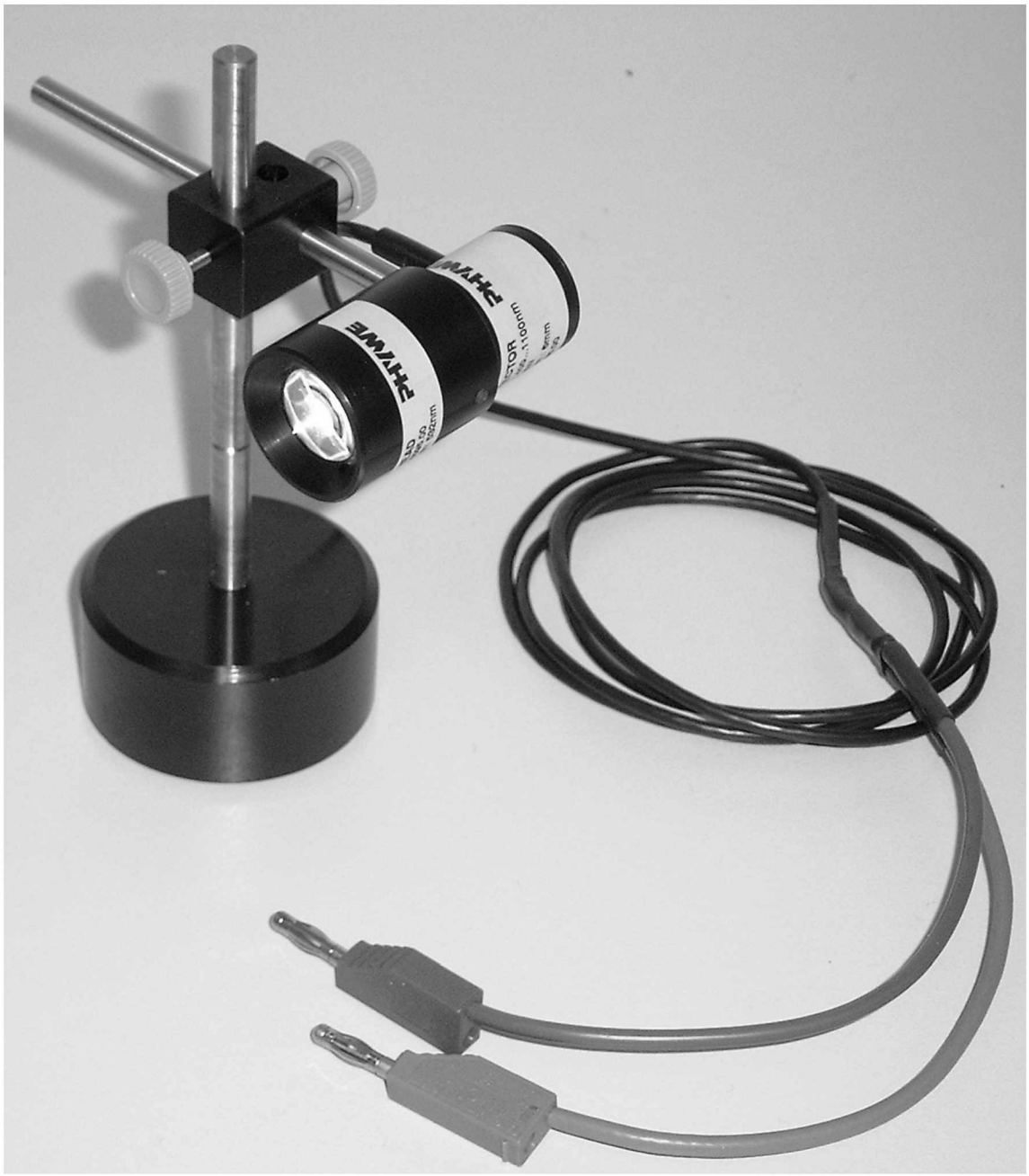


Messsonde für Laserleistungsmesser
08595-00

SENSOR HEAD FOR LASER POWER MEASUREMENTS

08595.00

1. PURPOSE

In order to determine the output power of experimental lasers often wide band instruments for measuring power and energy are used which according to the thermopile principle convert the irradiated energy on some absorbing surfaces into heat and then display the resulting temperature difference in a proportional way regarding the power. These instruments are too expensive for student experiments when in a laboratory several work places have to be equiped. For this purpose a sensor head has been developed which can be used for a wave range of 400 nm up to 1100 nm and a power range of 0... 500 mW. In conjunction with an analog or digital current meter, the power of the PHYWE Nd-YAG-Laser can be measured with a sufficient degree of accuracy.

2. CONSTRUCTION

A targe-surface silicon photovoltaic cell with a crystal thickness of about 0.6 mm and a vapour-deposited gold layer on the back serves as a detector for the irradiated power. The gold layer considerably improves the sensitivity of the photovoltaic cell for the wave range above 900 nm and the distribution of heat throughout the crystal. In order to be able to measure not only focused laser radiation of high energy and with a high power density (for example 500 mW/mm^2), but also ray beams with a diameter of, for instance, 6 mm, a diffuser plate (ceramics, thickness appr. 1 mm) is arranged directly in front of the silicon detector. This diffuser reduces the direction sensitivity of the sensor and improves the distribution of heat throughout the silicon photovoltaic cell.

3. PRINCIPLE OF MEASUREMENT

Photovoltaic cells are very suitable for determining the radiation power since the current generated in the cell goes together with the irradiated power in a linear way for more than 5 decades. This linearity is directly dependent on the outer load resistance of the photovoltaic cell. It is best utilized when the photovoltaic cell is used in short circuit operation, that means connected to a measuring instrument with a small internal resistance (d.c. measuring range). The PHYWE measuring instrument 07034.00 shows this characteristic.

4. CALIBRATION

In order to guarantee a sufficient degree of accuracy as far as the power measurements are concerned, the sensor must be calibrated. For every sensor head certain characteristics are recorded which describe its sensitivity concerning the wave lengths and powers used in the case of the Nd-YAG experimental laser. With the aid of the supplied reference characteristics it is thus possible to determine the radiation power by means of the measured currents.

4.1 COLLECTOR HEAD

In order to cover a greater angle of dispersion when the fluorescence power (532 nm) of the Nd-YAG-rod is measured, the sensor head is fitted with an additional lens (diameter 17 mm). This additional lens concentrates the incident radiation on the diffuser plate. The inherent absorption of the lens is about 15% (532 nm) which means that the real power is about 15% higher than the power displayed by the measuring instrument.

5. APPLICATION

In order to carry out a measurement, the sensor head 08595.00 must be connected to the measuring instrument 07034.00 and a suitable d.c. measuring range must be set. Then the sensor head is placed in the centre of the beam path and the resulting photo current is measured.

For every measured current value the laser power is read off the characteristic map of the corresponding wave length (810 nm or 1064 nm respectively) (chart 1+2).
In order to measure the fluorescence power (532 nm) the collector head is attached to the sensor head. The radiation power is again determined with the aid of a characteristic map (chart 3).

Note: If the laboratory is equiped with a professional wide band power meter (for instance PHYWE No. 08579.93) all calibration characteristics can be checked.

6. DATA

6.1 SENSOR HEAD 08595.00

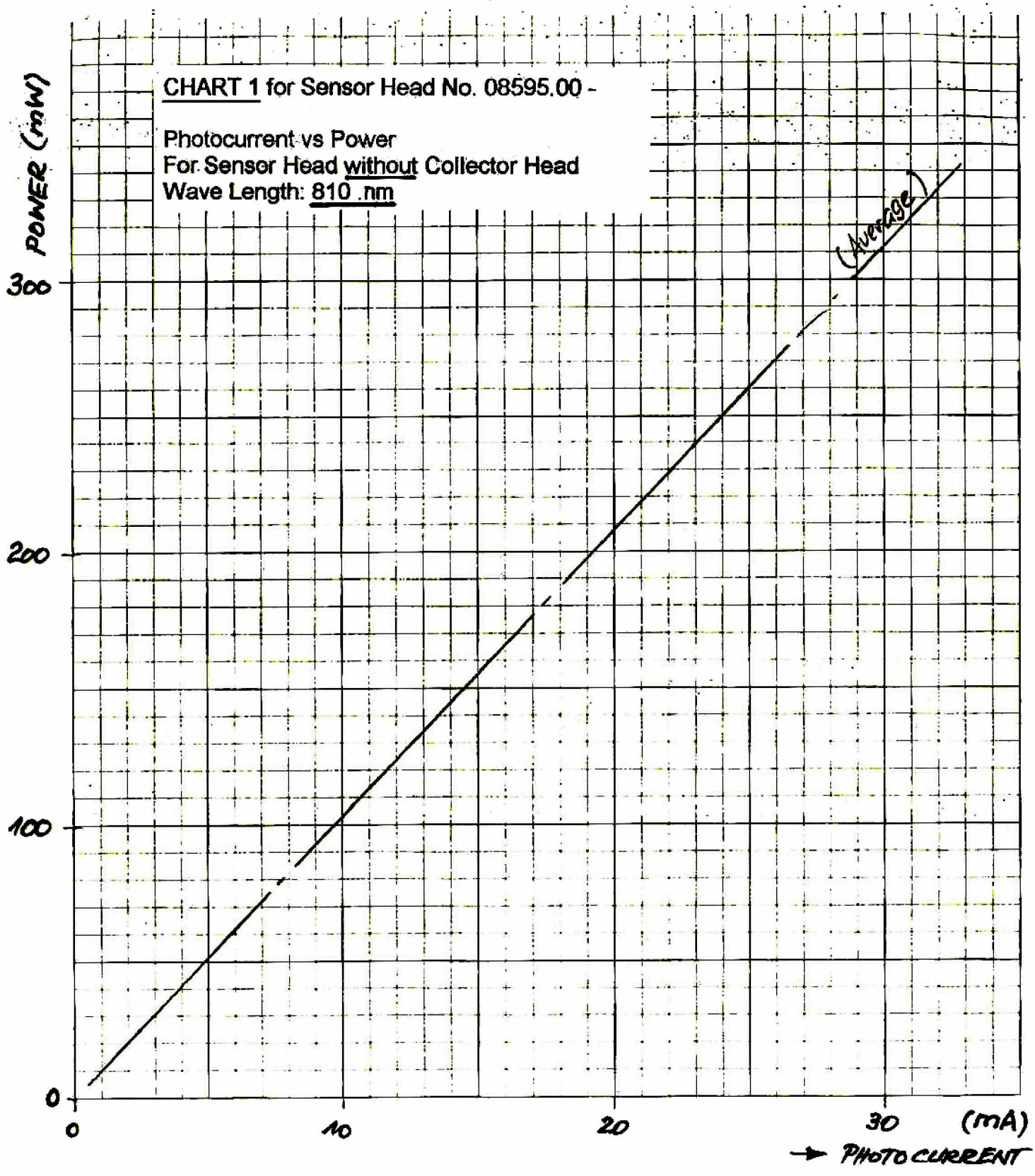
Spectral Range:	400... 1100 nm
Input Power, CW (max.):	1 W
Input Power, CW (typ.):	0.3 W
Linearity (current vs power):	better 10%, see chart
Risetime:	< 5 µs (termination: 100 ohm)
Active Material:	Si
Active Area:	1 cm^2
Beam Diameter (max.):	8 mm (typ. 6 mm)
Connecting Cord 1,5 m, plug:	4 mm diameter

6.2 COLLECTOR HEAD

Beam Diameter (max.):	17 mm
Power Attenuation:	approx. 15%

6.3 MECHANICAL DIMENSIONS

Head Diameter:	25 mm (collector head 30 mm)
Dimensions:	120 x 120 x 60 mm (H x W x D)
Weight (total):	approx. 0.5 kg



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		Maßstab	Geprüft												
Paßmaß	Abmaße		Genehmigt				Ersatz für								

DIN 7168-m	0,5 bis 6	über 6 bis 30	über 30 bis 120	über 120 bis 400	über 400 bis 1000	über 1000 bis 2000	über 2000 bis 4000
	± 0,1	± 0,2	± 0,3	± 0,5	± 0,8	± 1,2	± 2
DIN ISO 1302 Reihe 2	▽	▽ R_z 100	▽ R_z 25	▽ R_z 6,3	▽ R_z 1		

PHYWE

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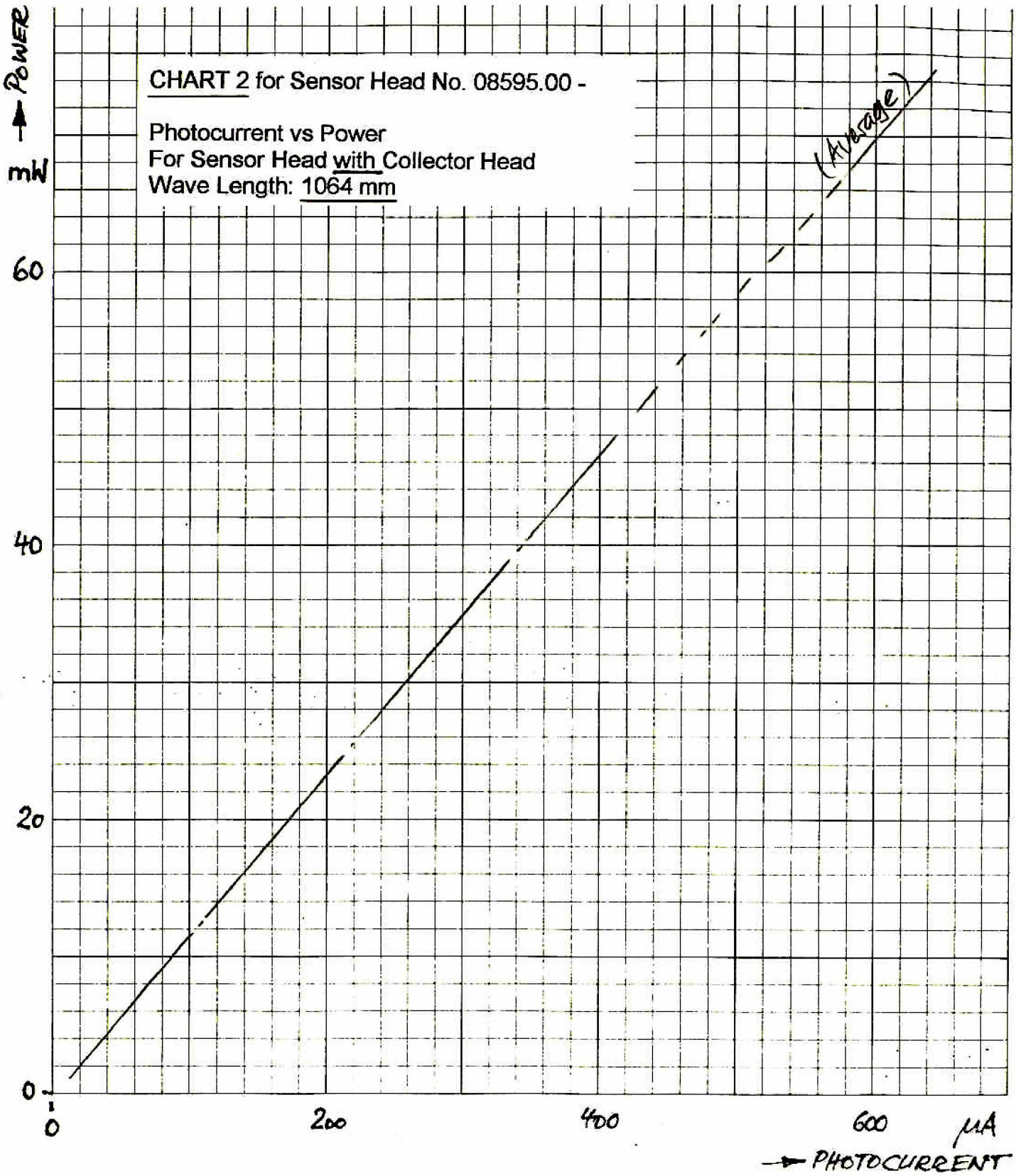

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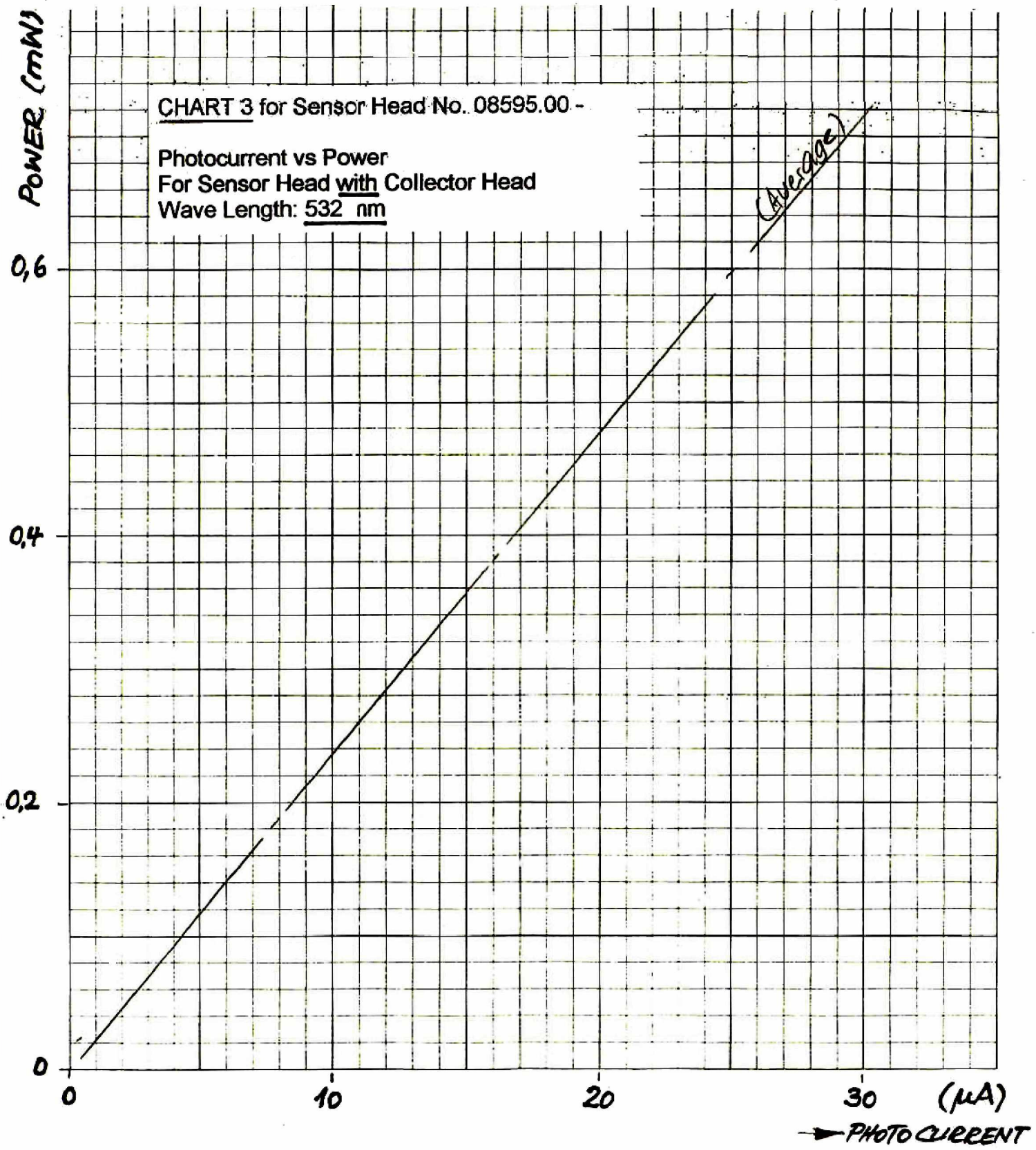
PHYWE

SENSOR HEAD FOR LASER POWER MEASUREMENTS



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