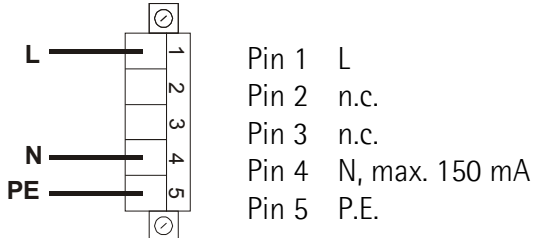
5 – Electrical connections

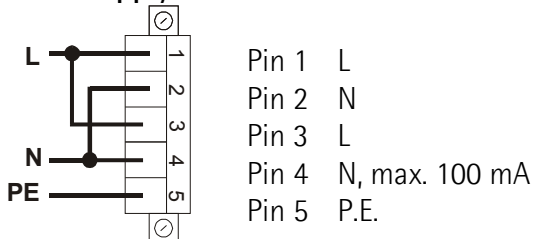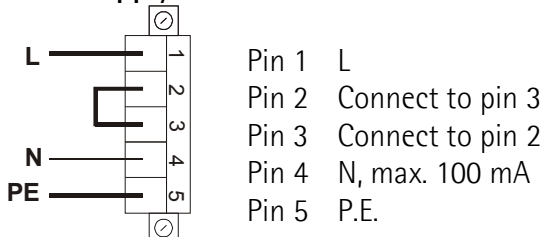## 5.1 CON1 connections (power supply)
Power supply 24Vdc

Pin 1 +24Vdc, max. 150 mA
Pin 2 n.c.
Pin 3 n.c.
Pin 4 GND
Pin 5 GND

Power supply 24Vac

Pin 1 L
Pin 2 n.c.
Pin 3 n.c.
Pin 4 N, max. 150 mA
Pin 5 P.E.

n.c. = Not connected

Power supply 115Vac

Pin 1 L
Pin 2 N
Pin 3 L
Pin 4 N, max. 100 mA
Pin 5 P.E.

Power supply 230Vac

Pin 1 L
Pin 2 Connect to pin 3
Pin 3 Connect to pin 2
Pin 4 N, max. 100 mA
Pin 5 P.E.

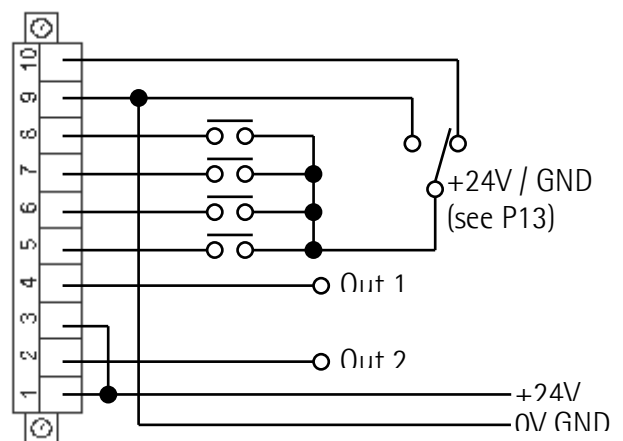## 5.2 CON2 connections (sensor input)

Pin	Function
1 *	GND
2 *	+24Vdc (J1: left, power supply: 24Vdc) +12Vdc (J1: left, power supply: 115Vac 230Vac) +5Vdc (J1: right, any power supply)
3	A
4	/A (see parameter P22)
5	B
6	/B (see parameter P22)
7	0
8	/0 (see parameter P22)
9	P.E.
10	P.E.

*: output power supply for measuring system

5.3 CON3 connections (Inputs and Outputs)

Pin	Function
1	+24Vdc input supply for output 2
2	Output 2 (PNP) *
3	+24Vdc input supply for output 1
4	Output 1 (PNP) *
5	Input 4 - OFFSET function
6	Input 3 - FREEZE/STOP function
7	Input 2 - SET function
8	Input 1 - RESET function
9	GND output for function inputs
10	+24Vdc output for function inputs

*: available only with "MC150-P1-..."

5.4 CON4 connections (RS232)

Pin	Function
1	RxD
2	TxD
3	GND

5.5 J1 jumper (encoder power supply)

Position	Function
Left	+10Vdc +30Vdc ✱
Right	+5Vdc

✱: see chapter "5.2 CON2 connections".

5.6 J2 jumper (input signal level)

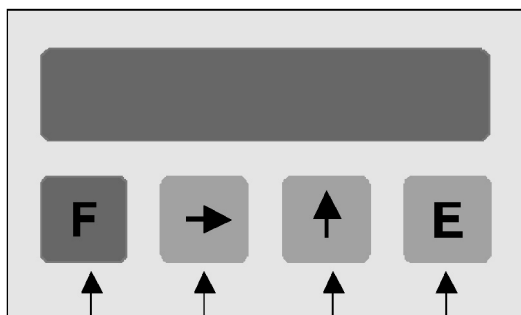| Position	Function
Left	Input connected with GND (CON3/Pin9)
Right	Input connected with +24Vdc (CON3/Pin10)

6 – Functions

6.1 Start up

At start up the unit shows the software version followed by actual position.
Software version: **SOF xx**

6.2 Key functions

Key	Function
F	Function (save + exit setup)
➔	Shift Right (select parameter / digit)
↑	Up (change value)
E	Enter (save + scroll menu)

6.2.1 Default parameter (factory settings)

Default parameter values are written in **BOLD** characters. The unit can be reset to default values by pushing **F**, **↑** and **E** key while switching on.

6.2.2 Direct functions

To set direct functions, such as reset, reset with datum value, tool correction (offset value), absolute/relative display mode and mm/Inch display mode, program **P07** parameter.

7 – Set up

7.1 Access to setup menus

Push **F** key to enter setup.

- push ➔ to select **Func 1** or **Func 2**
- push **E** to scroll parameters
- push **F** to exit setup

Admissible value range for each parameter is listed as follows: [min. value, max. value]

7.2 Parameter setting

In order to activate modified parameters, switch off and on the device.

Level 1: Func1

P00 Datum value / Eich [-99999, 999999]
Display can be set to datum value (or preset) by activating SET input or pushing **↑** key.
Default value: **50.0**

Level 2: Func2

P00 Display value per distance moved [1, 10000]
Enter the value to be displayed when the unit receives the number of pulses per distance moved in parameter P01. Note this value is entered without decimal.
Default value: **100**

P01 Nr. of pulses per distance moved [1, 65000]
Enter the number of pulses per distance. This same distance unit is used to determine the Display value per distance moved.
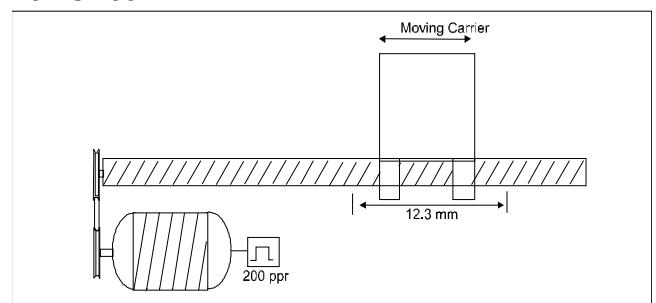Default value: **100**

Example:

A ball screw moves 12.3mm per revolution. The system uses a rotary encoder with 200 PPR (pulses per revolution).
In this case:
P00 should be set to 123 (value without decimals)
P01 is 200

P02 Encoder edge counting mode [1, 3]
1 = x 1 (1 edge counting mode)
2 = x 2 (2 edge counting mode)
3 = x 4 (4 edge counting mode)
For linear magnetic measurement systems set 3.

Example:
A magnetic sensor SME5 with 0,01mm resolution has to be displayed. The measurement length is 100,00 mm. The sensor outputs 10000 pulses (after quad.).
P00 is 10000 (100,00mm without decimals)
P01 is 10000 (pulses)
P02 is 3 (signal quadrature)

P03 Counting direction [0, 1]
Sets counting direction of display.
0 = standard counting direction
1 = inverted counting direction

P04 Decimal point [1, 4]
Modification of decimal point position. This setting has no influence on other parameters.
0 = 000000
1 = 00000.0
....
4 = 00.0000

P05 Password Level 1 [0, 999999]
Enter desired code number here to prevent operator from entering the "Datum value mode" (Level 1).
Default value: **0**

Attention: Datum value can be set only after digiting the correct password.
To cancel password and restore default value see chapter "Default parameter" (6.2.1).

P06 Password Level 2 [0, 999999]
Enter desired code number here to prevent operator from entering the "Parameter mode" (Level 2).
Default value: **0**

Attention: Datum value can be set only after digiting the correct password.
To cancel password and restore default value see chapter "Default parameter" (6.2.1).

P07 Function of the push buttons [0, 6]
The function of the ➔, ↑ and the **E** buttons in operating mode can be selected.
0 = no functions
1 = **E** will set actual value to zero
2 = ↑ will set actual value to Preset (Func1, P00)
4 = **E** activates Offset (P12)
8 = ➔ will set absolute/incremental mode
16 = **E** will set Inch/mm mode

To combine more than one function add up the totals of the different functions and enter the sum (amount):
3 = function 1 and 2 activated
6 = function 2 and 4 activated
9 = function 1 and 8 activated
11 = function 1, 2 and 8 activated
14 = function 2, 4 and 8 activated
18 = function 2 and 16 activated

P08 Input 1: Reset function [0, 1]
Sets function of Reset input.
0 = static reset. Sets actual value to 0 until input is activated (high).
1 = dynamic reset. Edge triggered Reset input.

P09 Encoder Index function [0, 2]
Sets function of encoder index pulse 0, /0.
0 = no function
1 = Rising edge triggered Index pulse
2 = Falling edge triggered Index pulse

P10 Input2: SET function [0, 1]
Sets function of SET input.
0 = static SET input. Sets display to Preset value until input is activated (high).
1 = dynamic SET. Edge triggered SET input.

P11 Input 3:
Freeze/ Stop/ Absolute-incremental function [0, 2]
Sets function of Freeze/Stop input.
0 = freeze actual value while internal counter is still active.
1 = stop encoder pulse counting.
2 = change absolute/incremental mode

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P12 Offset [0, 65000]
Value entered here will be subtracted from actual value by activating OFFSET function (Input 4).
By deactivating OFFSET input, Offset value will be added to actual value.
Enter the Offset dimension in units of length, such as xx.x mm or x.xx inches.
Default value: **10.0**

P13 Function input configuration [0, 15]
Chose from NO (Normally Open) or NC (Normally Closed), low active (connected with GND) or high active (connected with +24Vdc).

P13		CON3			
Con. with GND	Con. with +24Vdc	Pin 5	Pin 6	Pin 7	Pin 8
0	15	NO	NO	NO	NO
1	14	NC	NO	NO	NO
2	13	NO	NC	NO	NO
3	12	NC	NC	NO	NO
4	11	NO	NO	NC	NO
5	10	NC	NO	NC	NO
6	9	NO	NC	NC	NO
7	8	NC	NC	NC	NO
8	7	NO	NO	NO	NC
9	6	NC	NO	NO	NC
10	5	NO	NC	NO	NC
11	4	NC	NC	NO	NC
12	3	NO	NO	NC	NC
13	2	NC	NO	NC	NC
14	1	NO	NC	NC	NC
15	0	NC	NC	NC	NC

P14 Output 1 [-99999, 999999]
Output 1 will be activated when actual value is more (or less) than Output 1 value, see P21.
Default value: **10.0**

P15 Output 2 [-99999, 999999]
Output 2 will be activated when actual value is more (or less) than Output 1 value, see P21.
Default value: **20.0**

P16 Output configuration [0, 1]
0 = static output
1 = with output dwell time (see P17 and P18)

P17 Output 1 dwell time [0, 2.50]
Enter output dwell time between 0 and 2.50 seconds. **P16** must be 1.
Default value: **0**

P18 Output 2 dwell time [0, 2.50]
Enter output dwell time between 0 and 2.50 seconds. **P16** must be 1.
Default value: **0**

P19 Memory on power down [0, 1]
0 = actual value will be stored on power down
1 = after turning power off and on Display shows "Cal". Display has to be Datumed again before use (see Func1,P00).

P20 Saw blade offset [-10000, +10000]
Here a value can be stored which is subtracted from the display value when the Set or Reset function is activated in incremental mode.
Default value: **0**

P21 Output logic [0, 3]
Enter output logic of Output 1 and Output 2.
0 = Output 1 activated when Actual value > P14
      Output 2 activated when Actual value > P15
1 = Output 1 activated when Actual value < P14
      Output 2 activated when Actual value > P15
2 = Output 1 activated when Actual value > P14
      Output 2 activated when Actual value < P15
3 = Output 1 activated when Actual value < P14
      Output 2 activated when Actual value < P15

P22 Select CON2 input signals [0, 1]
0 = measuring system with A, B and Z tracks.
1 = measuring system with A, /A, B, /B, Z and /Z tracks.

Setup for devices with RS232 serial interface (option I1)

P60 Display address [11, 99]
Enter here the serial address of the readout when using the serial interface option RS232. Don't use addresses 20, 30, 40,....., 90.
Default value: **11**

P61 Baud rate [0, 4]
0 = 2400
1 = 4800
2 = 9600
3 = 19200
4 = 38400

P62 RS232 mode [0, 3]
0 = RS232 protocol according to DIN66019
1 = Printer mode. To transmit actual value periodically to a printer at a time interval set in parameter **P63**.
2 = Printer mode. To transmit actual value to a printer when pushing **E** button (attention to **P07**: do not use 1, 4 and 16 functions).
3 = Printer mode. To transmit actual value to a printer when activating Input CON3/ pin 5 (attention: set **P12** = 0).

P63 Transmission time interval [0.01, 650.00]
Enter the time interval for periodic actual value transmission in sec. (**P62** must be =1).
Default value: **1.00**
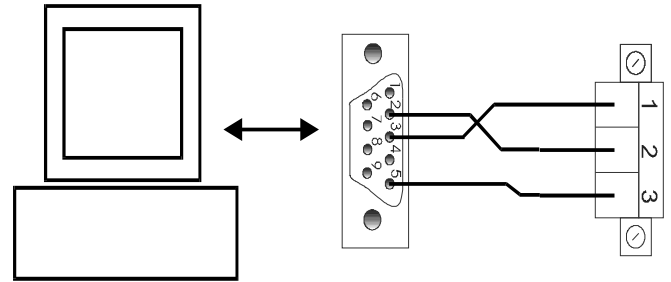
P99 Actual value for RS232 [-99999, 999999]
This parameter shows the actual value for serial transmission via RS232 Interface if parameter **P62**=0.

NOTE:
In order to activate modified parameters, switch off and on the device.

8 – RS232 interface
8.1 PC connection

Use 9 pin DSub connector and connect with CON4 of the MC150 readout.

Pin	Function	
1	RxD	Reception data
2	TxD	Transmission data
3	GND	Ground

Make sure that RxD on PC side is connected with TxD on MC150 side and TxD / PC is connected with RxD / MC150.

8.2 Technical data

Function	Data
Baud rate	2400,4800,**9600**,19200,38400
Data bits	8 bit ASCII
Parity bit	No
Stop bit	1
Flow control	No

8.3 Communication protocol
The RS232 protocol is according to DIN 66019, ISO 1765, ANSI X3.28.
The PC is the master and the MC150 is the slave with individual serial address to be entered in Parameter **P60**.
There are 3 ways of communication:
- Send
- Receive
- Broadcast

8.3.1 Protocol structure

Field	Value	Function
EOT	04 H	End Of Transmit
AD1	ascii	Unit address, MSByte
AD2	ascii	Unit address, LSByte
STX	02 H	Start of TeXt
C1,C2	ascii	Level code = 20 : Level 1 21: Level 2
C3,C4	ascii	Parameter code = 00...99
DATA	n byte ascii	Process data
ETX	03 H	End of TeXt
BCC	ascii	Block Check Character
ENQ	05 H	ENQuiry
NAK	15 H	Not Acknowledge
ACK	06 H	Acknowledge

NOTE:

- **BCC** (block-check-character) is a character used for check the correct transmission. It is generated by XOR-ing characters C1, C2, C3, C4, DATA and ETX (including). If BCC < 20 Hex, BCC must be added up with 20 Hex, this avoids BCC to have values in the range of control character values.

- **DATA** field can contain any number of numerical characters, a sign and can be filled up with zeros. All DATA are sent in ASCII Code.

8.3.2 Send data from Master to Slave

PC → MC150

EOT	AD1	AD2	STX	C1	C2	C3	C4

DATA	ETX	BCC

When transmission is correct slave replies with ACK in any other cases with NAK.

MC150 → PC

ACK	or	NAK

All parameters sent to the slave are stored in a data buffer. Parameters have to be activated by the "activate parameter" command (see chap. 8.3.4).

Example:

Sets the parameter P01 = 100 (unit address = 11).

PC → MC150

	EOT	AD1	AD2	STX	C1	C2	C3	C4
ascii		1	1		2	1	0	1
Hex	04	31	31	02	32	31	30	31

	DATA			ETX	BCC
ascii	1	0	0		
Hex	31	30	30	03	30

MC150 → PC

	ACK
ascii	
Hex	06

8.3.3 Receive data from slave

PC → MC150

EOT	AD1	AD2	STX	C1	C2	C3	C4	ENQ

The correct reception of the string is acknowledged with the following message:

MC150 → PC

STX	C1	C2	C3	C4	DATA	ETX	BCC

The reception of a incorrect string is followed by a negative acknowledgment like:

MC150 → PC

STX	C1	C2	C3	C4	EOT

in any other cases with "NAK":

MC150 → PC

NAK

Example:

Read actual value (unit address = 11).

PC → MC150

	EOT	AD1	AD2	STX	C1	C2	C3	C4	ENQ
ascii		1	1		2	1	9	9	
Hex	04	31	31	02	32	31	39	39	05

If actual value = 12 acknowledge message will be:

MC150 → PC

	STX	C1	C2	C3	C4	DATA		ETX	BCC
ascii		2	1	9	9	1	2		
Hex	02	32	31	39	39	31	32	03	23

8.3.4 Serial commands

All commands are sent with parameter P52 (C1, C2, C3, C4 fields = 2152). See "Send data from Master to Slave" (chap. 8.3.2)

The following commands are available:
- Activate data: DATA=137
- Save data to EEProm: DATA=138
- Set datum: DATA=139

Rev	HW-SW	Man. Vers.	Description
0		1.0	1st issue
-		1.-	Manual update
6	03-08	1.6	Chap.5, 6, 7 and 8 corrections
7	03-10	1.7	Chap. 5, 8.2 and parameter P62 corrections. Add parameter P22.

Example:

Send "Activate data" (unit address = 11).

PC ☐ MC150

	EOT	AD1	AD2	STX	C1	C2	C3	C4
ascii		1	1		2	1	5	2
Hex	04	31	31	02	32	31	35	32

	DATA			ETX	BCC
ascii	1	3	7		
Hex	31	33	37	03	32

MC150 → PC

	ACK
ascii	
Hex	06

8.3.5 Printer mode

When a printer is connected to the MC150 the following data string will be transmitted:

MC150 → printer

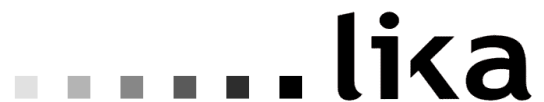| AD1	AD2	DATA	LF	CR
xx	xx	xx	0A Hex	0D Hex

The MC150 is sending its serial address followed by the actual value and Line Feed (LF) and Carriage Return (CR).

9 – Dimensional drawing and cut-out

Check details on product catalogue.

Provide a 90 x 66 mm^2 (w x h) cut-out.