Micro-Precis

Manual

DMP-3D/SP

Trigger Laser & Scanning Sensors

Made in Germany

CE

MANUAL

Copyright Notice

Micro-Precis
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CARE OF EQUIPMENT
Micro-Precis multisensor probes are precision tools used for obtaining precise measurements, must therefore be treated with care.

Changes of Micro-Precis products
Micro-Precis reserves the right to improve, change or modify its products without incurring any obligations to make changes to **Micro-Precis** products previously sold.

WARRANTY
Micro-Precis warrants its products provided that it is installed exactly as defined in associated **Micro-Precis** documentation. Claims under warranty must be made from authorized distributors only.

PATENTS
Features of **Micro-Precis** DMP sensor and associated products are subject of patents and patent applications.

CE MARKING
The CE marking (EMC Directive) is affixed to the product in accordance with EN standards.
This product has received EMC compliance under the conditions specified in 4.5.1.

FDA MARKING
This product conforms to the following laser standard:
21 CFR sub chapters J (Part 1040.10. Laser Products). This product is classified as Class 3R (FDA)
665nm, max. 2mW visible output at the frontlens.
Class 3R lasers emitt visible radiation in wavelength ranging from 400nm to 700nm. Eye protection is normally afforded by aversion responses including blink effects.

1. SAFETY

1.1. Environmental requirements

The following environmental conditions are specified for the DMP-3/SP

Indoor use	**IP40**
Altitude	**Up to 2000m**
Working temperature	**20°C to 30° C**
Storage temperature	**-10°C to 50°C**
Relative humidity	**Up to 80% relative humidity, non-condensing**
Laser safety	**This product conforms to the following laser safety standard:** **21 CFR sub-chapters J (Part1040.10. Laser Products) This product is classified as Class 3R (FDA), 665nm, max. 2mW visible output at the front lens.**

Class 3R lasers emitt visible radiation in wavelength ranging from 400nm to 700nm. Eye protection is normally afforded by aversion reponses including blink reflex.

WARNING

Do not stare into the beam!

This product contains a semiconductor laser focused to a spot in front of the sensor lens.

1.2. Laser safety features

The following features are incorporated into the design of the DMP-3D/SP:

1. Emission warning LED

The green LED on top of the sensor indicates the laser status ON.
When this LED is on, the laser is emitting radiation.

2. Safety labeling

The safety labels on the laser are shown in Figure 1

3. Safety instructions

3.1 Product care

Your **Micro-Precis** probe and accessories are precision instruments.
Please use and maintain the products in accordance with these instructions.
Please retain the transit box for storing the components when not in use.

CAUTION: The DMP contains sensitive optics.
Permanent damage may be caused if the probe is dropped or subjected to severe shock as may be caused by misuse.

Figure 1

1.3. Information for the user

Beware of unexpected movement. The user should remain outside the full working envelope of the PH10M/T probe head. There are no user serviceable parts inside the DMP-3D/SP sensor and mains powered unit. Return defective units to the distributor or **Micro-Precis**. Remove power before performing any maintenance operations. Refer to the CMM Supplier operation instructions. The expected method of providing an emergency stop for the **Micro-Precis** sensor is to remove power.

2. PRODUCT DESCRIPTION

The **Micro-Precis** DMP-3D/SP is an autonomous precision active dual mode sensor with a Renishaw autojoint, incorporating a Class 3R laser sensor and a Renishaw TP20 touch trigger probe that performs single point tactile and non-contact measurements as well as multi point scanning. It can be easily integrated in any CMM using a PH10M/T and TP20 probes when it is only used for single point measurements.
If the DMP-3D/SPSP scanning sensor is used, the sensor outputs an +/- 6.5V analog scan signal that has to be connected with a CMM controller allowing the signal input. The sensor projects a clearly visible red laser dot on the surface of the part to be measured or scanned. The sensor working distance of 34 mm remains constantly equidistant whether the part or the measuring axis is stationary or moving.

Features of the DMP-3D/SP

Non-contact and tactile single point measurements in all planes of the CMM.
Multi point laser scanning of specular or diffuse surface structures in all planes of the CMM.
Compatible with Renishaw touch trigger probes and changing systems.

- DO ensure that the laser lens cap is placed when the sensor is not in use
- DO clean the sensor lens using a cloth or a suitable equivalent
- DO not look directly into the laser beam
- DO not allow dust to accumulate on the front lens

3. COMPONENTS

The figure shows the **Micro-Precis** DMP-3D Multisensor

1. Renishaw autojoint
2. Sensor status LEDs
3. Sensor body
4. Sensor lens 10x
5. TP20
6. Lens cap

The DMP-3D/SP Multisensor is supplied in protective box and it is recommended that the sensor should be stored in this box when not in use.

The box also contains:

- Operating manual (stick)
- **Micro-Precis** quality certificate
- 12V multi-core connecting cable (only with DMP-3D/SP)
- 12V DMP power supply cable

4. INSTALLATION AND OPERATING INSTRUCTIONS

Installation Instructions

1. Connect the DMP with the autojoint of the PH10M and lock it with the locking screw. Insert the Plan Apo objective in the DMP-3D body and take the lens cap off.
If the PH10M has a multi-core, connect the DMP 12V multi-core cable with the 15 PIN HD sub connector (male) of the multi-core cable. Connect the 12V DMP multi-core with the PH10M controller.

2. Connect the 12V DMP connecting cable with the 110/220V power supply. The green LED (laser on) is lit.
The Laser is activated and ready to be used after 10 minutes of warming up.

3. Screw the TP20 in the DMP probe bush. The TP20 is deactivated.

4. If the CMM uses a PH10M without multi-core cable or a PH10T, still connect the 12V DMP power cable with the DMP and the 110/220V power supply.

5. Do not stare into the laser beam.

Front lens: Plan Apo 10x microscope objective, N.A. 0.28, DOF 3.5 µm, W.D. 34mm

Operation Instructions

The laser is a high accuracy distance sensor, that captures measurement points contact free from any type of surface reflectivity. The laser diode emits a visible light beam onto the area of interest and forms a visible micron size red dot or line. The dot is a considerable aid to navigate the sensor to the area of interest.

1. Move the measurement axis in direction of the feature to be measured. As soon as the laser enters the capture range, the yellow LED is lit and the laser is approaching the target point (focus point) to be measured. At the focus point the sensor automatically stops the measuring axis, the red trigger LED is lit and the trigger signal is sent to the CMM probe interface. In order to move to the next measurement point, the sensor is automatically retracted and ready to be moved to the next point of interest.

2. The laser must be calibrated with the CMM calibration sphere before it can be used for capturing measurement points.

3. If you want to use the TP20, the probe body has to be connected with the probe module. As soon as the module is connected, the TP20 is activated and the laser is deactivated. To reactivate the laser, the probe module has to be disconnected. The module can be changed automatically with the Renishaw Probe Changer or manually by the operator.

5. USING THE DMP-3D/SP

To understand the operation of the laser sensor,
the emitted beam can be splitted in three regions.

The range of the region below will vary depending
on the reflectivity of the surface structure

- OUT OF RANGE — RANGE 3
- IN RANGE — RANGE 2
- TRIGGER/SCAN — RANGE 1

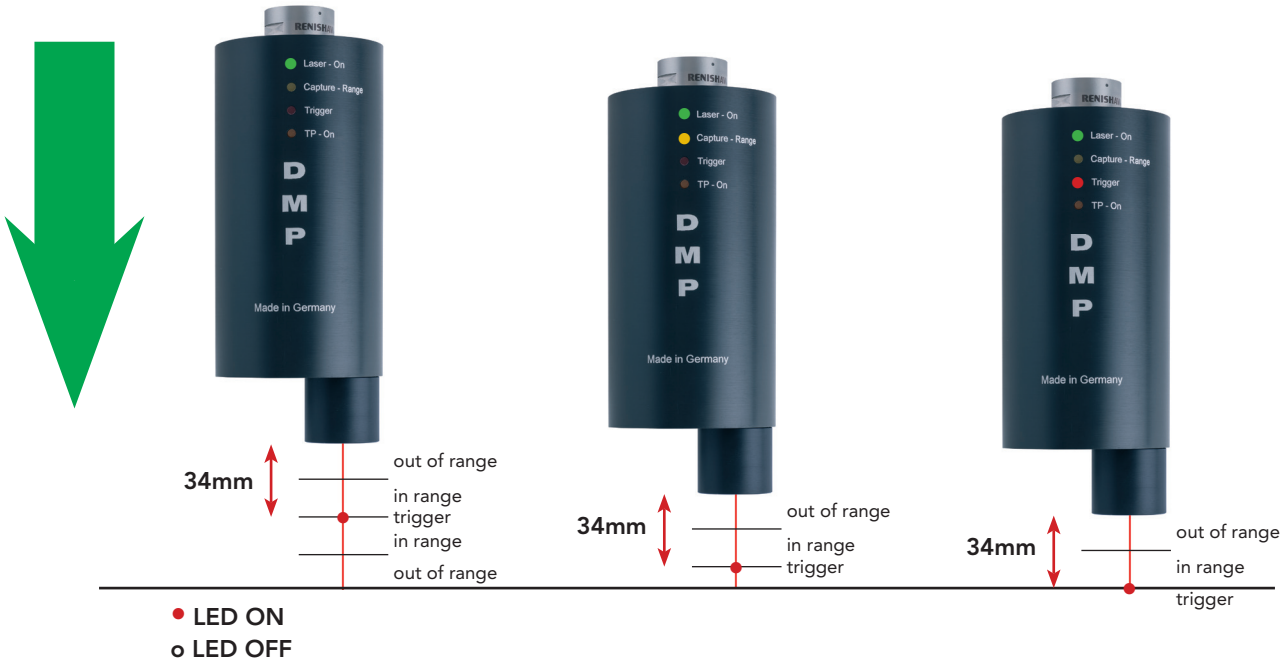
6. SINGLE POINT MEASUREMENTS OR MULTI POINT SCANNING

The probing occurs in the optical axis of the sensor (i.e. along the direction of the laser beam)

NOTE

In order to operate the laser sensor correctly, it is necessary to ensure that the sensor is moved perpendicular towards the surface to be measured or scanned (Figure3).
The probe will remain in the triggered state until it is backed off from the surface (into the range region).

Laser on	o green	Laser on	o green	Laser on	o green
In range	o yellow	In range	o yellow	In range	o yellow
Trigger/Scan	o red	Trigger/Scan	o red	Trigger/Scan	o red
TP on	o pink	TP on	o pink	TP on	o pink



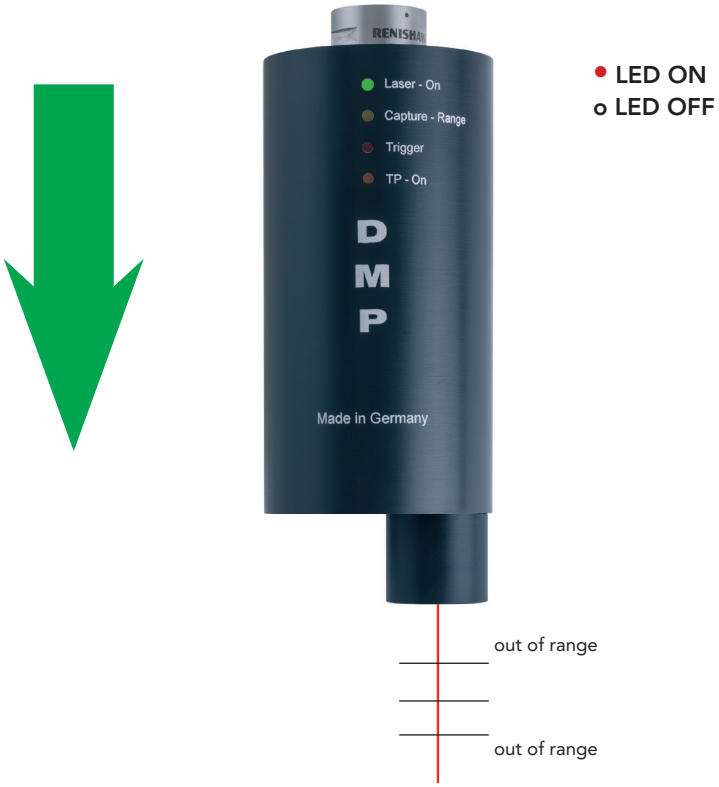
● LED ON
o LED OFF

Micro-Precis

It is not necessary to monitor the IN RANGE signal to successfully operate the sensor.

The direct compatibility of the DMP-3D/SP sensor output with conventional touch trigger probes such as Renishaw TP20 allows easy retrofit to existing CMM probing installations. A trigger signal is generated when the sensor moves from the range region to the trigger point.

Laser on o green
In range
Trigger/Scan



● LED ON
o LED OFF

7. CALIBRATION

It is essential for accurate measurement and operation that calibration procedures are carried out.

Qualification of the DMP-3D/SP Multisensor

To qualify the sensor, it is recommended to perform the following procedure.

NOTE

If the CMM manufacturer recommends a procedure to qualify the DMP-3/SP Sensor, it should be followed. The DMP-3D/SP will be calibrated with the CMM calibration sphere. The sphere will be used with the central coordinates at the axis origine position X=0, Y=0, Z=0 and with the sensor mounted vertically in the PH10 along the Z axis

7.1. Step 1

- Move the sensor to the top of the Sphere in the X and Y axes (x=0, y=0) and in the out of range region of the sensor in the Z axis.
- Move the sensor towards the sphere in the Z axis and record an optical trigger point

7.2. Step 2

- **Rotate the sensor by 90°** and move downwards until the beam is showing to the equator
- Record an optical trigger point by moving the sensor towards the sphere

7.3. Step 3

Record 3 further optical trigger points at this latitude around the Sphere.

7.4. Step 4

Using all 5 trigger point records in steps (1) to (3), follow the instructions provided by the CMM manufacturer to calculate the sensor qualification data.

NOTE

When operating the sensor, it is important to avoid triangulation errors and errors associated with probing a specular surface at steeply inclined angles > 7.5°.

Under normal conditions, the DMP-3D/SP qualification data will give a very small or negative sensor tip (visible dot) diameter.
When used with the PH10 head, the sensor must be qualified for each orientation required and the qualification stored. The appropriate qualification can be recalled after every reorientation.

CAUTION

When inspecting specular or higly reflecting surfaces at angles > 7.5° or translucent, the amount of reflected light may be not strong enough to guarantee a reliable trigger point, leading to the risk of collision. When inspecting such surfaces, it is recommended to probe the surface manually first. To avoid triangulation errors at > 7.5°, use the PH10 to orientate the sensor perpendicular to the surface to be measured.

8. SCANNING

Scanning routines are increasingly being adopted by many CMM manufacturers. The DMP-3D/SP allows automatically scanning along a surface by keeping the sensor equidistantly (working distance) at the laser focus point and capturing surface data at short intervals. The intervals or steps are programmed by the CMM software.
To use the DMP-3/SP SCAN operation mode, the DMP-3D/SP provides a separate analog signal output by creating a point cloud that has to be evaluated by the measuring software of the CMM. The analog signal output is listed in the DMP-3D/SP autojoint pin assignment.

9. SENSOR CHANGE

Changing the laser sensor to TP20 or vice versa is performed as follows:
When the DMP-3D/SP is installed and powered, the probe module is disconnected from the TP20 probe body, the TP20 is deactivated and the orange LED is off, the laser sensor is activated and the green LED is on. If the probe module is connected with the TP20 probe body, the TP20 is activated and the orange LED is on, the laser sensor is deactivated. The sensor change can be performed manually or automatically with the Renishaw Probe Changing System. The DMP-3D/SP automatically recognizes the selected sensor and activates it. The TP probe changing is defined in the Renishaw user manuals.

10. SPECIFICATION DMP-3D/SP LASER

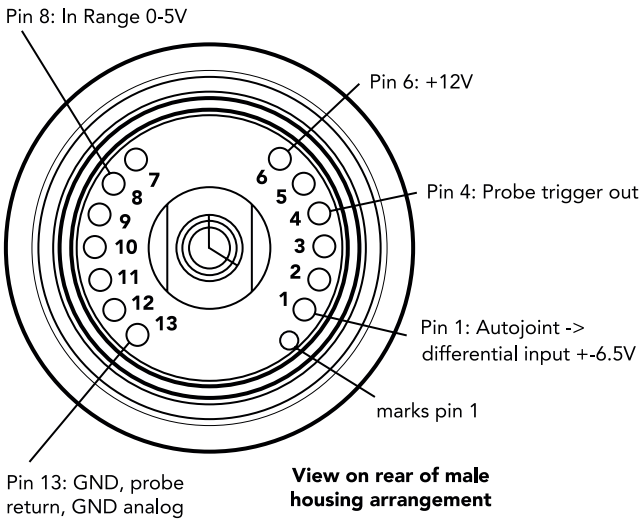
Mounting Adapter	Renishaw Autojoint PH10M compatible
Light Source	Semiconductor Laser Diode, 665nm, Safety Class 2
Laser Footprint	Dot,<5µm, visible
Working Distance w. 10x HBL objective	34mm
Capture Range	+/-3.0mm
Internal refresh frequency	40KHz
Analog Output	+6.5V-6.5V, 350mA
Scan Data Rate	40.000 Pts/s (max.)
Reflectivity Range	1%-99%
Sens Direction w. PH10	+/-X,+/-Y,+Z
Repeatability	+/- 0.4µm
Planar, specular surface max. inclination angle	7.5°
Spherical ,diffuse, max. Angle	45°
Laser Intensity Control	Adaptive, <0.03ms
Power Supply	12VDC
LED Status Display	Laser-on, Capture Range, Trigger/Scan, TP-on
Dimensions Sensor Body	L=180mm, Dia.60mm, Weight 480g
Pin Assignment	Pin2 (12V), Pin 4, 13 (probe signal) Pin11 (+/-6.5V)
Front lens	High quality LWD Plan Apo 10x objective (changeable) N.A. 0.28, DOF 3.5 µm, W.D. 34mm

REMARK

Pin assignment can be customized upon request.
Specification for Renishaw TP20 probe systems, see Renishaw user manual.

DMP-3D/SP AUTOJOINT PIN ASSIGNMENT

Micro DSub	Autojoint	DMP-3D/SP Pin
1	5	uncommitted
2		
3	13	Probe return, GND, Signal GND
4	2	uncommitted
5	3	uncommitted
6	6	+12V power supply
7	7	uncommitted
8	10	uncommitted
9	9	uncommitted
10	8	In Range 0-4V
11	1	Scanning Signal +6.5V to -6.5V
12	12	uncommitted
13	4	2 wire probe signal
14	14	uncommitted
15	15	uncommitted
shell	11	shell



View on rear of male housing arrangement

Figure 8 shows the DMP-3D/SP with the Renishaw TP20 with disconnected probe module, Figure 9 shows the TP20 with connected probe module.

Figure 8

Figure 9