OPTIMUM
MASCHINEN - GERMANY

Betriebsanleitung - de
Operating manual - en

Version 1.0.4

Dreiachs- Positionsanzeige

Three-axes position display
DRO 5

Artikel Nr. *Item no.* 3383975

Preface

Dear customer,

Thank you very much for purchasing a product made by OPTIMUM.

OPTIMUM digital displays offer a maximum of quality, technically optimum solutions and convince by an outstanding price performance ratio. Continuous enhancements and product innovations guarantee state-of-the-art products and safety at any time.

Before commissioning please thoroughly read these operating instructions and get familiar with the digital display. Please also make sure that all persons who operating the digital display have read and understood the operating instructions beforehand.
Keep these operating instructions in a safe place nearby the digital display.

The operating instructions include indications for safety-relevant, proper installation and operation of the digital display. The continuous observance of all notes included in this manual guarantee the safety of persons and of the digital display.

The manual determines the intended use of the digital display and includes all necessary information for its economic operation as well as its long service life.

The illustration and information included in the present manual can possibly deviate from the current state of construction of your digital display. Being the manufacturer we are continuously seeking for improvements and renewal of the products. Therefore, changes might be performed without prior notice. The illustrations of the digital display may be different from the illustrations in these instructions with regard to a few details. However, this does not have any influence on the operability of the digital display.
Therefore, no claims may be derived from the indications and descriptions. Changes and errors are reserved!

Your suggestion with regard to these operating instructions are an important contribution to optimising our work which we offer to our customers. For any questions or suggestions for improvement, please do not hesitate to contact our service department.

If you have any further questions after reading these operating instructions and you are not able to solve your problem with a help of these operating instructions, please contact your specialised dealer or directly the company OPTIMUM.

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1 Safety instructions

1.1 Safety and warranty informations

- In order to carry out installation correctly, we strongly recommend this document is read very carefully. This will ensure your own safety and the operating reliability of the device.
- Your device has been quality controlled, tested and is ready for use. Please respect all warnings and information which are marked either directly on the device or in this document.
- Warranty can only be claimed for components supplied by Optimum Maschinen Germany GmbH. If display is used together with other products, the warranty for the complete system is invalid.
- Repairs should be carried out only at our works. If any information is missing or unclear, please contact Optimum Maschinen Germany GmbH .

1.2 Intended use

Combined with external sensors, the DRO5 electronic display represents a high-precision measuring system. The electronic display serves exclusively for processing and indicating position and rotational speed values.

Observe all safety instructions contained herein.

- Arbitrary modifications and changes to this electronic display are forbidden.
- Observe the prescribed operating and installation conditions.
- Operate the electronic display exclusively within the technical data and the specified limits.

1.3 Identification of danger and notes

Safety notes consist of a signal sign and a signal word.

1.3.1 Danger classes

Symbol	Alarm expression	Definition / consequence
	**DANGER!**	Immediate danger that may cause irreversible bodily harm resulting in death, property damage or unplanned device reactions if you disregard the instructions given.
	WARNING!	Danger that may cause irreversible bodily harm, property damage or unplanned device reactions if you disregard the instructions given.
	CAUTION!	Danger that may cause minor injury, property damage or unplanned device reactions if you disregard the instructions given.
	**ATTENTION!**	Important operating information that may facilitate operation or cause unplanned device reactions if disregarded including possible property damage.
	**INFORMATION**	Application tips and other important/helpful or useful information and notes. No dangerous or harmful consequences for persons or objects.

1.4 Target group

Installation instructions and user manual are intended for the configuration, commissioning and mounting-personnel of plant or machine manufacturers. This group needs profound knowledge of an position indicator's necessary connections of a electronic display and its integration into a complete machinery.

⚠WARNING!

Insufficiently qualified personnel

Insufficiently qualified personnel cause personal injury, serious damage to machine or actuator.

- Configuration, commissioning, mounting and maintenance by trained expert personnel only.
- This personnel must be able to recognize danger that might arise from mechanical, electrical or electronicequipment.

Qualified personnel

are persons who

- are familiar with the safety guidelines of the electrical and automation technologies when performing configuration tasks;
- are authorized to commission, earth and label circuits and devices/systems in accordance with thesafety standards.

1.5 Basic safety information

⚠DANGER OF EXPLOSION!

Do not use the electronic display in explosive zones.

2 Identification

The type label shows the model name with model number and serial number.

2.1 Scope of delivery

- Digital Position Indicator DRO5
- Magnetic plate 60 x 46mm with countersunk head screws for fixing the housing on side or bottom.
- 4 pcs. Plastic closing caps for threaded holes in the housing.
- Speed sensor, cable length 5 meters
- Connection cable power supply, cable length 6 meters
- 3 pcs. Magnetic sensors MS200 = MR000, without magnetic tape.

2.2 Optionally available

- Magnetic tape item no. 3383978 - Length in a piece - 1100 mm ,
  Resolution 0.05 mm (50µm)
- Magnetic tape item no. 3383979 - Length in a piece - 2000 mm ,
  Resolution 0.05 mm (50µm)
- Magnetic tape item no. 3383980 - Bulk stock,
  Resolution 0.05 mm (50µm)

3 Installation

3.1 Mechanical installation

⚠CAUTION!

Failure of electronic display

- When mounting pay attention to the IP type of protection.
- Make absolutely sure to close not used fixing holes in the housing with enclosed plastic caps.
- Avoid impact on the device.
- Do not modify the device in any way.

Assembly

Fasten the device via the threaded holes (2x M5, 7 deep) onto the bottom side or onto a flat working surfacewith the magnet plate.

The mounting surface should be made for better grip with a suitable cleaning agent fat or oil-free.

Device dimension: height 134mm, width 98.5mm, depth 65.5mm

3.2 Electrical installation

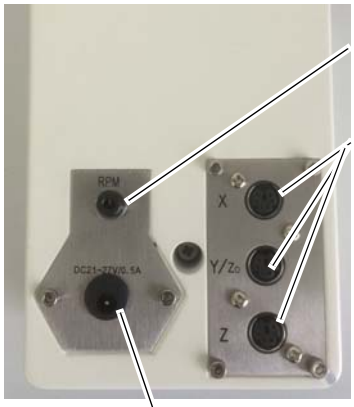
⚠WARNING!

Destruction of parts of equipment and loss of regulation control

- Check all line connections and plug connections before switching on supply voltage.

ATTENTION!

Basically, all connections are protected against external interference. Choose a place of operation that excludes inductive or capacitive interference influences on the electronic display or its connecting lines. When mounting the system keep a maximum possible distance from lines loaded with interference. If necessary, provide additional installations including screening shields or metallized housings. Contactor coils must be wired with spark suppression.



Connection
speed measurement

Connections
magnetic sensors
Plug type MINI-DIN
(6-pins)

Power supply connection
21V ~ 27V DC / 0.5 amps

Working temperature	0 °C ... +50 °C
Storage temperature	-10 °C ... +60 °C
Humidity	max. 80 %rF
Protection type	IP50
Electrical data	
Power supply Mains connection	21 V to 27 V DC
Current consumption mains connection	~ 500 mA
System data, resolution and accuracy:	
Resolution [mm]	0.001 I 0.002 I 0.005 I 0.01 I 0.05

3.2.1 Power supply speed sensor

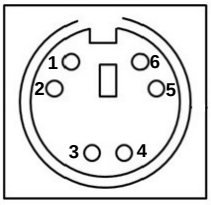
Power is supplied via the rear jack plug . Connect the sensor for speed measurement from the scope of delivery with the electronic display.

3.2.2 Pin assignment magnetic sensor

Connect the sensors with electronic display.

3.3 TTL differential signal

6-pin socket: (Metal outer ring)



Pin No.	1	2	3	4	5	6	Metal outer ring
TTL differential signal	+5V	A+	A-	B+	B-	0V	Shielding

4 Function

- Display: three position display, one speed display
- Counting resolution setting function
- Counting direction setting
- Linear error compensation
- Metric / inches change-over
- LCD display status setting
- Speed mode setting
- Basic value setting

4.1 Keyboard (eight keys)

The selection keys of axes

Function selection key, enter key.

Moving key

Increase or decrease key of the digits

4.2 Operations

4.2.1 Axial function

In the normal display state, press (X,Y, Z) key to make the corresponding axial value flash. After flash several times, this axis will be cleared.

If the value of the indicator is blinking, press the corresponding axis button again to cancel the operation.

If the displayed value is in flashing state, press again the function button "PROG" in order to change the fundamental value of the axis.

4.2.2 Modification of the basic value of X, Y, Z

After entering this option, the basic value is highlighted, and the digital bit is located in the flashing state. The ↑ ↓ keys are used for changing the digital bit, the ← → keys are used for selecting the digital bit. After completing the changes, press the "PROG" key to exit the option.

5 MENU

The operating modes of the menus are nearly same. The ↑ ↓ key move the cursor to the specified options, the "PROG" key is used to select. For optional items, using ↑ ↓ key to select, and using the "PROG" key to exit after completing. For modifying items,
using ↑ ↓ key to modify the digital bit, using ← → key to select the digital bit, using "PROG" key to exit after completing. Pressing the "PROG" key in multilevel menus enters the next level menu.

5.1 The main menu

In the normal display state, press and hold the "PROG" key for three seconds to enter the main menu.

LCD display setting

LCD display setting: the secondary menu, press "PROG" key to enter to modify the LED display parameter.

Unit selection

Press "PROG" key to enter the menu, mm/inch as a select.

Language selection

Press "PROG" key to enter the menu, English/German as a select.

Working mode

Press "PROG" key to enter and select,

- X Y/Z0 Z
  Standard display
- X Z+Z0 Z
  for lathes, Z / Z0 axis overlay display, Sum of bedslide + top slide
- 2X Y/Z0 Z
  for lathes, duplicate value in the X axis display.

Decimal point

Selection of decimal places, 2 or 3 decimal places.

Channel setup

Multilevel menus, press the "PROG" key to enter the menu, to modify X Y Z as well as the speed axial parameter.

Operation

The introductions of the main functions.

Save and Exit

Saving new parameters, press the "PROG" key to confirm, then return to the normal display state.

5.1.1 LCD display parameter setting

Contrast

Press the "PROG" key to enter the menu, selection range is 0~31, the increment or decrement is 1.

Backlight

Press the "PROG" key to enter the menu, selection range is 0~63, the increment or decrement is 1.

Test sample

Selection of three different RGB display types.
Press the "PROG" key to enter the menu, selection range is 0~3, the increment or decrement is 1.

Save and Exit

Saving new parameter, press "PROG" key to confirm, then return to the main menu.

5.1.2 Parameter setting of X Y Z-axis and speed axis

X-axis parameter

Three-level menu, press "PROG" key to enter to modify the X-axis parameter.

Y-axis parameter

Three-level menu, press "PROG" key to enter to modify the Y-axis parameter.

Z-axis parameter

Three-level menu, press "PROG" key to enter to modify the Z-axis parameter.

Speed axis parameter

Three-level menu, press "PROG" key to enter to modify the speed axis parameter.

5.1.3 Parameter setting of X-axis

Sensor

Setting of sensor type. Press "PROG" to enter the menu, there are several digital sensor types selectable.
MS100 ; MS200 ; MS500 ; CSA010 ; CSA020 ; CSA050
Use the sensor setting MS200 for reading heads in scope of delivery of DRO5.

Resolution setting

Press "PROG" key to enter and choose.
For sensor type „MS200“ , there are 4 possibilities to choose from. 2µm I 5µm I 10µm I 50µm
Use a resolution of 50 microns for the magnetic tapes with the item no. 3383978 or 3383979 or 3383980 .
Other magnetic tapes from other manufacturers, or magnetic tapes with another item number can have a different resolution.

Setting counting direction

Press the "PROG" key to enter the menu. “+/-“ as a select.

Setting display mode

Press the "PROG" key to enter the menu. "On / Off" as a select.

Linear error compensation

Press the "PROG" key to enter the menu, use ↑ ↓ ← → keys to modify, then press the "PROG" key to exit.

Save and Exit

Saving new parameters, press the "PROG" key to confirm, then return to section 5.1.2

INFORMATION

The parameter setting of Y, Z-axis is the same as X-axis.

5.1.4 Parameter setting of speed axis

Teeth amount of every turn (pulses per rev)

Press "PROG" key to enter, selection range is 1~36, the increment or decrement is 1.

Display mode

Press the "PROG" key to enter the menu, "On / Off" as a select.

Save and Exit

Saving new parameters, press the "PROG" key to confirm, then return to section 5.1.2

5.2 Magnetic sensor and magnetic strip

5.3 Mechanical installation

Installation may only be carried out in accordance with the specified IP protection. If necessary the system must be protected against environmental influences, such as sprayed water, solvent, dust, shocks, vibrations, temperature fluctuations.

5.4 Installation magnetic strip

The mounting surface / measuring track must be flat. Buckles or bumps will lead to measuring inaccuracies.

For technical reasons the strip should be approx. 30mm longer than the actual measuring distance.

ATTENTION!

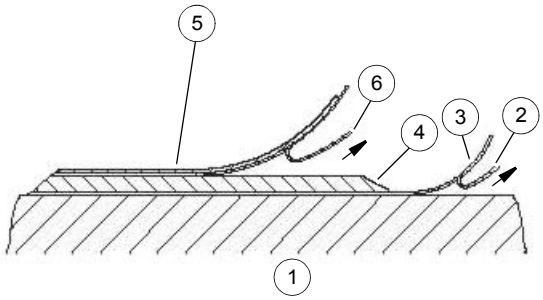
For an optimum of adhesion, all anti-adhesive substances (such as oil, grease, dust etc.) must be removed by using residue-free (=evaporating) cleaners. Suitable cleansing agents are e.g. ketones (acetone) or alcohols; Messrs.octite and 3M can both supply such cleansing liquid. Make sure that the surface to be glued is dry and apply the stop with maximum pressure. Glueing should preferably be undertaken at temperatures between 20° to 30° Celsius and in dry atmosphere.

INFORMATION

When applying long pieces of magnetic strip do not immediately remove the complete protective foil, but rather peel back a short part from the end sufficient to fix the strip. Now align the strip. As the protective strip is then peeled back and out, press the tape firmly onto the mounting surface. (a wallpaper roller wheel could be used to assist in applying pressure onto the magnetic strip when fixing it in position)

5.4.1 Installation steps

- Clean mounting surface (1) carefully.
- Remove protective foil (2) from the adhesive side of the magnetic strip (3).
- Stick down the magnetic strip (4).
- Clean surface of magnetic strip carefully.
- Remove protective foil (6) from adhesive tape on the cover strip (5).
- Fix cover strip (both ends should slightly overlap).
- Secure the overlapping ends of the cover against detachment .

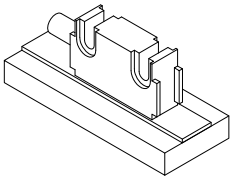


ATTENTION!

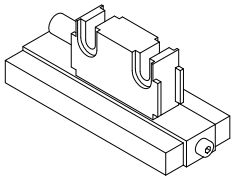
Do not expose the system to magnetic fields. Any direct contact of the magnetic strip with magnetic fields (e.g. adhesive magnets or other permanent magnets) is to be avoided. Sensor movements during power loss are not captured by the follower electronics.

5.4.2 Installation examples

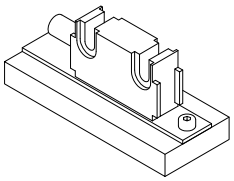
Mounting with chamfered ends
(☞ Img.5-1:) is not recommended unless the strip is installed in a safe and protected place without environmental influences. In less protected mounting places the strip may peel. In such cases are mounting methods more suitable as shown in ☞ Img.5-2: and
☞ Img.5-3:. Best protects the assembly in a groove
☞ Img.5-4: which should be so deep that the magnetic tape can be completely embedded therein.



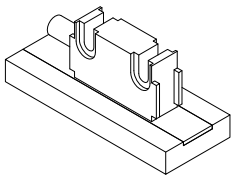
Img.5-1:



Img.5-2:



Img.5-3:

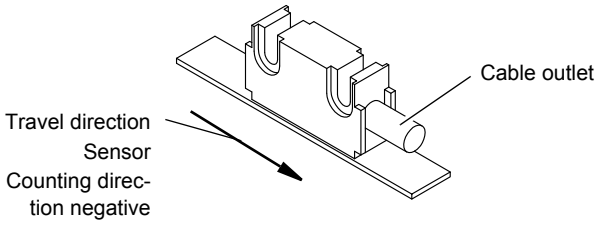


Img.5-4:

5.5 Mounting the magnetic sensor

Use two M3 screws to fix the magnetic sensor. We recommend to use washers.

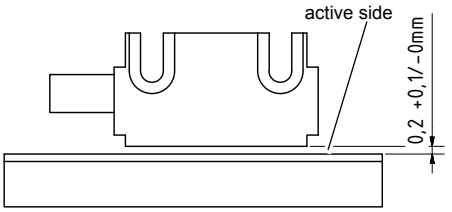
- Cable layout should avoid damages due to cable strain or other machine parts. If necessary use a drag chain or protective hose and provide for strain relief.
- Sensor must be aligned correctly with respect to the counting direction. This can be ignored if counting direction can be changed via the follower electronics.



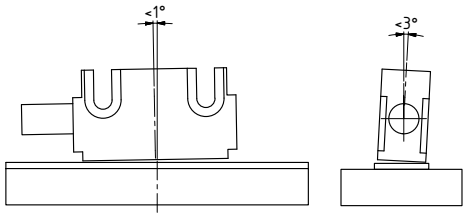
Img. 5-5: Definition of counting direction

- Distance measurements between sensor and magnetic tape and angular tolerances, must be maintained over the entire test section! (☞ Img. 5-6: to ☞ Img. 5-8:)

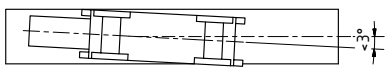
The max. gap without cover strip is 0.2 mm + 0.1 / -0mm. When using cover strip, the gap is reduced by the thickness of cover strip including its cover strip. Sensor must not touch the magnetic strip.



Img. 5-6: Distance sensor / magnetic tape



Img. 5-7: Max. deviation



Img. 5-8: Installation of sensor

5.6 Electrical connection

ATTENTION!

These magnetic sensors have been prepared for connection to DRO5. No modification of the sensor connection (e.g. cable modification) is permitted.

Check all lines and connections before switching on the equipment.

5.6.1 Interference and distortion

All connections are protected against the effects of interference. The location should be selected to ensure that no capacitive or inductive interferences can affect the sensor or the connection lines! Suitable wiring layout and choice of cable an minimise the effects of interference (eg. interference caused by SMPS, motors, cyclic controls and conductors).

5.6.2 Necessary measures:

- The sensor should be positioned well away from cables with interference; if necessary a protective screen or metal housing must be provided. The running of wiring parallel to the mains supply should be avoided.
- Contactor coils must be wired with spark suppression.

5.7 Maintenance

We recommend cleaning the magnetic strip's surface from time to time with a soft rag. This avoids dirt(dust, chips, humidity ...) sticking to the strip.

5.8 Trouble shooting

Below are some typical errors which may occur during installation and operation:

- Magnetic strip incorrectly mounted (active surface must be mounted towards the sensor). ☞ "Installation magnetic strip“ on page 23
- To protect the magnetic tape the supplied cover tape was not used. Must always be non-magnetic.
- Sensor incorrectly connected. Check connection
- Tolerance for the gap between magnetic sensor and magnetic strip not observed over the total traveldistance (☞ Img.5-6:).
- Cable squeezed / interrupted / cut by sharp edges.
- Sensor's active side not mounted towards the magnetic strip (☞ Img.5-8: and ☞ Img.5-8:) .
- Sensor has not been aligned according to ☞ Img.5-5: and ☞ Img.5-7:

5.9 Compatibility with other OPTIMUM digital displays

Using of your currently installed measuring system on the machine with the digital display DRO5.

Display	Compatible		Anzeige	Compatible	
MPA3 - DRO5	no	Read head different, magnetic stripe differently	DPA21 - DRO5	no	Connector differently = active read head
MPA4 - DRO5	no	Read head different, magnetic stripe differently	DPA22 - DRO5	no	Connector differently = active read head
DRO3 - DRO5	no	Connector differently = active read head	DPM1 - DRO5	no	other system
DPA2000 - DRO5	no	Connector differently = active read head	DPM3 - DRO5	no	other system
DPA2000S - DRO5	no	Connector differently = active read head			

5.10 Operating manual change information

Chapter	Short note	New version no.
all	Page layout columns in one column	1.0.1
5.4.1	Drawings sketches of mounting examples	1.0.2
2.2	Optionally available	1.0.3
5.1.3	Parameter setting for reading head MS200 (MR000)	1.0.3
5.9	Compatibility with older digital displays	1.0.3
3.3	6-pin socket, connection	1.0.4

5.11 EC - Declaration of Conformity

according EMC Directive 2014/30/EC

The manufacturer / distributor:	Optimum Maschinen Germany GmbH Dr.-Robert-Pfleger-Str. 26 D - 96103 Hallstadt

hereby declares that the following product

Product designation:	Digital position display
Type designation:	DRO 5
Year of manufacture:	— — — —

Digital position display for using on machine tools for path measurement in conjunction with magnetic sensors, which meets all the relevant provisions of the above mentioned Directive 2014/30/EC including their amendments in force at the time of declaration. The safety objective meet the requirement of directive.

Responsible for documentation: Kilian Stürmer, phone: +49 (0) 951 96555 - 800

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Kilian Stürmer
(CEO, General manager)
Hallstadt, 2015-02-02