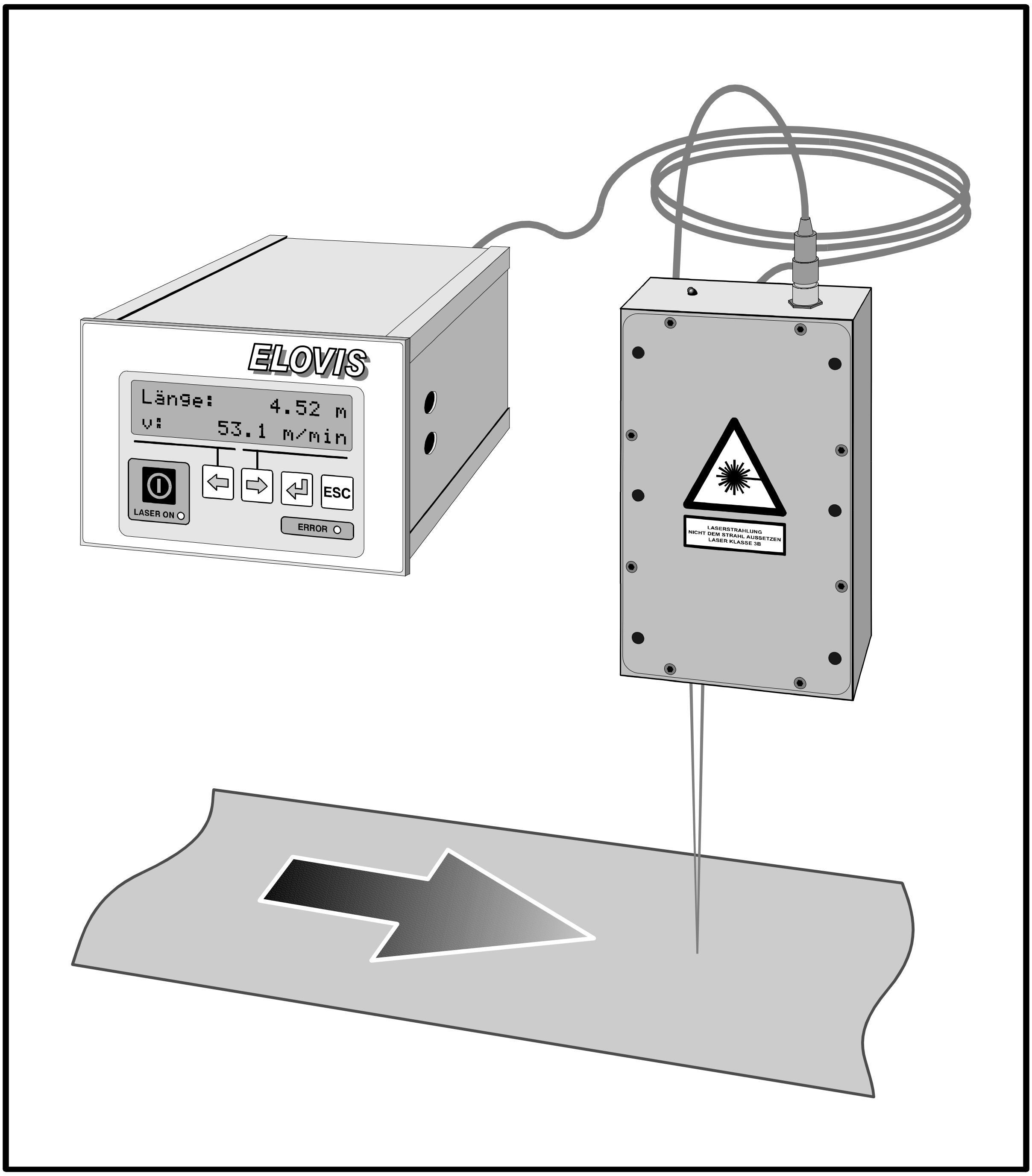
Product Information

µSpeed ®

Non-contact Optical Length and Speed Measurement



Long term calibrated device with certification of the national metrology institution (PTB – Physikalisch Technische Bundesanstalt)

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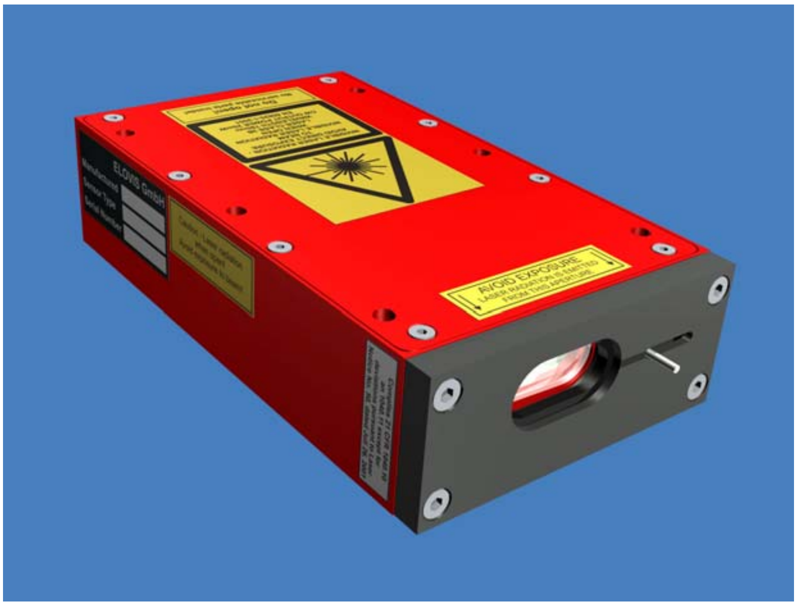
Safety and Laser Protection

This unit is a class IIIB laser product and complies with EN60825-1:2001. Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated July 26, 2001.

INVISIBLE LASER RADIATION -
AVOID DIRECT EXPOSURE
TO BEAM
INVISIBLE LASER RADIATION
WHEN OPEN
LASER CLASS 3B
WAVELENGTH 780nm
CW OUTPUT POWER 25mW
EN 60825-1:2001

The following safety features required to comply with the Bureau of Radiological Health Class IIB laser requirements are included:

- **Key-operated power switch on controller**
- **Laser indicator light on controller and laser**
- **Delayed laser startup-laser indicator light on prior to laser radiation**
- **Laser beam blocking device**
- **Interlock capability for remote shut-off**



THE INSTRUCTION MANUAL MUST BE STUDIED CAREFULLY BEFORE INSTALLATION AND COMMISSIONING OF THE µSPEED SYSTEM. THE MEASURES AND RECOMMENDATIONS ARE TO BE FOLLOWED.

General Description

The ***µ*Speed**® Sensor is a LASER-DOPPLER-Velocimeter for non-contact speed and length measurement to be used for all kinds of material with micro structured surfaces. Its simple use and robust design makes it suitable for a variety of applications in all kinds of industries. Speed and length of material with a length more than 5m can be measured long term with an accuracy, better than +/-0,05%. The laser-doppler principle allows precise measurement on most technical surfaces. The unit's compact design makes it also suited for confined spaces. There are versions available, for up to 60m/s [11800f/mn] and stand off distances between 120mm [4,7in] and 500mm [19,6in]. In addition, application-specific modifications and housing protections as well as cooling devices can be asked for.

***µ*Speed** is also available in a certified form with the certification of the national metrology institution of Germany (PTB – Physikalisch Technische Bundesanstalt, Braunschweig).

Measurement Principle

Using two laser beams a stripe pattern is projected onto the object. The intensity of the reflection is modulated by the movement of the object and detected by the sensor. The frequency of the intensity modulation is proportional to the velocity of the object and thus to the doppler frequency. There is no need for markings or reference points on the object.

Applications

Speed and length measurement for

- ❑ metals, paper, timber, textiles, non-woven, plastics, rubber
- ❑ web material, tapes, pipes, sheets, film, wire, cable, goods in pieces
- ❑ cutting length, process control, positioning, dosing, production data acquisition
- ❑ speed measurement for process control purpose

Technical Specifications

speed range	0m/min...3600m/min [0ft/mn…11800ft/mn] *1)
typical accuracy	0,05% *2)
stand off distance →	120mm [4,7in] → +/- 5mm (+/- 20mm) [0,12in (+/-0,7in)]
depfh of field	240mm [9,4in] → +/- 10mm (+/- 40mm) [0,24in (+/-1,5in)]
	500mm [19,6in] → +/- 20mm (+/- 80mm) [0,36in (+/-3,1in)] *3)
interfaces	1x RS 232 unidirectional for printer
	1x RS 232 bidirectional for PC
	I²C Bus for external keyboard or special applications
analog output	0...4 V (programmable)
impulse output	1 ... 10000 Impulses/m (programmable)
optical isolated outputs	stop contact, pre-stop contact, alarm
LASER diode	25 mW / 780 nm (class 3b)
power supply	230V / 50-60 Hz , 110 V / 50-60 Hz

*1) Valid for ***µSpeed***-S1 to – S60

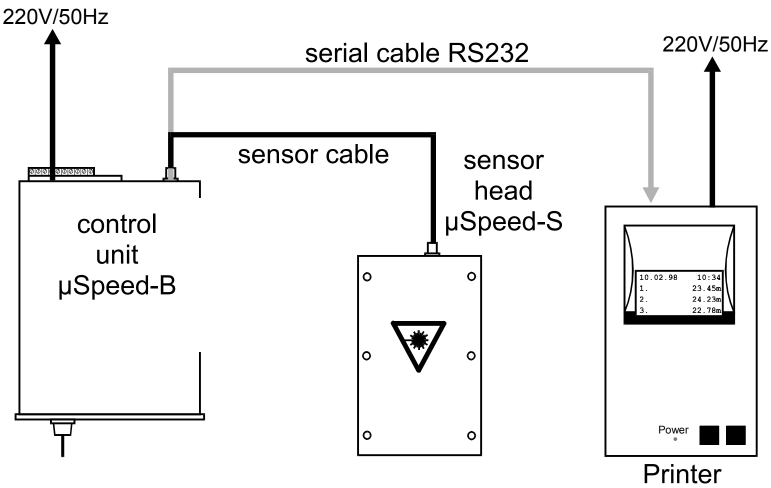
*2) Valid for lengths more than 5m (1σ) / >10m (2σ) / >20m (3σ) → see also figure on page 4

*3) µSpeed adjustment at the extreme range of values in round brackets may reduce measurement accuracy

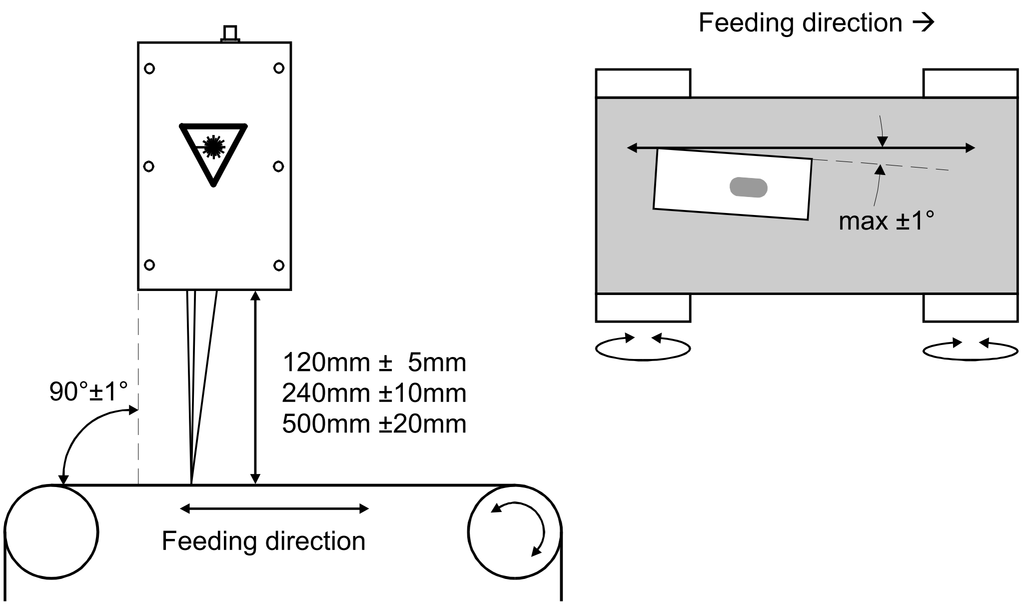
► Specifications are subject to change without notice.

Mounting Layout

Wiring diagramm of the system



Mounting tolerances of the standard system



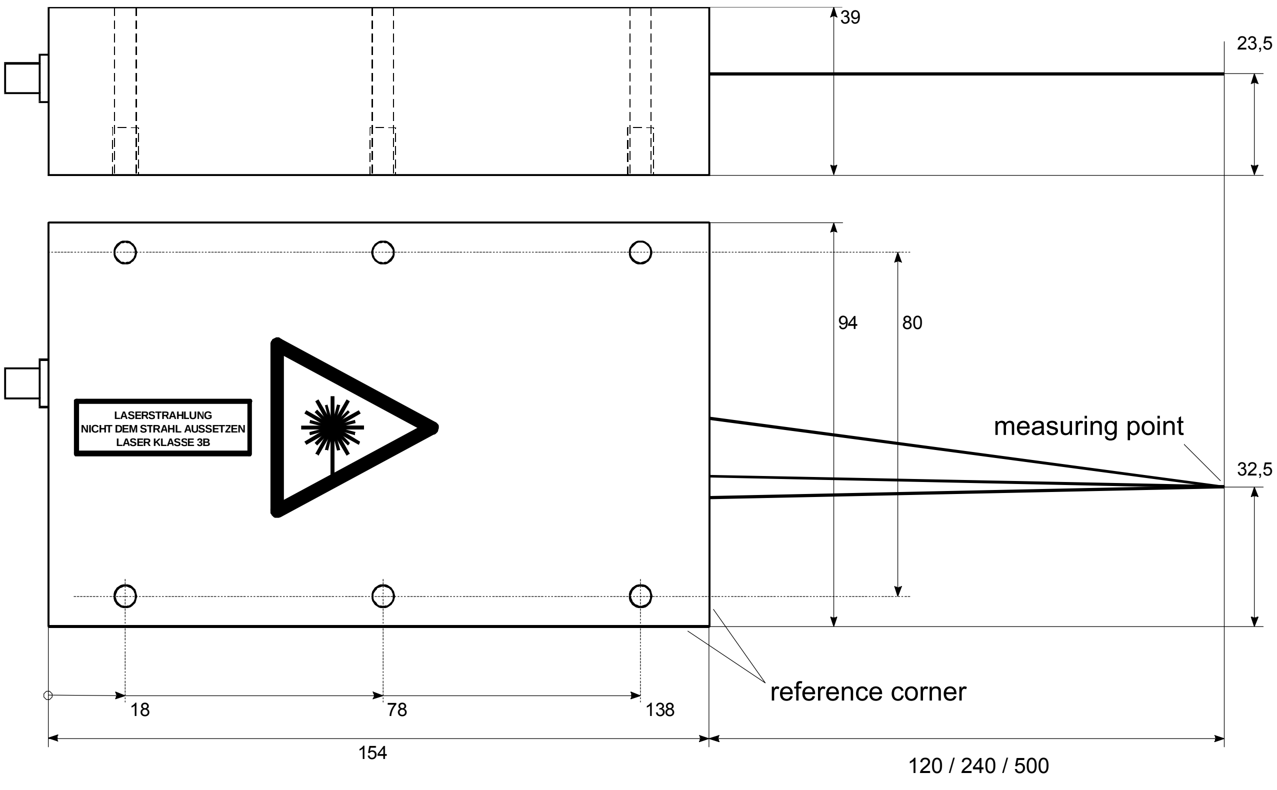
Sensor Head

Dimensioned sketch of the sensor head

The housing of the sensor head, which is made of aluminium, is closed with 6 screws. The emission of the laser beam goes through a special glas.

A ready made 3m five-pole cable for the connection of the sensor head and the processing unit is part of the scope of delivery. The voltage of the sensor head is 5VDC.

A two-colour LED at the side of the plug shows the operation status of the laser. Red light means off – Green light means laser on!



Direction for mounting:

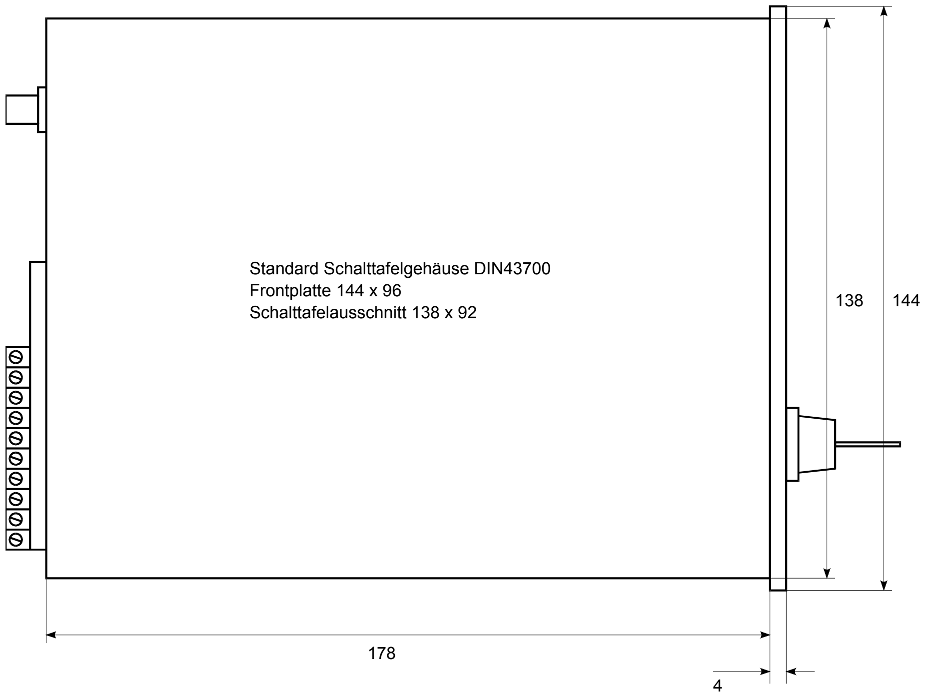
The scope of delivery includes also a PVC isolation plate (94x154x1mm) and 6 plastic screws M6 x 12. The customer or integrator has to provide a vibration free mounting plate (appr. 4mm thick) with 6 holes according to the above shown hole pattern. Please consider the mounting tolerances of the µSpeed system mentioned on page 5. Make sure that the sensor head is mounted in a isolated way by using the plastic screws as well as the isolation plate.

Processing Unit

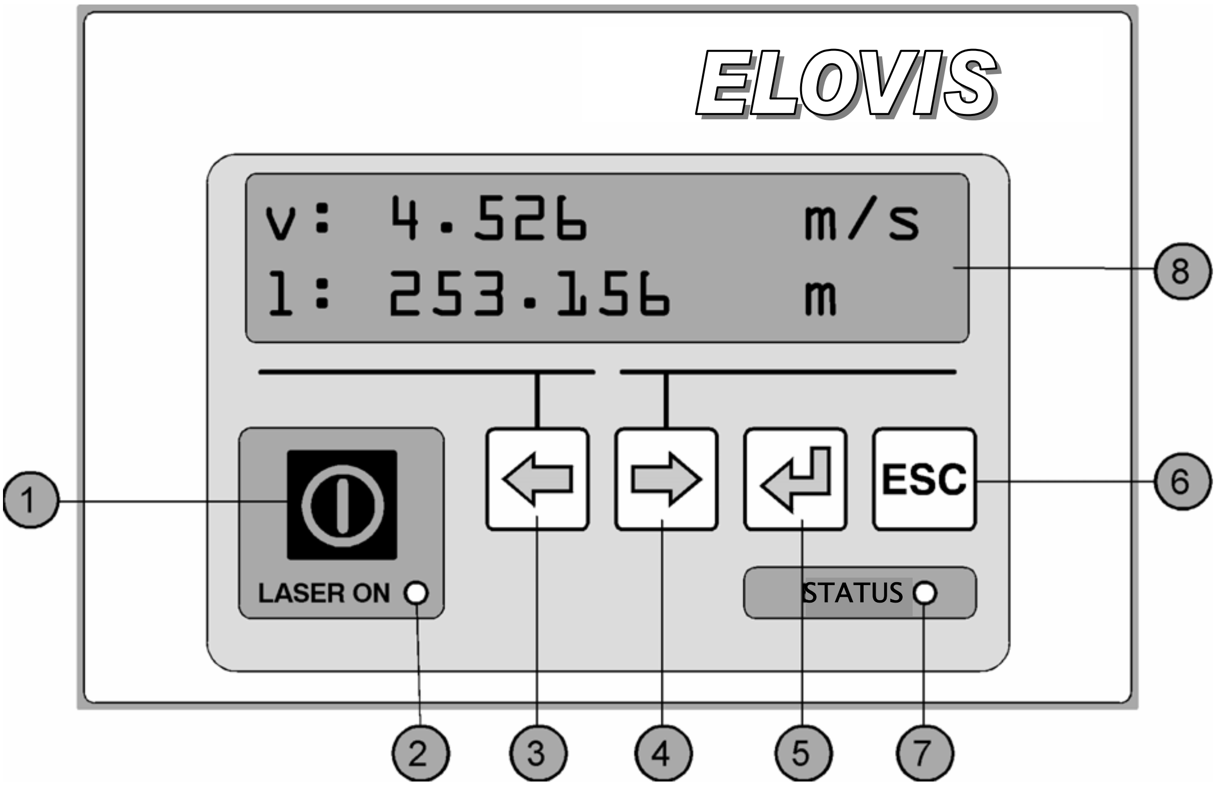
Dimensioned sketch of the processing unit

The housing of the processing unit is made of a aluminium frame with aluminium side walls. The unit is to be used both as table unit or for mounting into instrument panels. With the delivered clamp devices the processing
Unit can be fastened in a cut-out of $138^{+1,0}$ x $92^{+0,8}$ mm. Herefore the plastic feet have to be removed.

The front plate carries a foil keyboard including display and four operation keys as well as a key switch.

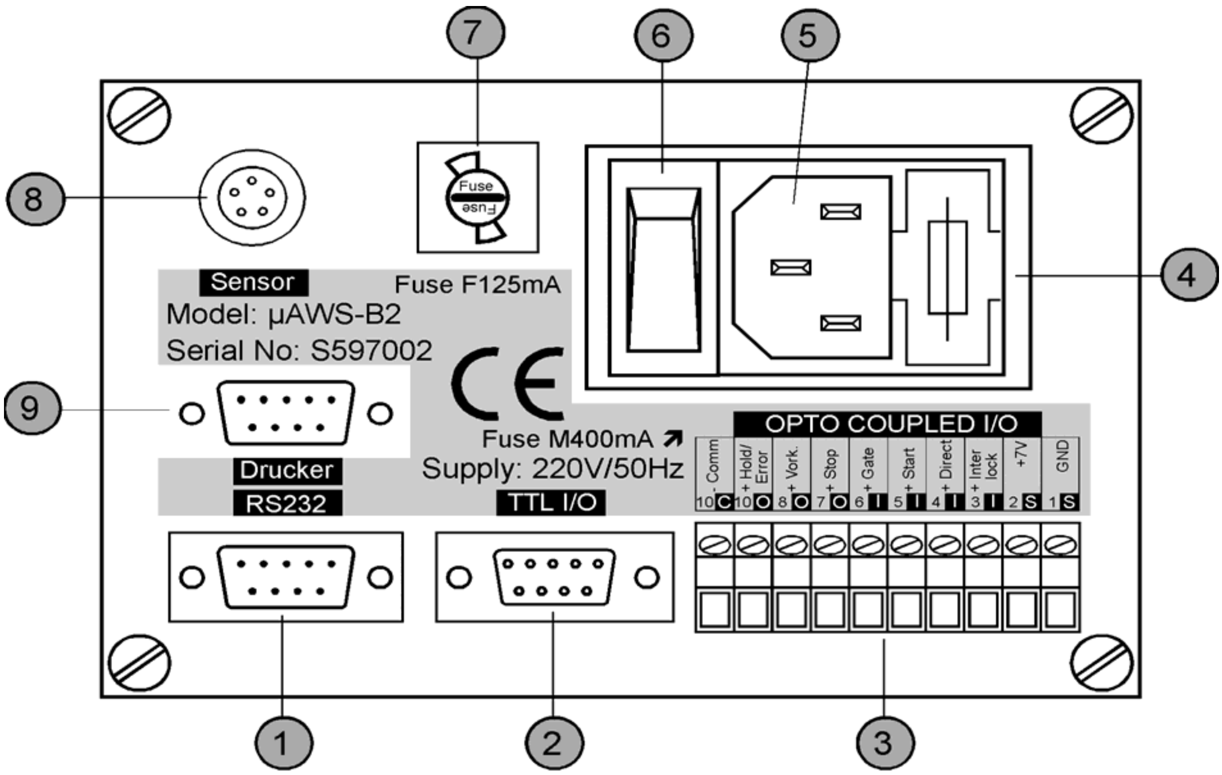


Front View



Nr.	*Description*
1	Key switch - is used to switch the LASER beam on/off
2	LASER ON LED: Lighted if Laser is on.
3	Left Button: This key is for menu selection or cipher input (left side)
4	Right Button: This key is for menu selection or cipher input (right side)
5	Return: Start / Stop function during measurement; Confirmation of selected menu points or ciphers
6	Escape: Change menu level; interruption of manual input
7	Status LED: - indicates failure or stand still
8	Display: 16 letters x 2 lines alphanumerical Display

Rear View



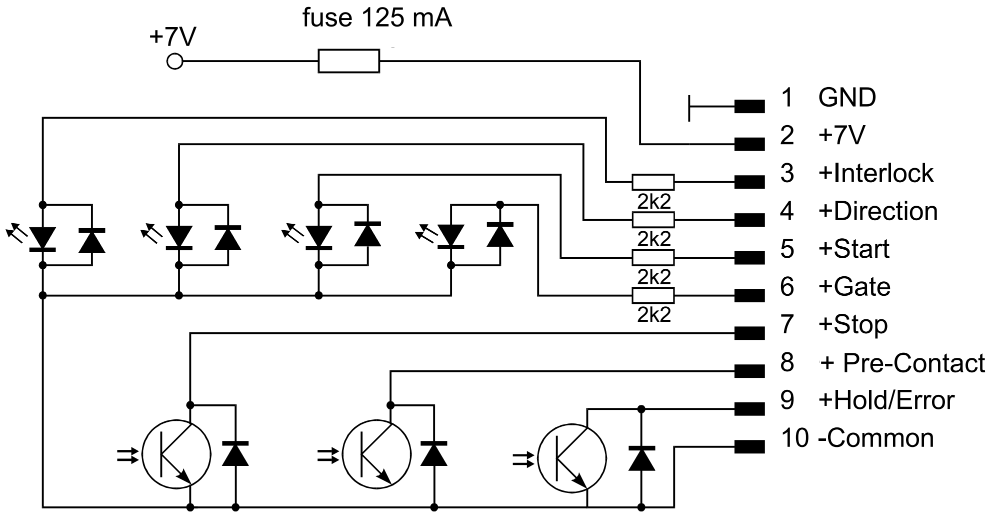
Nr.	*Description*
1	9 Pin Sub-D plug for connection of the asynchronous serial RS232 interface (DTE)
2	TTL I/O: Impulse output, direction output, DAC-output, Error/Hold. For the connection of the µSpeed-IMP-module
3	Optoisolated I/O: 10 pole connection device with Input for Start, Direction, Interlock and output for Pre-Stop, Stop and Hold/Error.
4	Main fuse: M400mA
5	Power supply (230V/50Hz or 115V/50Hz)
6	Main switch (Power ON/OFF)
7	secondary fuse for the auxiliary voltage
8	connector for the sensor head
9	9-pin Sub-D-Plug for serial printer

Pin Connection Layout

Description

- [+7V] Output voltage is additionally fused with 125 mA. The output is only used for the eventual supply of the optocouppled inputs.
- Interlock is used for the remote control of the laser (LASER ON/OFF). Hereby µSpeed can be integrated in a safety circle around a machine or production line.
- Direction is used for the change of the counting direction by external direction signal. It is recommended to use the direction port at the µSpeed-IP-module.
- Gate takes a mute signal of an external device, for temporary switching the sensor dumb without resetting the measured length. E.g. during the movement of defective material, which has to be cut out later. of a machine if the machine is at a rest. It is recommended to use the port at the µSpeed-IP-module.
- Start is used fort he external control of the measurement. A start signal results in resetting the unit.

opto-isolated I/O



Inputs : max 50V / 20mA
Outputs : max 50V / 100mA

Pin Nr.	*Description*
1	GND: (Internal 0-Volt)
2	+7V (fuse 125mA)
3	Interlock + Input (min. 2mA/5V, max. 20mA/50V)
4	Direction + Input (min. 2mA/5V, max. 20mA/50V)
5	Start + Input (min. 2mA/5V, max. 20mA/50V)
6	Gate + Input (min. 2mA/5V, max. 20mA/50V)
7	Stop + Output / End-contact (max 100mA, 300V)
8	Pre-Stop + Output / precontact (max 100mA, 300V)
9	Hold/Error + Output (max 100mA, 300V)
10	Common

*µ*Speed Accessories

***µ*Speed-TUBE**	**Sensor Head Tube**
***µ*Speed-CMS**	**Configuration & Monitoring Software**
***µ*Speed-RCS**	**Remote Control & Production Data Acquisition Software**
***µ*Speed-IMP**	**Impulse Processing Module**
***µ*Speed-KEY**	**Comfort Keyboard**
***µ*Speed-LM**	**Long-term Memory**
***µ*Speed-P**	**Printer**
***µ*Speed-IMPW**	**IMP Wheel**
***µ*Speed-DISP**	**Additional Display**
***µ*Speed-HSE**	**Protective Housing**
***µ*Speed-TRI**	**Sensor Tripod**

Sensor Head Tube
*µ*Speed-TUBE

Description

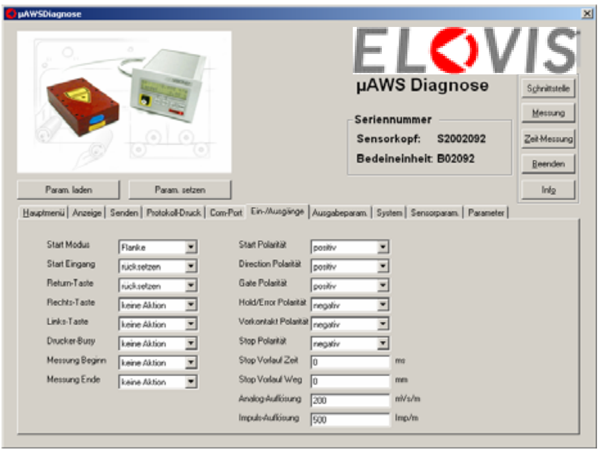
The Sensor Head Tube reduces the danger of looking directly into the laser beam.

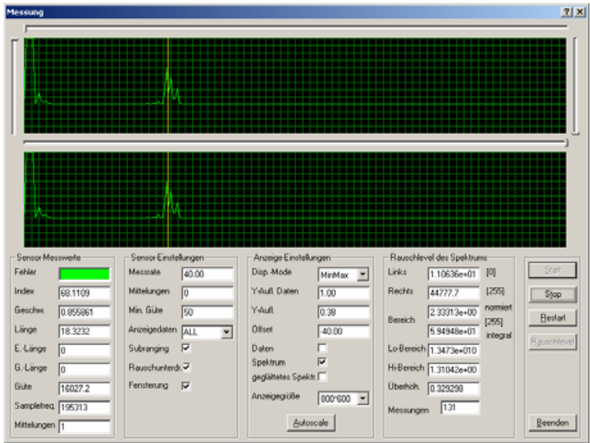
The standard tube reduces the gap between sensor head and material surface to 10mm only. In connection with other protection activities (light trap, mechanical shutter, manipulation prevention, machine safety enclosure with emergency stop switch) the laser class of the system can be reduced to class 1. Hereby further activities as e.g. the need of an employer who is in charge of laser protection, is not necessary any more.

Features

Heigth:	110 mm
Width:	20 x 30 mm
Material:	Aluminium

Configuration & Monitoring Software
*µ*Speed-CMS





Description

The configuration- and monitoring software is installed on a PC or a laptop. By connecting the µSpeed via RS 232 to the laptop, the laptop can be used for monitoring the measurement process or for showing or changing the configuration of the µSpeed system.

All measurement values can be displayed in graphical way.

The software enables the user additionally to memorize to the PC all data or measurement values which were monitored during the connection of µSpeed and PC.

Features

Number of files:	unlimited
Interpretation:	serial, RS232
Transmission format:	binary, ASCII

Remote Control &
Production Data Acquisition Software
*µ*Speed-RCS

Description

The software module µSpeed-RCS enables the user to read µSpeed data by a PLC (SPS) or a PPC (PPS) system or any other superior host computer at any time, defined by the host. Additionally the host computer can send data to µSpeed. All functions of µSpeed, which are available by pressing µSpeed keys can then be operated remote controlled by the host. The module uses the integrated RS-232 interface for communication.

µSpeed-RCS provides/enables:

- To read µSpeed data by PLC (SPS) or PPC (PPS) or any other host computer at any time defined by the host.
- The integration of µSpeed into the data processing of the production.
- To give the possibility to install a user specific visualization (e.b. by Visual Basic).
- To control the µSpeed by external computer or host systems.

The functions of the RCS module can be classified as follows:

- Replacement of the sensor keys
- To request measurement values
- To set parameters

Eigenschaften

Interpretation:	serial, RS232
Transmission format:	binary, ASCII

Impulse Processing *µSpeed*-IMP

→ certified by national metrology institution PTB
→ applied for patent

Description

***µ*Speed-IMP** provides four functions:

a.) direction recognition

b.) start and stop detection

c.) low speed measurement

d.) pulse output

By the use of ***µ*Speed-IMP** the signals of an external pulse generator device are processed to achieve the functions a, b and c. The pulse generator device can be either a encoder, which is driven by contact wheel or by transporting cylinder, or directly by a electric drive. The pulse output function (d) operates without any other external device and enables µSpeed to send quadrature pulse signals to replace contact tachometers.

***µ*Speed-IMP** is certified by the national metrology institution PTB (Germany) and has been applied for patent.

For achieving the function a, b and c, two shifted by 90° pulse input signals are necessary, which in general will be provided by a external encoder (contact wheel plus encoder that in most cases is already mounted to the machine). Hereby **µSpeed-IMP** detects the direction as well as start and stop of the material movement (not machine movement). In addition speed below the measurement limit of µSpeed is measured by **µSpeed-IMP**. As the external encoder is getting continuously calibrated by µSpeed, day to day use problems as well as material and thickness changes won't affect the measurement. By using this configuration the complete measurement system is long term stable and long term calibrated.

Connection

The fast and easy connection with **µSpeed-IMP** is done by plugging in the included in delivery 9-pole Sub-D cable in the µSpeed TTL I/O. The external encoder has to be connected to the corresponding clamp (channel A, channel B) of the **µSpeed-IMP**. See Figure 1. The pulse output signals are at clamp 9, 10, 13 and 14. **µSpeed-IMP** is designed to be mounted by top hat rail. Similarly the **µSpeed-IMP** has to be connected to the power supply (carried out by 24V auxiliary supply). The Grounding of the external encoder has to be the same as for the **IMP** unit (important: similar reference ground).

ELOVIS		
Impulse-Processing **µSpeed-IMP**		
1	Input	Impulse A
2	Input	Impulse B
3	-	n.c.
4	-	n.c.
5	-	n.c.
6	-	n.c.
7	-	n.c.
8	-	n.c.
9	Output	Channel /A
10	Output	Channel /B
11	Output	Impulse /N
12	Supply	24V
13	Output	Channel A
14	Output	Channel B
15	Output	Impulse N
16	Supply	0V

Table 1: Connector pin assignment

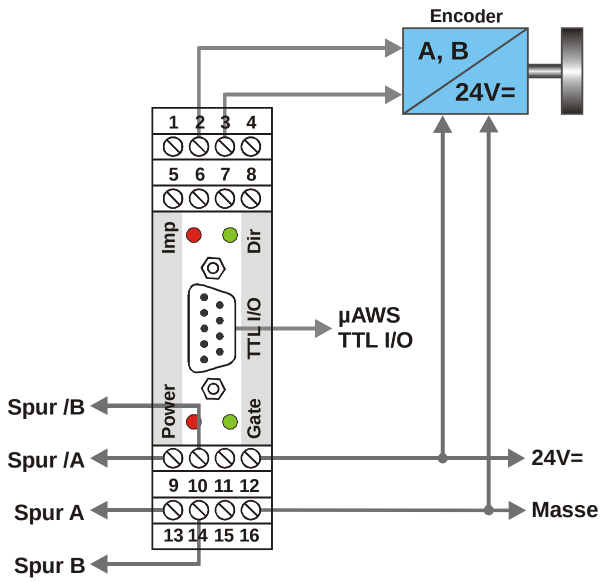


Figure 1: Connector pin assignment schema

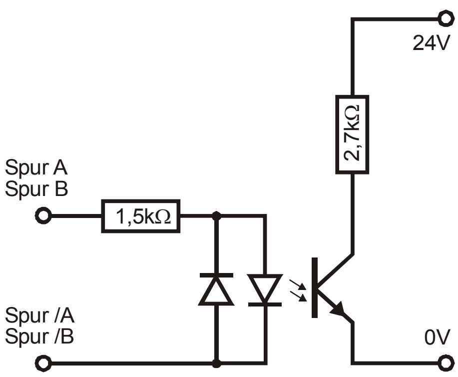


Figure 2: Input circuit

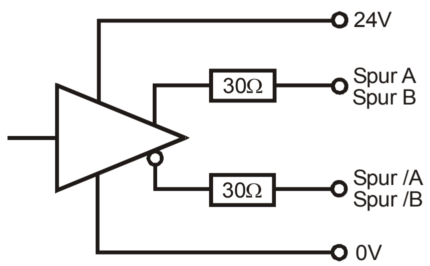


Figure 3: Output circuit

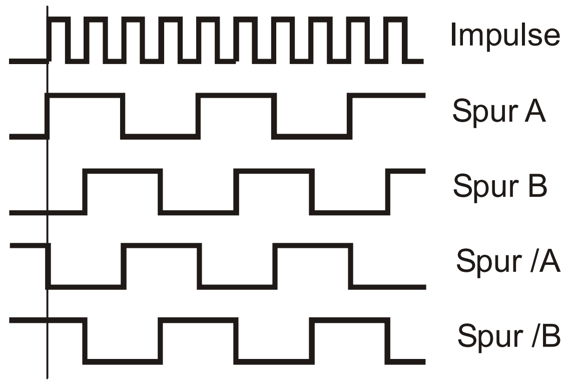


Figure 4: Timing diagram quadrature pulse output

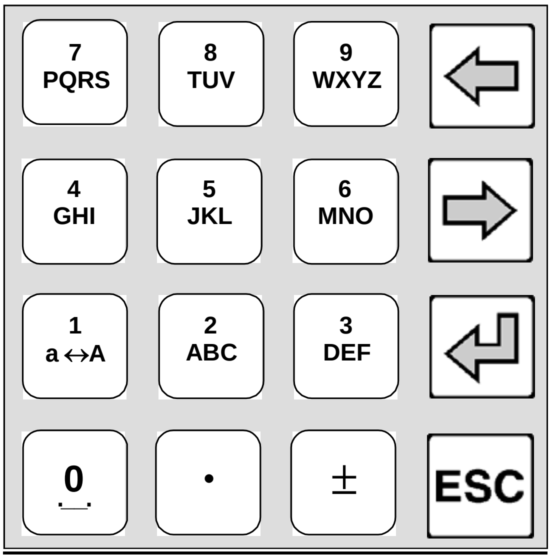
Features & Translation

Channel (Spur)
Ground (Masse)
Supply (Versorgung)........ 8-24V=
µSpeed (µAWS)………… Sensor system
Power consumption......... max. 2W
Inputs…......................... Imp. A
Imp. B
TTL I/O
Input resistance…............10kΩ
optional 10kΩ
Pullup resistance
Input - Hi......................... 3-24V
Input - Lo........................ <1.5V
Input frequency…............ <10kHz
Pulse resolution............. <4mm/Impuls
Scope of delivery............ µSpeed-IMP
TTL I/O cable

Parametration of µSpeed Processing unit:

To be set up in the under menu I/O:
a.) pulses/m……………... (…)
→ enter 4 times the number of pulses per meter which µSpeed+IMP should send to the machine control
b.) IMP ………………….. on
→ to activate the direction, low speed and gate function of the µSpeed
c.) IMP auto…………….. on
→ to activate the auto calbriation function
d.) IMP line periode……. (…)
→ enter the number of pulses per meter which the external wheel encoder sends out (standard: 1000imp/m)

Comfort Keyboard
*µ*Speed-KEY



Description

The comfort keyboard **µSpeed-KEY** makes data input to the µSpeed unit more easy. The comfort keyboard makes sense, if data input has to be done frequently and manually by an operator – e.g. for typing in length values for cut-to-length applications such as pre length and end length.

Beside the two ARROW keys, RETURN- and ESCAPE-key, 12 keys for typing in numbers and letters are integrated into µSpeed-KEY.

As e.g. in mobile phones, most keys are used for multiple input. Therefore text or parameter can easily and fast be changed.

The selection for multiple input of one key is done by pressing the same key several times in a fast way. The respectively selected value is shown in the display.

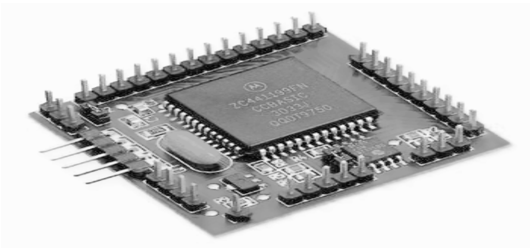
The µSpeed processing unit identifies by itself that the µSpeed-KEY has been plugged in, and makes the connection and switches the operation itself to µSpeed-KEY. The four keys of the processing unit have the same functionality as the according keys of the comfort keyboard.

The comfort keyboard is designated to be installed into a front panel. The connection of the comfort keyboard is done by a 9-pole cable (I^2C-Bus) to the TTL I/O-interface of the µSpeed processing unit.

Features

Interface	I^2C-Bus
Dimensions (BxH)	96 x 96 mm
Front	membrane keyboard 4 x 4 Keys

Long-term Memory
*µ*Speed-LM



Description

The **µSpeed-LM** long-term memory electronic board (ring memory) is designed to be integrated into the µSpeed processing unit and is used for memorization of up to 50.000 measurement values. The Measurement values can be read out via serial interface.and by laptop, PC or any superior host computer.

One data file memorizes not only the measurement value “Length” itself, but also the running memory file number, the date and hour of the measurement, the user name as well as the failure flag which tells about the validity of the measurement value.

Additionally a shift performance counter is implemented into µSpeed-LM, which memorizes the performance of up to 6 working shifts. By this counter, the production volume and the total lengths of each shift can be memorized and then analyzed by a production data analyze software.

The memorized data can be selected an displayed by the operator menu of the µSpeed processing unit and then be sent by serial interface to an external computing system. The data selection can be done by choosing the memory file number or the memorization date of the data file.

The µSpeed-LM long-term memory is a flash-EEPROM with a capacity of more than 50000 data files.

µSpeed-LM memorizes the data in a cyclical way, that means that if the memory capazity has been reached, the oldes data file will be over written by the newest data file and so on. The running file number will count on and on. By the high memory capacity the memorized data files can rest long time in the memory until they will be over written.

It is not possible to delete data files manually (not by accident – and not if wanted!).

Features

File capacity…………….......... appr. 50.000

Data file format....

1. Running file number
2. Failure flag of the measurement value (correct measurement)
3. Date/Hour of measurement
4. User 1
5. User 2
6. Failure flag of data file (correct memorization)

Data reading and analyze: serial, RS232

Printer
*µ*Speed-P

Description

The EPSON TM-U295 printer enables the user to print out measurement values or optionally (by additional ordering) customer specific production data inclusive customer logos into document forms.

The format of the print out is defined by two independent format strings which are memorized in the processing unit.

The print out of the last measurement result starts by receiving the start signal which is given to start a new measurement.

Five different ways of giving the start signal can be used:

1. RETURN-Key of the processing unit
2. RIGHT ARROW Key
3. LEFT ARROW Key
4. External start signal input
5. Printer busy (by inserting paper into the printer)

The operator can select each of this signal sources by menu of the processing unit to combine them with one of the two format strings. Therefore the print out can be controlled very flexible.

Besides logos and texts which can be programed in a fix way, the following running program parameter can be read out:

1. User 1
2. User 2
3. Date
4. Hour
5. Running number of measurement
6. Failure flag of the measurement
7. Formated length measurement value

The printer is connected to the RS232 print out port of the µSpeed processing unit.

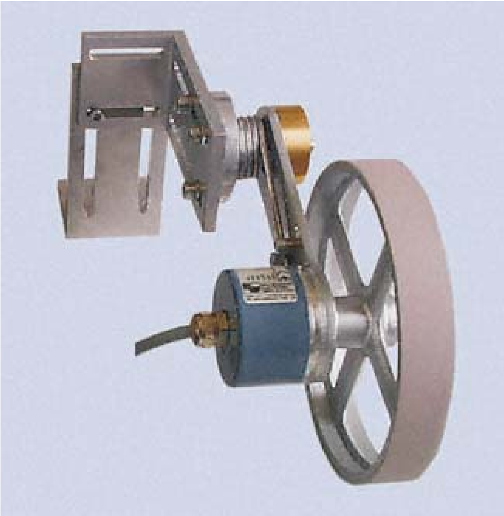
Features

Printing method...............	7-Pin-Matrix-Shuttle-Printer
Size of Paper (WxH).......	80x69 - 1582x257
Characters per Inch.........	13,5 / 16,2
Printing speed……….….....	2,1 LPS
Life time of cartridge….....	15 Mio. Characters
Interface…......................	RS-232
Buffer.............................	512 or 35 Bytes
Weight............................	1,6 kg
Printer size (WxDxH)…....	180x190,5x101,5
Supply……….....................	24 V=

(all size units in mm – if nothing else mentioned)

Remark: Also other RS232 printers are available!

IMP-WHEEL
*µ*Speed-IMPW



In combination with the ***µ*Speed-IMP,** the IMP wheel can be used to send direction and gate signals to µSpeed. The µSpeed IMP Wheel enables also to measure extremely low speed which in general can not be measured by any laser-doppler system.

In combination with µSpeed-IMP and µSpeed basic unit, the ***µ*Speed-IMP wheel** is certified by the national metrology institution PTB (Germany).

Description

To recognize the direction of the material movement as well as for measurement of lowest speed (e.g. 5mm/hour), µSpeed-IMPW consists of
- rubber nib roll with 500mm circumference
- encoder, 10-30VDC, 500imp/turn, push-pull output or contra pulse (alternative: 5VDC, TTL)
- arm with spring

Additional Display
*µ*Speed-DISP

picture shows 4-spaces 7-segment display

Description

µSpeed can additionally be equipped with a alphanumeric size display, which enables the user to read measurement values and status messages over distances of more than 10 m.

µSpeed-DISP in standard configuration is a 8-spaces 7-segment display. µSpeed-DISP can optionally be ordered as a two line display with each 16-spaces 7-segments.

The display scope of delivery includes a mounting plate and connection cable.

Other sizes of displays and more than one or two arrays due to customer specifications, are possible. Please contact us!

Protective housing
*µ*Speed-HSE


Standard Protective Housing µSpeed-HSE

Protective housing with shild µSpeed-HSEa

<u>Description</u>

The µSpeed-HSE protective housing is used to protect the sensor head against pollution and high temperature.

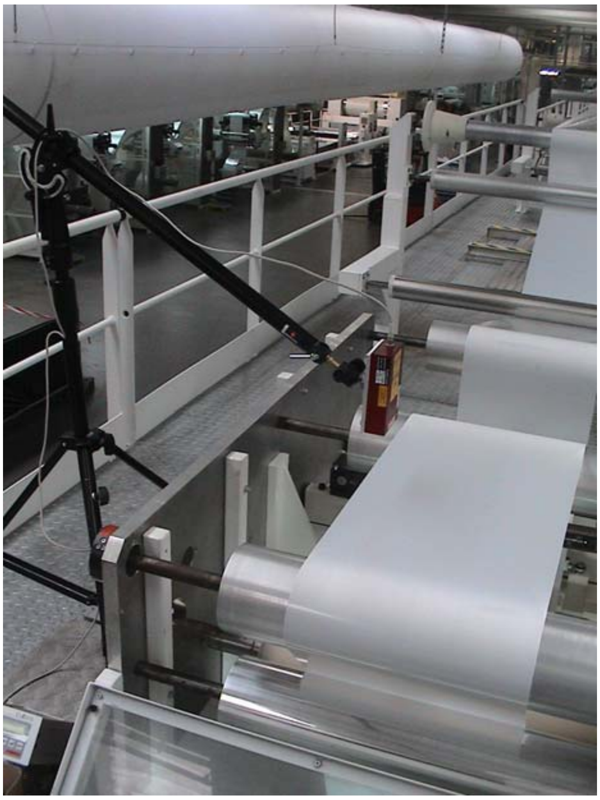
The housing is standardly delivered with a 5m oilresistand flexible tube for air conditioning. The air with a max. temperature of 30°C has to be delivered by the customer.

According to the temperature of the incoming air, the housing can be used in surroundings with 80°C and more.

By the continuous flowing air, the sensor is also protected against pollution, fog or humidity which could affect the measurement ability of the sensor.

The housing can optionally be equipped with a protection shild (µSpeed-HSEa – see picture below) or with a laser protection tube.

Sensor-Tripod
*µ*AWS-TRI



Tripod µAWS-TRI with standard sensor head

Tripod µAWS-TRI with conter weight in combination with housing µAWS-HSE

Description

Aufgrund der geringen Baugröße sowie dem äußerst geringen Gewicht des Sensorkopfes (1kg) kann der Sensor auch portabel eingesetzt werden.

Das Sensorkopf-Stativ µAWS-TRI dient hierbei als Standardhalterung. Mittels Galgenausleger und Kugelkopf ist das System nahezu an jeder Stelle einer Produktions- oder Umwickelmaschine innerhalb kurzer Zeit stabil aufgebaut und messbereit ausgerichtet. Durch den Galgenausleger kann der Sensorkopf bis zu 2,5m entfernt vom Zentrum des Stativs justiert werden.

Durch die stabile Bauweise des Stativs ist es sogar möglich das Sensor Umgehäuse µAWS-HSE für portablen Aufbau zu verwenden. Für diesen Anwendungsfall kommt das standardmäßig gelieferte Gegengewicht (orange) zum Einsatz.

Wichtig bei der portablen Nutzung des Sensors ist die Kenntnis und Berücksichtigung der ELOVIS Laserschutzvorschriften. Die Nutzer von portablen Sensoren müssen dementsprechend besonders in Sachen Laserschutz geschult und ausgebildet werden.