MSG™

Autofocus & Tracking Sensor

LAF4, LAF5 Sensor Series

CE

Manual

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INTRODUCTION

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EQUIPMENT CARE

METROLOGY SENSORS instruments are precision optical tools used for obtaining precise measurements and must therefore be treated with care.

CHANGES TO METROLOGY SENSORS PRODUCTS

METROLOGY SENSORS reserves the right to improve, change or modify its products without incurring any obligations to make changes to METROLOGY SENSORS equipment previously sold.

WARRANTY

METROLOGY SENSORS warrants its equipment provided that it is installed exactly as defined in associated METROLOGY SENSORS documentation.

Prior consent must be obtained from METROLOGY SENSORS if non-METROLOGY SENSORS equipment (e.g. power supply and/or cabling) is to be used or substituted. Failure to comply with this will invalidate the METROLOGY SENSORS warranty.

PATENTS

Features of the METROLOGY SENSORS LAF instrument and associated products are the subject of granted and pending patents.

CE Marking

The CE Marking (EMC Directive) is affixed to the product is accordance with EN standards.

Installation Conditions (EN Standard)

This product is to be used as a component within other equipment.

Overvoltage category: I

Pollution degree: Class II

Protection against electric shock: Class III

For EMC Directive

This product has received EMC compliance under the conditions specified in 4.5.1.

The compliance of the final machinery with the EMC Directive will depend on such factors as the configuration, wiring, layout and risk involved in the control-system equipment and electrical parts.

It therefore must be verified through EMC measures by the customer of the machinery.

Applicable Standards

EMI Emission Tests

Radiated Emission Test

EN61000-6-4

EN55011 Group1 ClassA

EMS Immunity Tests

Radiation Field Immunity Test

Electrostatic Discharge Immunity Test

Fast Transient / Burst Immunity Test

Conductive Noise Immunity Test

EN61000-6-2

EN61000-4-3

EN61000-4-2

EN61000-4-4

EN61000-4-6

Hazardous Substance

RoHS (Directive 2002/95EC 27Jan.2003) compliant

FCC (USA)
This equipment has been tested and found to comply with the limits for a Class A digital device (FCC section 15.105), pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generate, use and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio Communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Information to user (FCC section 15.21)

The user is cautioned that any changes or modifications not expressly approved by METROLOGY SENSORS or an authorised representative could void the user's authority to operate the equipment.

Special accessories (FCC section 15.27)

The user is also cautioned that any peripheral device installed with this equipment such as a Computer, must be connected with a high-quality shielded cable to insure compliance with FCC limits.

1 SAFETY

1.1 ENVIROMENTAL REQUIREMENTS

The following environmental conditions are specified for the LAF

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 FDA laser safety standard:
	21 CFR sub-chapters J (Part 1040.10, Laser Products). This product is classified as Class IIIR (FDA), 660-670nm, max 2mW visible output at the sensor port

Class IIIB lasers emit visible radiation in wavelength ranging from 400nm to 700nm. Eye protection is normally afforded by aversion responses including the blink reflex.

Figure 1

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

1.2 LASER SAFETY FEATURES

The safety label on the sensor is shown on Figure 1

Figure 2

1.3 INFORMATION FOR THE USER

There are no user serviceable parts inside the product. Return defective units to METROLOGY SENSORS for repair.

1.4 INFORMATION FOR EQUIPMENT SUPPLIER

It is the equipment supplier's responsibility to ensure that the user is made aware of any hazards involved in operation, including those mentioned in METROLOGY SENSORS product documentation, and to ensure that adequate guards and safety interlocks are provided.

Under certain circumstances the signal may falsely indicate an instrument condition. Do not rely on LAF signals to stop equipment operation.

The expected method of providing an emergency stop for METROLOGY SENSORS instruments is to disconnect power.

2 INTRODUCTION

The LAF sensor enables a closed loop focusing system for motorized z stages on infinity corrected or finite conjugated microscope and laser machining systems.

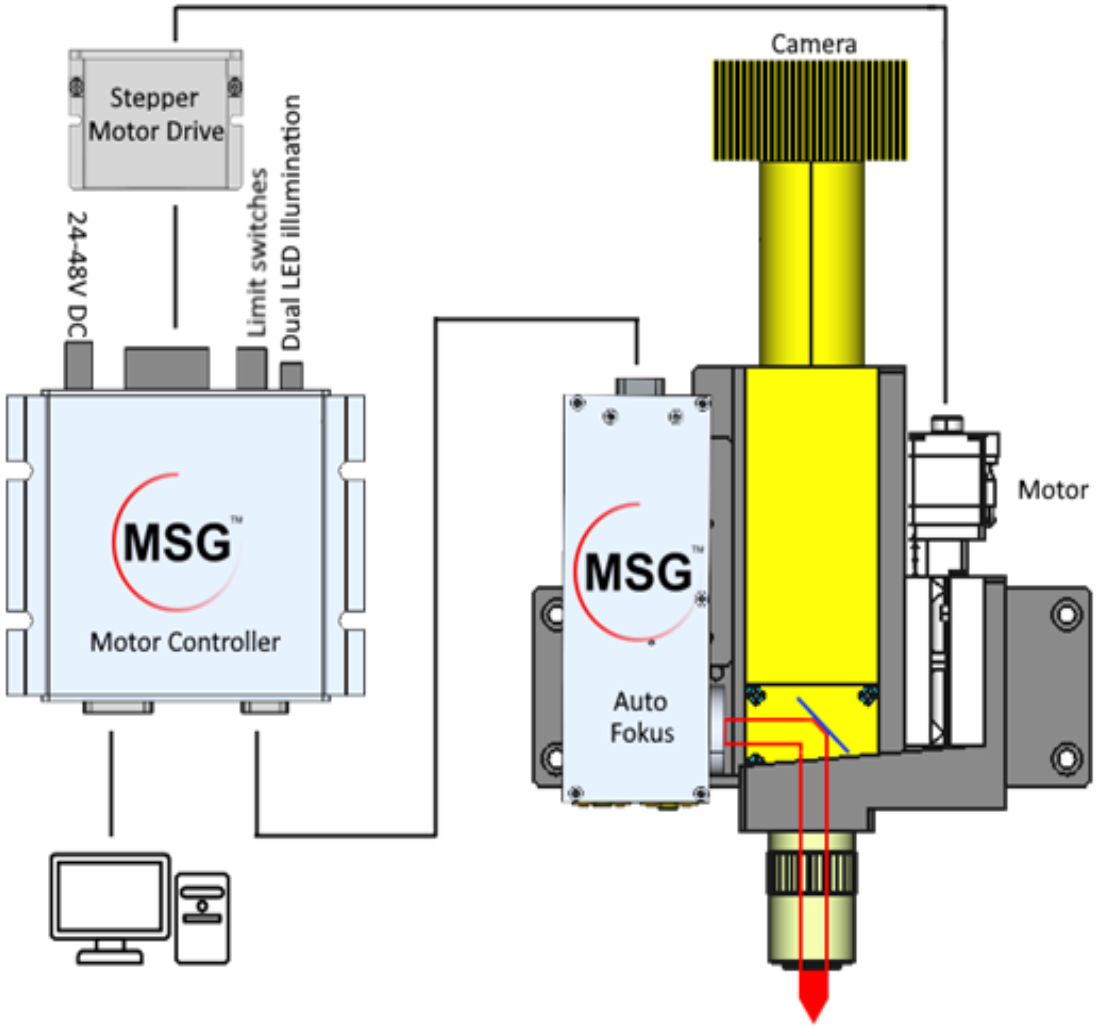

Figure 3 Principle of operation

3 MECHANICAL INTERFACING

3.1 DIMENSIONS SENSOR

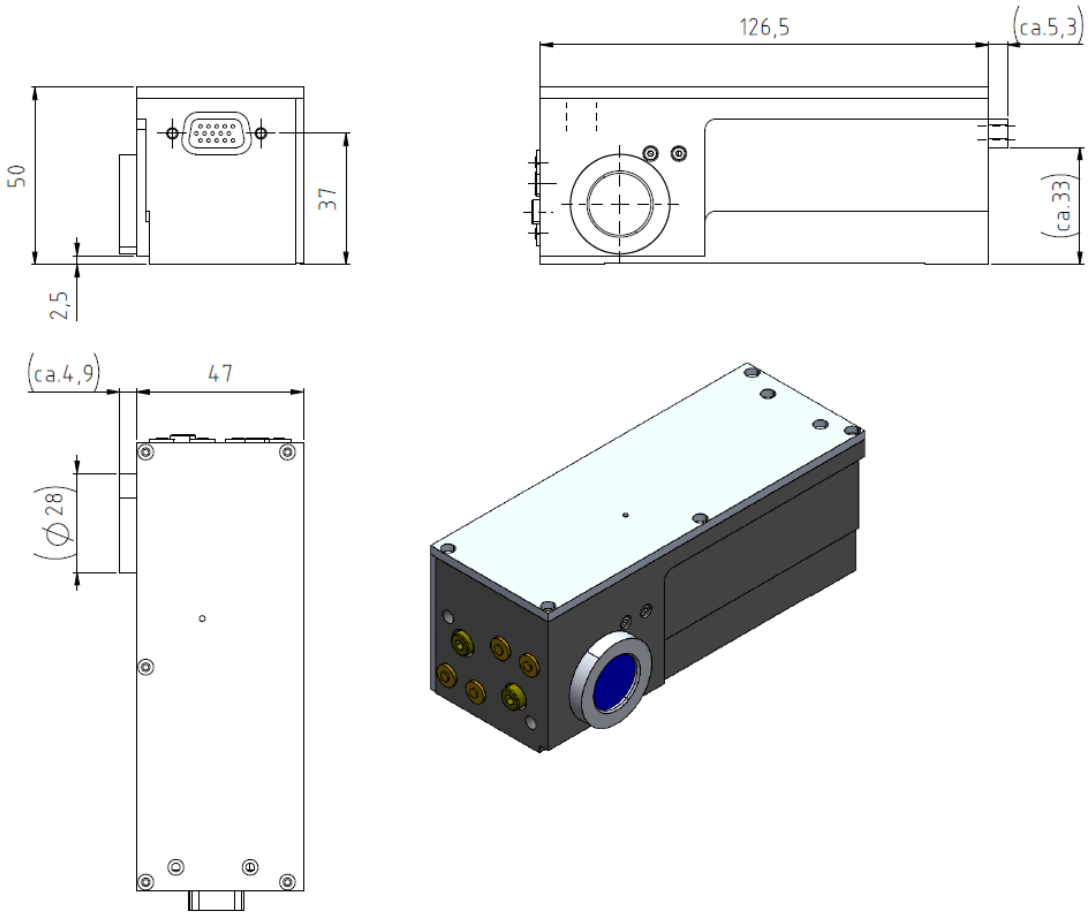

Figure 4

3.2 MOUNTING HOLES SENSOR

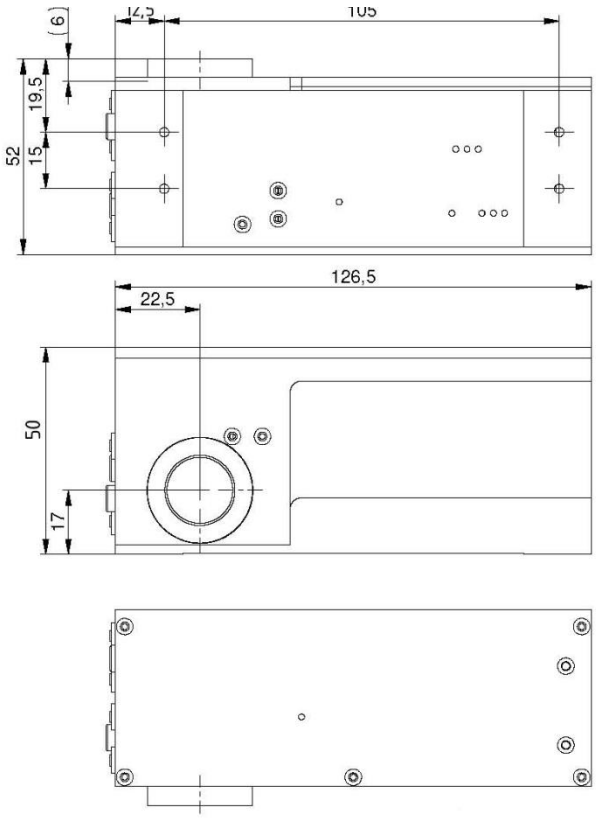

Figure 5 Dimensions LAF4S

For installation, the sensor requires an optical port in the infinity range of the microscope and a customized mounting bracket for attaching the sensor.

The sensor should be installed on a user provided base plate with slotted holes (Figure 6).

Two sets of threaded mounting holes are available at the sensor base (M3).

The mounting screws must not penetrate the sensor housing any deeper than 5 mm.

WARNING

Using longer screws may damage the sensor inside.

Figure 6

3.3 OPTICAL PORT

The sensor's optical port, in the infinity range of the microscope, must be equipped with an

beam splitter (Figure 7). Recommend is 50T/50R Beamsplitter @670nm (@790nm) or an band-pass filter which reflects 670nm (@790nm) at 45° and transmits the rest of the light spectrum. The surface quality of the beamsplitter should be better than 1λ

The optical port closest to the objective lens should be assigned for LAF sensor interface, if this is not possible, please contact Metrology Sensors GmbH for sensor integration assistance.

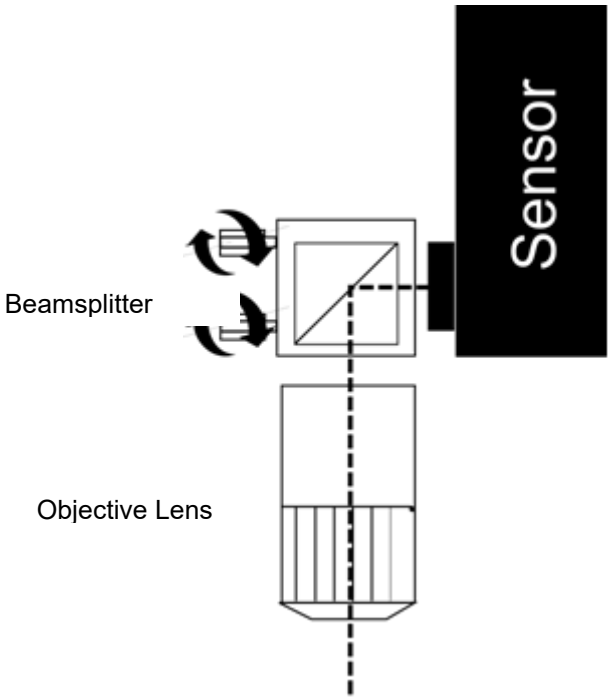

Figure 7

3.4 SENSOR ALIGNMENT

The following are the sensor alignments steps:

1. Place the sensor into its mount

2. Power-up the sensor, everything should be properly set up and wired so laser in the sensor will turn on.

3. Move the sensor housing on the mounting (Figure 8) , such that exactly half of the

objective lens aperture is covered by the sensor’s laser beam (Figure 9). The laser should NOT cover more than half of the aperture.

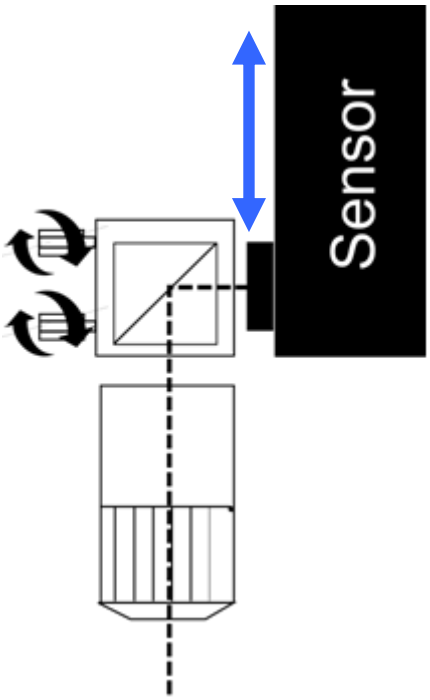

Figure 8

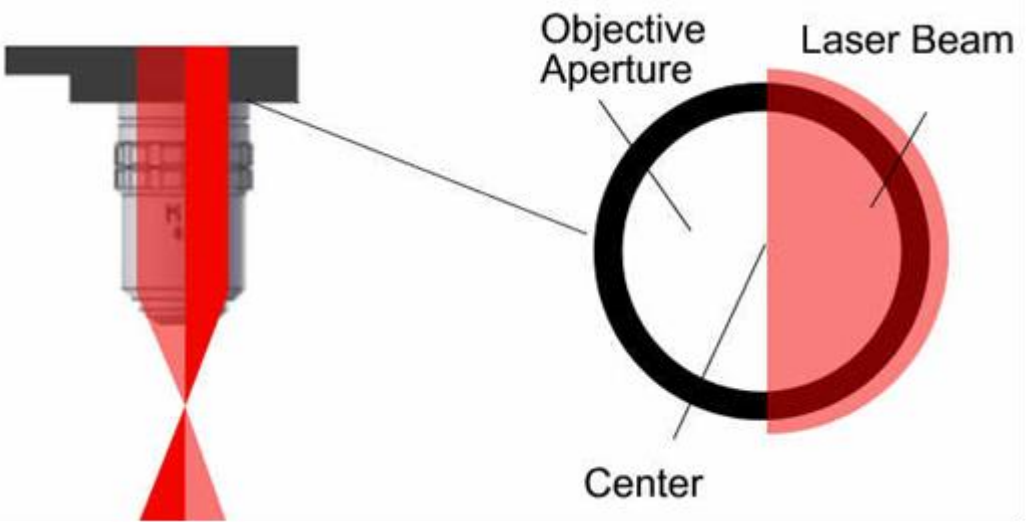

Figure 9

4.Fix the sensor position using mounting screws assuring that it does not shift while

mounting screws are being tightened.

5. The Sensor should be installed exactly perpendicular to the microscope’s optical axis.

Figure 10 shows how the laser line should change during Z movements for proper alignment.

This may change the beam position in the Aperture (Figure 8) so that you may have to repeat steps 3-5 until beam position (Figure 9) is correct and the beam is perpendicular.

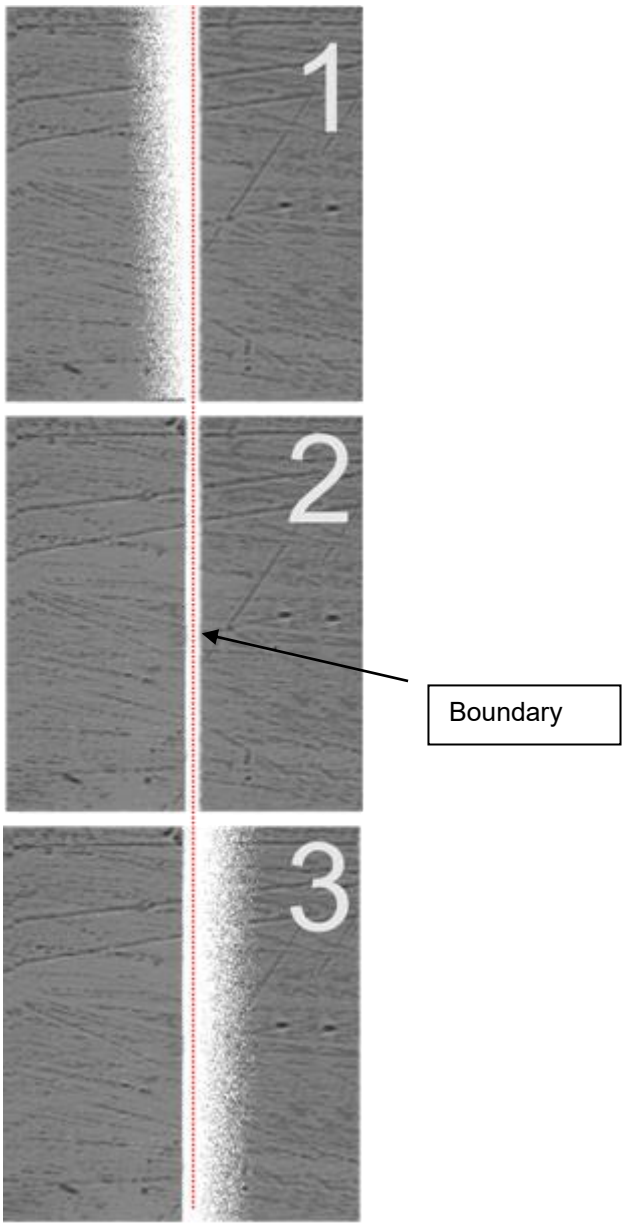

Figure 10

If the sensor is correctly aligned, the laser line should evolve as it is shown. The straight boundary in the middle must not move during Z motion and indicates if the beam is perpendicular to the specimen.

Figure 11

Schematic of how the Beam should change during Z movements

4 ELECTRICAL INTERFACING

4.1 SENSOR CABLE CONNECTIONS

The sensor electronics is electrically isolated from the metal case. Shield of the connector is connected to the case.

The connecting cable should be shielded and this shield needs to be properly connected to both connectors on both sides, to avoid EMI/EMC Problems.

No voltages above 40V should be applied between any connection of the sensor and the shield. Shield should be connected to signal ground at least by a capacitor to avoid ground loops and interference.

4.2 CONNECTING CABLE OPTIONS

The LAF sensors are provided with the standard 1.5 m (4.92 foot) cable. The cable is terminated on the sensor side with Plug Type Hirose - 3540-16P-CV(50) , CABLE TYPE, SOLDER, 16WAY. The user's end terminated with a 15 Pin D-Sub (female connector). If a longer length of cable is required, it is suggested to use a 15 Pin D-Sub extension cable (good quality shielded cable 14x AWG 28, Stranded, Twisted Pair, PVC/PVC e.g.Farnell Type 1196920)

4.3 SENSOR CONNECTOR PIN ASSIGNMENT

Pin number	Name	Comments
1	+12V	Power supply
2	+12V return	Power supply return
3	Laser on input	3.3V CMOS input , Pull Up, 5V tolerant, active high pull down, in use of optoisolator via 10KR to +12V
4	Reserved	Connect to pin 7 for proper operation
5	Reserved	Connect to pin 7 for proper operation
6	Reserved	
7	Signal Ground	Signal Ground
8	Reserved	Don't connect
9	Reserved	Don't connect
10	0-10V	Distance Signal, 10K load to Ground
11	0-10V	Quality Signal , 10K load to Ground
12	Signal Ground	Signal Ground
13	RXD input	RS232 level
14	TXD output	RS232 level
15	Ground RS232	
Shell		

Table 1

4.3.1 Digital Input

Laser on (pin 3)

The Laser on input is designed to be used as the laser safety lock. If Pin 3 is not connected with pin 1 via 10KR (+12V DC) does not give a on signal , the laser is turned off (See Figure 11). Delay time to OFF time is about 1µs and ON transition time is max. 4ms.

Safety Stop (Pin 4 + Pin 5)

The Safety Stop inputs are designed to be used with the LAF-C2 controller interface . If the sensor is used

with an third party external controller pin 4 and pin 5 must be connected with pin 7 (signal ground) or the laser is turned off. (See Figure 11).

4.3.2 **Distance Signal Output**

The distance signal from focus position is provided as COG value (digital engineered unit) in the user interface and as report command (see COG **Fehler! Verweisquelle konnte nicht gefunden werden.**) with the processed output characteristics shown in figure 12 and optional as analog output 0V to +10V with the processed output characteristics shown in figure 13. The sloop of the analogue out can be adjusted with the command DACGAIN (See **Fehler! Verweisquelle konnte nicht gefunden werden.**). Default value of DACGAIN is -64.

Description	Min	Focus	Max
Report (COG)	-245000	0	245000
Analog	10V	5V	0V
Report (DAC)	0	0	10

Table 2

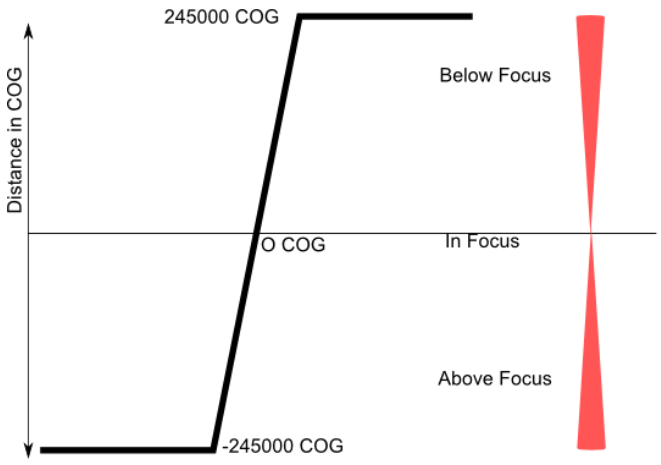

Figure 12

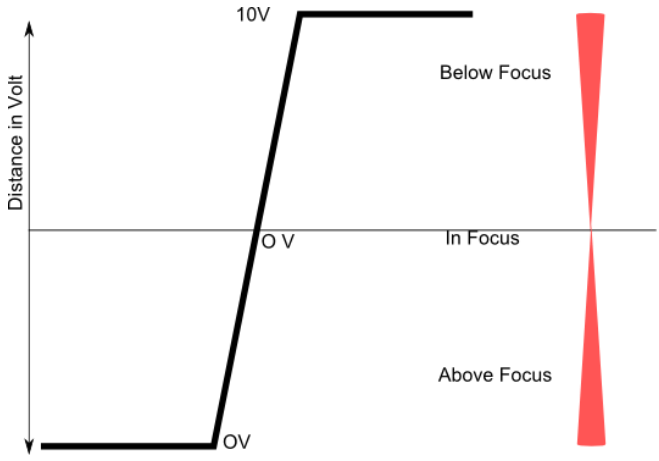

Figure 13

4.3.3 **Quality Signal Output**

The Quality Signal is an Opto-isolated (NPN Transistor).

For digital report (see SIG, **Fehler! Verweisquelle konnte nicht gefunden werden.**) from 0- 100.

For analog output reading please see **Fehler! Verweisquelle konnte nicht gefunden werden.** for wiring.

Quality Signal	0%	50%	100%
Analogue	0V	5V	10V
Report (SIG)	0	50	100

Table 3

Several conditions may cause the signal quality to drop as: Misalignment / improper set up, not enough reflection from the specimen, object plane too far away from focus point, excessive loss of laser power in the optical path outside of the sensor, interruption of the laser beam, object plane not perpendicular to laser beam.