User Manual

Anwenderhandbuch engl.

VLM 200

ASTECH
Angewandte Sensortechnik

Notes

The information contained in this manual has been thoroughly researched and prepared. Nevertheless, we cannot assume liability for omissions or errors of any nature whatsoever. We would, however, be grateful for your comments or suggestions.

No damage claims can be made, except those resulting from intentional harm or negligence.

As this product is available in several designs, the manual in hand may possibly deviate from the product supplied.

We reserve the right to make technical changes, which serve to improve the product, without prior notification. Thus, it cannot be assumed that subsequent versions of a product will have the same features as those described here.

Registered trade marks are the property of their manufacturers.

Contents

1 Introduction

The VLM 200 measuring device for velocity and length is suitable for taking measurements on a wide variety of materials. The VLM 200 operates optically without contact, and implements the physical principle of the spatial filter via the use of a CCD-sensor: Optically resolvable structures of the material surface are mapped on the CCD-sensor, which derives from the motion a frequency, from which the velocity can be calculated.
The VLM 200 measures the velocity of solids or particles. A subsequent integration calculates the length. The integration can be controlled by an external signal (start/stop controlled by signal trigger).

The velocity is calculated and the length integrated **based on positive and negative sign.** The direction can be controlled by an external signal. An automatic directional identification is optionally available.

The output signals are generated by a processor. The VLM 200 can be connected to an existing control and process data capturing system. All inputs and outputs are optically isolated. For programming a serial interface RS 232 exists (serial interface 1). The standard delivery of the VLM 200 with connection board AB1 is equipped with two outputs, which can be used either as pulse or alarm outputs. A third output serves as status signal and is programmable. Further serial interfaces, an analog output, different high resolution pulse outputs and bus interlaces are optionally available (interface cards).

The system is accommodated in an IP 65 casing. It is powered by 230-Volt AC or optionally by 24-Volt DC and 115-Volt AC.

Notes on this manual:

- Commands and functions are in italics. Large and small case writing serves to improve legibility:
    e.g. *ALOn* (command for switching on the alarm function)

- The brief writing style recommended for command inputs is additionally printed in bold in the syntax:
    e.g. ***S1F****ormat* (command for programming the serial interface 1).

- Designations are enclosed in apostrophes:
    e.g. ´SW500´ (switch SW500).

- The following symbols are used:

n	number	s	character string
c	character	[ ]	optional

- The following abbreviations are used for measuring data:

V	velocity	N	object counter
L	length	R	measuring rate

The following symbols are used to accentuate particular hints:

⚠ Attention!   ⚠ Hint!   ⚠ Information!

2 Function

2.1 Physical principle

The VLM 200 operates optically without contact, and implements the principle of the spatial filter via the use of a CCD-sensor.

Spatial filter is the generic term for a measuring principle for the non-contact determination of the velocity and length of moving materials. The spatial filter is based on the filter effect of grid-like structures (grid modulation).

The function of the VLM 200 can be described in simple terms as follows:

The lens is oriented towards the moving measuring object, the object forming an image on the CCD-line. The CCD-line is operated as an optical grid (no image pickup). To illuminate the measuring object, a white light source is used. System hums of the lighting and external light are suppressed by the principle. Due to the grid modulation, the movement of the object generates a frequency, which is proportional to the velocity, i.e. the structure of the measuring object (brightness contrast) generates a signal. This signal is hereinafter known as "burst". These bursts are evaluated by the system, i.e. the signal frequency is measured, and the velocity calculated thereof.

There are several control circuits that enable an automatic adjustment to the most varied of materials (material surface structure and brightness).

$$v = f \cdot k$$

v - velocity
f - signal frequency
k - device constant
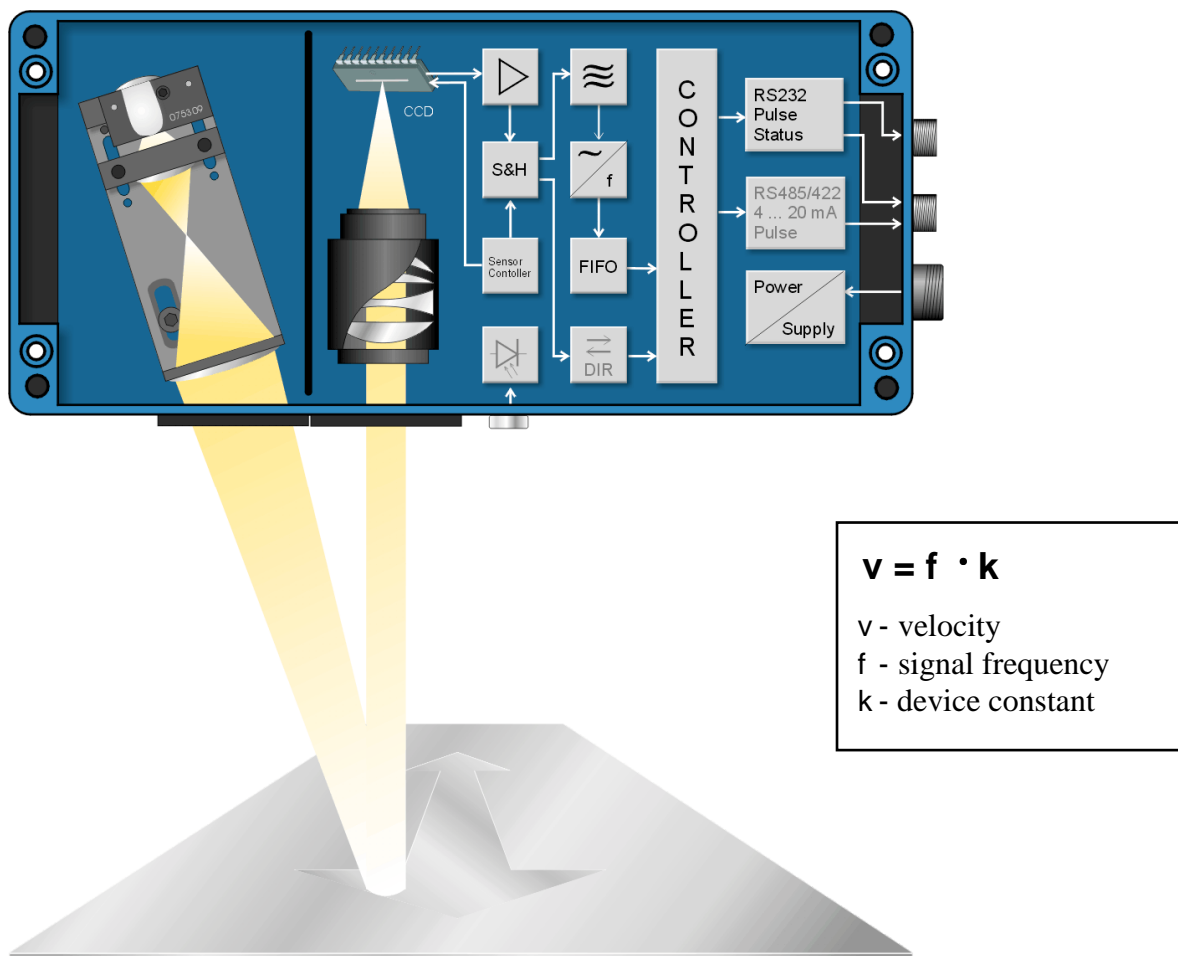
Figure 1   Structure of the VLM 200

2.2 Evaluation

The signal frequency (bursts) is determined by the VLM 200 electronic evaluation system . It implements a short-time frequency measurement via the evaluation of individual periods. The velocity is calculated by multiplying the frequency with the device constant and the calibration factor. By transitorily integrating the velocity, the length of the object can be determined. The integration can be controlled by an external signal (trigger).
Furthermore, the measuring rate is calculated. It can be used to optimise the device assembly.

2.3 Interfaces

The VLM 200 is equipped with various optically isolated interfaces (some are optionally). The measuring values can be output via serial interfaces to the PC, to a control unit (PLC) or to a printer. Different pulse outputs are available for the connection of the counters. An optional analog output is also possible.

The standard version with comprises the following interfaces (connection board AB1):

- RS 232 (serial interface S 1, programming interface),
- Two alarm or pulse outputs,
- Status signal output ,
- Directional signal and trigger signal inputs.

Optionally, the system can be equipped with the following interfaces (interface cards):

- Second serial interface S2 on IFI interface card (RS 232, RS 422/RS 485)
- IF1 analog output (4 to 20 mA, other ranges optional),
- IF2-series interface card with two high resolution pulse outputs and partially optional analog output,
- ECC2 shaft encoder coupling with optional serial interfaces S2 (RS485),
- For network connection IFPROFI (Profibus DP) or IFETHER (UDP/IP, TCP/IP).

All interfaces are distinguished by a high flexibility (programmable scaling and output time) and can be easily configured.

2.4 Configuration

All configurations can be made using a PC and a terminal program via the serial interface S1 (RS 232). The individual commands are described in the chapter on Programming .
The set parameters can be protected by a password. Any changes made are lost after switching off the device, if they were not saved by the password protected *Store* command.

3 Equipment designs

There is a range of various equipment designs (series) available – which are compatible with each other both electrically and as regards connection. The majority of the options (interface cards, mounting accessories, etc.) can be used with all designs.

Differences in the possible measuring range, in the measuring distance and in the distance variance result due to the different optics of the A, L and D device series.

The devices of the F- and S-series have a fast signal evaluation – the resulting differences in programming are explained in a separate chapter.

The signal processing of the F-series is combined with the various optic designs in the A-, L- and D-series, so that the types such as VLM 200 FA or VLM 200 FD emerge. For the VLM 200 D-Series the option /h is available for glowing surfaces.

3.1 VLM 200 A-series

The VLM 200 A realises a working distance of 185 ± 7,5 mm. It is designed as a universal device and allows **measuring on the most varied of materials**. The device can be automatically adjusted to the reflection, colour and structure of the material surface in an extremely wide range.

By altering the *DIRECTION* parameter (refer to programming chapter) the working distance range can be extended; i.e. the range, in which the material to be measured must be located. The extended working distance-range of the A-series equals 185 ± 15 mm.

3.2 VLM 200 F-series

The devices in the VLM 200 F-series have been developed for **highly dynamic velocity measurements** in the production process and are especially well suited for **closed control loops**. The F-series has been extended to include an averaging processor. This calculates the gliding average value, weighted according to the signal quality. A ring memory with 4 or 8 averaging cycles is used. Hereby, a significantly higher update rate can be achieved at the outputs compared with that of the VLM 200 A, whereby the minimum update time of the outputs equals 2 ms. The internal calculation of the length and an automatic directional identification are not possible (refer to the chapter on the F and S device series for more details).

Due to the high calculation performance the use of the VLM 200 F is to be recommended for higher velocities.

3.3 VLM 200 D-series

The VLM 200 D and VLM 200 FD are specially designed for applications on **metallic surfaces** as well as for a large distance variance.

They realise a working distance of 240 ± 15 mm and are distinguished by a high reproducibility ≤ 0,05 % with a working range of 240 ± 7,5 mm.

Measurements of **velocities less than 0.033 m/s** (2 m/min) are possible.

The devices in the D-series can, if necessary, be configured for a wide range of the distance variance (see table).

3.4 Option /h for VLM 200 D-series

Build on the VLM 200 D-series the option /h was developed for measuring **glowing tubes, wires and profiles** made of steel, copper and brass and other. The older H-series with a working distance of 330 ± 15 mm is stopped.

The devices VLM 200 D /h realise a working distance of 240 ± 15 mm and use special optical windows. Depending on the individual ambient conditions, a sufficient cooling is necessary (e.g. CB5 cooling and protecting case and air supply AC5).

3.5 VLM 200 L-series

The VLM 200 L and VLM 200 FL devices realise a measuring distance of $170 \pm 7{,}5$ mm. They are used primarily to **measure low velocities**, as the minimum possible velocity is **0.008 m/s** (0.5 m/min).

The devices of the L-series have an extended working range of 170 ± 10 mm.

3.6 VLM 200 S-series

Devices of the S-series correspond to those of the F-series, however, also allow the **synchronisation of the averaging processor** and therefore of the complete system via an external clock signal.

If two measuring devices of the VLM 200 SD type are controlled by the same clock signal, the complete processing of the measuring value of both devices is synchronous to the set clock signal. Using this configuration it is then possible, for example, to carry out highly precise and dynamic **differential velocity measurements** (for further details refer to chapter on the F and S device series).

The VLM 200 SD measuring devices are distinguished by an especially high reproducibility rate of $\leq 0{,}03$ % for a working range of $240 \pm 7{,}5$ mm.

3.7 Summary of equipment designs

	VLM 200 A	VLM 200 FA	VLM 200 SA	VLM 200 D	VLM 200 FD	VLM 200 SD	VLM 200 L	VLM 200 FL	VLM 200 SL
Velocity range in m/min	**4 up to 400 m/min**	**4 up to 1500 m/min**	**4 up to 1500 m/min**	**2 up to 400 m/min**	**2 up to 900 m/min**	**2 up to 900 m/min**	**0.5 up to 50 m/min**	**0.5 up to 50 m/min**	**0.5 up to 50 m/min**
Velocity range in m/s	0.07 up to 6.7 m/s	0.07 up to 25 m/s	0.07 up to 25 m/s	0.03 up to 6.7 m/s	0.03 up to 15 m/s	0.03 up to 15 m/s	0.008 up to 0.83 m/s	0.008 up to 0.83 m/s	0.008 up to 0.83 m/s
Accuracy	**0.1 %**	**0.1 %**	**0.1 %**	**0.1 %**	**0.1 %**	**0.05 %**	**0.1 %**	**0.1 %**	**0.05 %**
Repeatability	≤ 0.1 %	≤ 0.1 %	≤ 0.1 %	≤ 0.05 %	≤ 0.05 %	≤ 0.03 %	≤ 0.05 %	≤ 0.05 %	≤ 0.03 %
in range	185 ± 7.5 mm	185 ± 7.5 mm	185 ± 7.5 mm	240 ± 7.5 mm	240 ± 7.5 mm	240 ± 7.5 mm	170 ± 5 mm	170 ± 5 mm	170 ± 5 mm
Working distance	**185 ± 7.5 mm**	**185 ± 7.5 mm**	**185 ± 7.5 mm**	**240 ± 15 mm**	**240 ± 15 mm**	**240 ± 7.5 mm**	**170 ± 7.5 mm**	**170 ± 7.5 mm**	**170 ± 7.5 mm**
Internal length range	200 km	-	-	200 km	-	-	200 km	-	-
Widen velocity range in m/min *)	**8 up to 800 m/min**	**8 up to 3000 m/min**	**8 up to 3000 m/min**	**4 up to 800 m/min**	**4 up to 1800 m/min**	**4 up to 1800 m/min**	**1 up to 100 m/min**	**1 up to 100 m/min**	**1 up to 100 m/min**
Widen velocity range in m/s*)	0.14 up to 13.3 m/s	0.14 up to 50 m/s	0.14 up to 50 m/s	0.07 up to 13.3 m/s	0.07 up to 30 m/s	0.07 up to 30 m/s	0.016 up to 1.7 m/s	0.016 up to 1.7 m/s	0.016 up to 1.7 m/s
Working distance for widen range *)	**185 ± 15 mm**	**185 ± 15 mm**	**185 ± 15 mm**	**240 ± 30 mm**	**240 ± 30 mm**	**240 ± 15 mm**	**170 ± 10 mm**	**170 ± 10 mm**	**170 ± 10 mm**
Accuracy in widen range *)	0.2 %	0.2 %	0.2 %	0.2 %	0.2 %	0.1 %	0.2 %	0.2 %	0.1 %
Averaging and updating	≥ 8 ms	≥ 2 ms (moving average)	≥ 2 ms (moving average)	≥ 8 ms	≥ 2 ms (moving average)	≥ 2 ms (moving average, synchronously)	≥ 8 ms	≥ 2 ms (moving average)	≥ 2 ms (moving average)
Optional automatic directional-detection	yes	-	-	yes	-	-	yes	-	-
Material	almost al surfaces	almost al surfaces	almost al surfaces	metallic surfaces	metallic surfaces	metallic surfaces	metallic and other surfaces	metallic and other surfaces	metallic and other surfaces
Application	universal	universal	Difference measurement	universal	universal	Difference measurement	low velocity	low velocity	Difference measurement for low velocity

*) VLM 200 parameter *DIRECTION 4 ... 8*   Measuring range depends on the applied FB 1 filter (refer to appendix). Further information can be found in data sheets. Special designs are possible.

	VLM 200 A /h	VLM 200 FA /h	VLM 200 SA /h	VLM 200 D /h	VLM 200 FD /h	VLM 200 SD /h	VLM 200 L /h	VLM 200 FL /h	VLM 200 SL /h
Velocity range in m/min	**4 up to 400 m/min**	**4 up to 1500 m/min**	**4 up to 1500 m/min**	**2 up to 400 m/min**	**2 up to 900 m/min**	**2 up to 900 m/min**	**0.5 up to 50 m/min**	**0.5 up to 50 m/min**	**0.5 up to 50 m/min**
Velocity range in m/s	0.07 up to 6.7 m/s	0.07 up to 25 m/s	0.07 up to 25 m/s	0.03 up to 6.7 m/s	0.03 up to 15 m/s	0.03 up to 15 m/s	0.008 up to 0.83 m/s	0.008 up to 0.83 m/s	0.008 up to 0.83 m/s
Accuracy	**0.1 %**	**0.1 %**	**0.1 %**	**0.1 %**	**0.1 %**	**0.05 %**	**0.1 %**	**0.1 %**	**0.05 %**
Repeatability	≤ 0.1 %	≤ 0.1 %	≤ 0.1 %	≤ 0.05 %	≤ 0.05 %	≤ 0.03 %	≤ 0.05 %	≤ 0.05 %	≤ 0.03 %
in range	185 ± 7.5 mm	185 ± 7.5 mm	185 ± 7.5 mm	240 ± 7.5 mm	240 ± 7.5 mm	240 ± 7.5 mm	170 ± 5 mm	170 ± 5 mm	170 ± 5 mm
Working distance	**185 ± 7.5 mm**	**185 ± 7.5 mm**	**185 ± 7.5 mm**	**240 ± 15 mm**	**240 ± 15 mm**	**240 ± 7.5 mm**	**170 ± 7.5 mm**	**170 ± 7.5 mm**	**170 ± 7.5 mm**
Internal length range	200 km	-	-	200 km	-	-	200 km	-	-
Widen velocity range in m/min *)	**8 up to 800 m/min**	**8 up to 3000 m/min**	**8 up to 3000 m/min**	**4 up to 800 m/min**	**4 up to 1800 m/min**	**4 up to 1800 m/min**	**1 up to 100 m/min**	**1 up to 100 m/min**	**1 up to 100 m/min**
Widen velocity range in m/s*)	0.14 up to 13.3 m/s	0.14 up to 50 m/s	0.14 up to 50 m/s	0.07 up to 13.3 m/s	0.07 up to 30 m/s	0.07 up to 30 m/s	0.016 up to 1.7 m/s	0.016 up to 1.7 m/s	0.016 up to 1.7 m/s
Working distance for widen range *)	**185 ± 15 mm**	**185 ± 15 mm**	**185 ± 15 mm**	**240 ± 30 mm**	**240 ± 30 mm**	**240 ± 15 mm**	**170 ± 10 mm**	**170 ± 10 mm**	**170 ± 10 mm**
Accuracy in widen range *)	0.2 %	0.2 %	0.2 %	0.2 %	0.2 %	0.1 %	0.2 %	0.2 %	0.1 %
Averaging and updating	≥ 8 ms	≥ 2 ms (moving average)	≥ 2 ms (moving average)	≥ 8 ms	≥ 2 ms (moving average)	≥ 2 ms (moving average, synchronously)	≥ 8 ms	≥ 2 ms (moving average)	≥ 2 ms (moving average)
Optional automatic directional-detection	yes	-	-	yes	-	-	yes	-	-
Material	Metallic and glowing surfaces	Metallic and glowing surfaces	Metallic and glowing surfaces	Metallic and glowing surfaces	Metallic and glowing surfaces	Metallic and glowing surfaces	Metallic and glowing surfaces	Metallic and glowing surfaces	Metallic and glowing surfaces
Application	universal	universal	Difference measurement	universal	universal	Difference measurement	low velocity	low velocity	Difference measurement for low velocity

*) VLM 200 parameter *DIRECTION 4 ... 8*   Measuring range depends on the applied FB 1 filter (refer to appendix). Further information can be found in data sheets. Special designs are possible.

4 Technical data

Velocity measuring range [1]) [2])	0.008 to 50 m/sec corresponds to 0.5 to 3000 m/min (according to individual device type)
Working distance [2])	170, 185 or 240 mm (according to individual device type)
Length measuring range (internal)	< 1 m ... 200 km (except F- and S-series)
Detector / Measuring principle	CCD-sensor / spatial filter
Lighting [2])	White light, halogen lamp 10 W
Programming interface [3])	RS 232 (optically isolated)
Optically isolated outputs [3])	OUT1, OUT2, OUT3
Function	OUT1, OUT2: Pulse output with 2 phases shaft encoder emulation
	OUT3: Signal Status
Frequency of pulse output	1 Hz - 7 kHz with max. +0,2 % error at 7 kHz
Type / max. output current	(optional high resolution pulse output available)
	NPN open collector / 40 mA
Optically isolated inputs [3])	IN1, IN2
Function	external directional signal and trigger signal
	(for signals ±20 mA, 0/20 mA or 0/24 V, Ri approx. 1 kOhm)
LOW level	-40 to +0.3 mA
HIGH level	+2 to +40 mA
Power supply	230 V / 50 Hz
	optional 115 V / 60 Hz
	optional 24 V / DC (20 to 30 V)
Power consumption	< 50 W
Temperature range	0 to 50 °C
Protection type	IP 65
Weight	Approx. 5.8 kg
EMV [4])	Industrial standard in compliance with CE
Dimensions without connections [2])	360 mm x 160 mm x 90 mm

Options

- Analog output IF1 4 to 20 mA or 0 to 20 mA (16 bit, optically isolated)
- Different digital interfaces IFI (RS 484/RS 422, RS 232, optically isolated
- Network connection IF-PROFI (Profibus DP), IF-ETHER (UDP/IP and TCP/IP)
- High resolution pulse output IF2 0.4 Hz to 25 kHz, IF2/PP 0.4 Hz to 50 kHz and IF2F/5V or IF2F/422 0.4 to 500 kHz (2 x 2 phases, resolution 20 ns)
- Light cabinets, directional identification (not for F/S-series), real time clock, different counters and displays
- Mounting accessories, linear units, protection casing, free blowing device

[1]) Configured according to customer demand, dependent on the FB1 filter board (refer to appendix)

[3]) Max. voltage 50 V/DC, 36V/AC

[2]) Standard design, other versions are available

[4]) Tested by accredited institute

5 Installation

The installation is carried out transversally to the direction of movement of the measuring object (see drawing in the appendix, special designs possible). The standard direction of movement (forwards) is determined from the bottom of the casing to the casing cover (special designs possible). The direction of movement (plus means forwards) is identified by an arrow at the device.

H	Installation can take place either in positive or negative direction. Only the *Direction* parameter must be set accordingly (refer to chapter on programming)!

The device does not need to be opened for installation. It is secured with four M6 hexagon socket screws.

It is necessary to adhere the correct working distance (distance between lens window and material surface) and the range variation specified by the manufacturer (see rating plate).
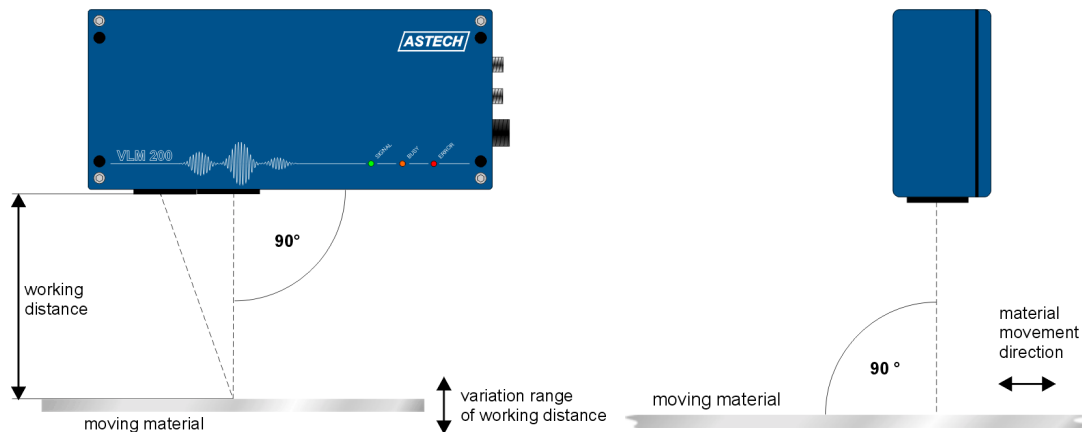
Figure 2   Working distance (see rating plate) and alignment to the material surface with a **maximum tolerance of ± 1°**
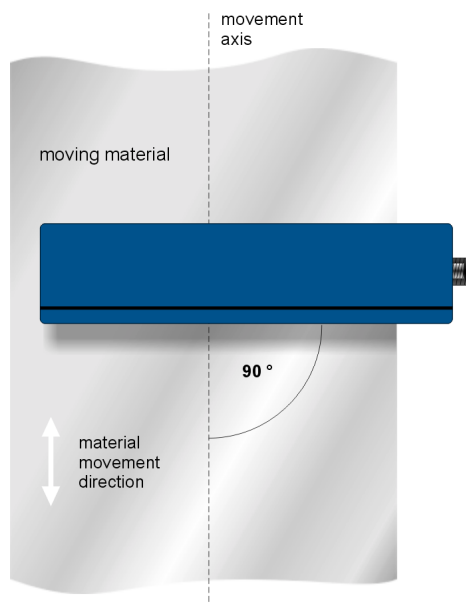
Figure 3   Alignment to the speed vector with a **maximum tolerance of ± 1°**

> ⚠ The installation is carried out at right angles to the direction of movement of the material **with a maximum tolerance of ± 1°**. If the alignment is not made with the specified tolerance, a measuring error can occur.
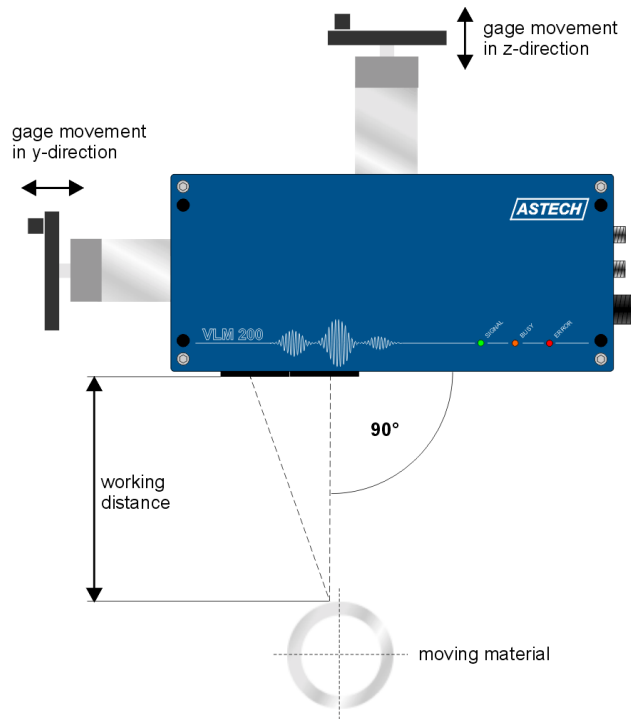
Optional linear units continue to allow an adjustment in the case of changing material distance (LJ1 for an axis) or for round surfaces, such as e.g. pipes, wires and profiles (LJ2 for two axes).

Figure 4a VLM 200 with LJ2 linear unit
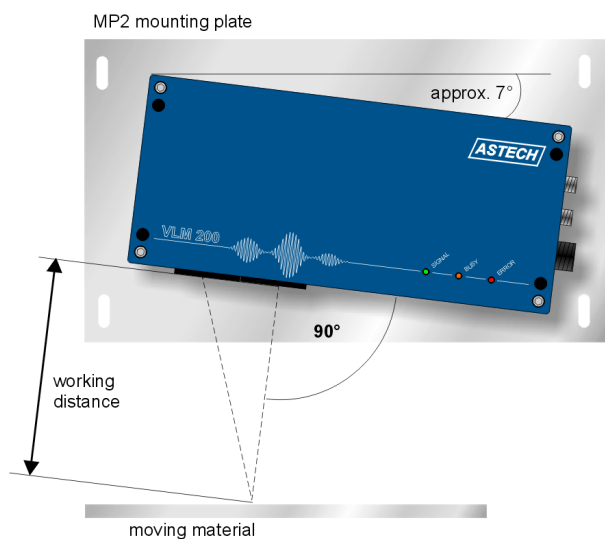
A tilting by the velocity vector is possible when using the MP3R mounting plate. This does not result in a vectorial measuring error. The tilting is necessary in the case of measurements on highly reflective materials and some plastic surfaces.

Figure 4b VLM 200 with MP2 or MP3R mounting plate

An optimisation of the alignment via the *Test* command in the case of reflective and domed surfaces is useful following connection of the power supply, the programming cable and a PC. Here, the measuring rate output value should becomes the greatest value.

6 Connection

The VLM 200 has screwable device connections. There is an earth screw, a connection for the programming interface, a connection for the signalling lines (inputs and outputs) and a connection for the power supply. Two additional signalling line connections are optional.

Connection 4, signals (optional)

Connection 5, signals (optional)

Earthing screw

Connection 1, programming

Connection 2, signals

Connection 3, power supply
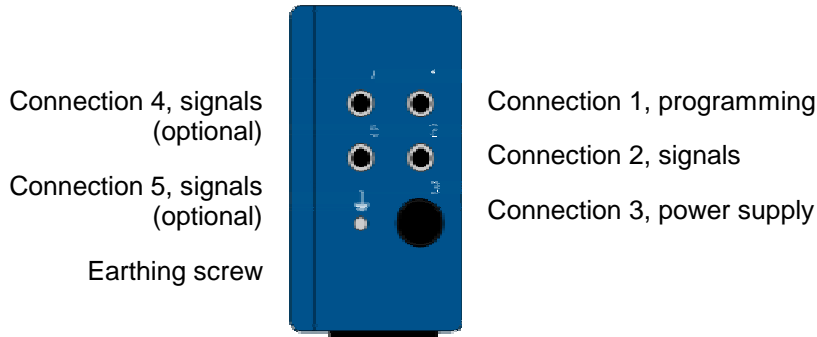
Figure 5   VLM 200 device connections

6.1 Power supply and earthing

The standard VLM 200 design is manufactured with a 230 V / 50 Hz AC power supply. Optionally, a 24 V DC (20 – 30 V) or a 115 V / 60 Hz AC power supply can be provided. The power is supplied via device connection 3.

A mains cable with removable grounding contact connector is included in the delivery in Germany. All terminals in the cable connectors can be screwed (except DSUB9 at the programming cable). The user should perform the cabling according to the appropriate regulations.

Before connecting the VLM 200 to the power supply, a connection has to be made between the earthing screw and the device holder with the aid of the earthing cable included in the delivery. The device holder also has to be low resistance earthed!

⚠	Missing or insufficient earthing of the measuring device can cause malfunctions or damage to the electronics in case of surge!
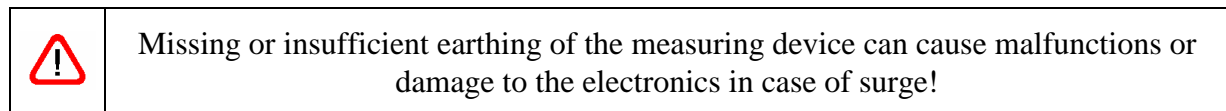
6.2 Signalling lines

The device contains a connection card (AB1) with screwed terminal as standard and an optional interface card (IF1, IF2 and others) with screwed terminal, which are accessible after removal of the casing cover. Prior to opening the casing, always disconnect the device from the power supply. There are different possibility's for the connection assignment (refer to appendix). As these assignments can be modified by either the manufacturer or the user, they should be inspected prior to connection.

Only screened connectors and cables should be used for signal transmission (device connections 1, 2, 4 and 5). The programming cable (device connection 1) should be removed once programming has been completed. The shielding should be earthed always. Connectors and cables can be purchased from the manufacturer.

The device connections 4 and 5 are optional. Unoccupied device connections should be protected against the penetration of dirt by dummy plugs.

	The device connections 2, 4 and 5 are wired according to customer specifications. They are not protected against exchange. A wiring scheme is enclosed with every device!

Some wiring examples can be found in the appendix. You will also find more detailed explanations of the individual interfaces there.

It should be ensured that the potential differences between the output and input signals to the ground conductor (PE) are less than 42 volts. It is recommended that the GND cable of the system voltage be connected with the earth or the PE conductor via a potential compensation.

	The protective switches integrated on the connection and interface cards transmit in the case of voltage differences of > 42 volts between the signals or to the ground conductor. The derivation of the surge can lead to the protection switching transmitting and thus to the short-term failure of the signal concerned!

6.3 AB1 connection card

The terminal of the AB 1 connection card contains the connections for the serial interface 1 (programming interface), the inputs ´IN1´, ´IN2´ and outputs OUT1´ up to ´OUT3´. The ´BR1´ and ´BR2´ terminals are only connected with each other and can be used as a bridge.
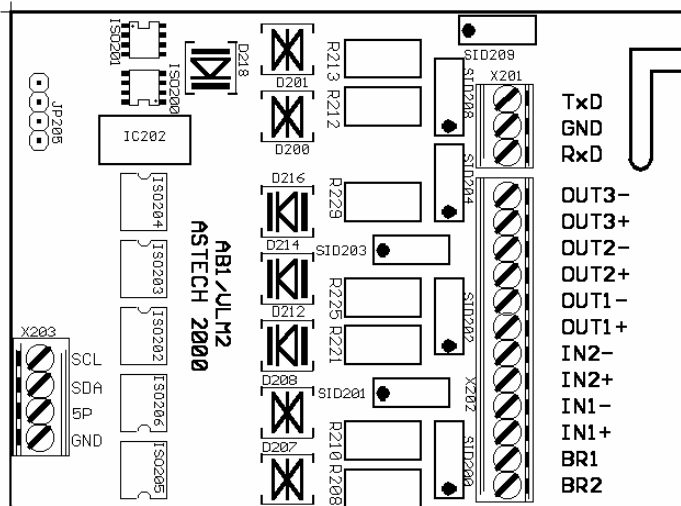
Figure 6   AB1 connection card

6.3.1 Serial interface 1

A serial interface according to the RS 232 standard is used. It serves to program the device and can also be used for data transfer. The RxD, TxD and GND connections are available (device connection 1).

Baud rate, protocol type and parity are set via the *S1Interface* command . The VLM 200 is equipped with an automatic baud rate identification, which can be switched-on via the *S1Interface* command. The format is pre-set to 8 data bits and 1 stop bit. Standard parameters are 9600 baud, no parity and XON/XOFF-protocol.

The connection is made at the terminals identified by 'GND', 'RxD' and 'TxD'. The interface is optically isolated to all other connections.

6.3.2 ´IN1´ and ´IN2´ inputs

The ´IN1´ (external directional input) and ´IN2´ (trigger) inputs on the connection card are electrically isolated by optical couplers. An input current of -40 to +0.3 mA corresponds to the LOW level and a current of +5 to +40 mA to the HIGH level.

⚠	The maximum input frequency may not exceed 10 Hz in the case of a mark-space ratio of 1 : 1. In the case of F-series devices the frequency at the IN2 trigger input may equal up to 500 Hz.

The connection of an external directional transducer to ´IN1´ should be given preference over an internal directional identification (option DIR).

The ´IN2´ trigger input serves to control the internal calculation of length (refer to *Trigger* command) and the synchronisation of outputs to external signals. Thus, e.g. the measured length of an individual part can be output after its end (refer to *Trigger* and *S1Output* commands).

In the case of the internal laser light barrier option for the measurement of individual parts, ´IN2´ is connected to the laser light receiver integrated in the measuring device.

⚠	The signals for direction and trigger must be de-bounced! Mechanical contacts (switches and relays) may be used only if the signals are switched when the measured object is standstill!

6.3.3 ´OUT´ output

The two ´OUT1´ and ´OUT2´ outputs (AB1 connection card) are also electrically isolated by optical couplers. In the case of a pulse output a clock out of phase by 90° is made available (refer to pulse output). Furthermore, the outputs can be alternatively switched by the alarm function.

The ´OUT3 output (status) is optically isolated by an optical coupler. As a standard, it indicates that measuring signals exist and has a corresponding function to the ´SIGNAL´ LED at the front of the VLM 200. If the LED indicates green, ´OUT3´ is switched through.
The output can be programmed via either the *Minrate* command or the ECC control.

The output transistors can drive a maximum current of 40 mA each. If an external voltage of 24 V is to be used, load resistors of 1.2 kΩ each should be used to reach 20 mA. The OUT 1 to OUT 3 outputs are short-circuit and surge-proof.

⚠	**Connection card AB 2/PP with push-pull outputs** The card AB 2/PP can be installed instead of the AB1 inside the VLM 200. The push-pull outputs OUT1, 2 and 3 provides ±20 mA per each and 24 V level.

6.4 IF1 interface card

The optional IF1 interface card provides, depending on the components, an additional interface (serial interface 2: RS 232 with handshake signals, RS 422/RS 485, each optically isolated) and/or an analog output (16 bit resolution, 4 to 20 mA or 0 to 20 mA).
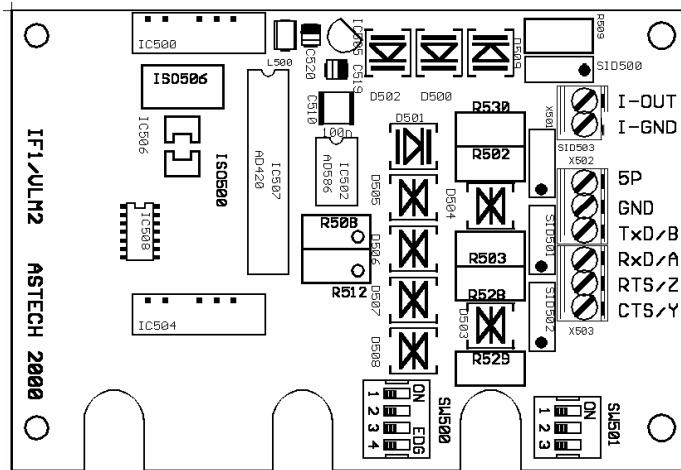
Figure 7   IF1 interface card

The DIL switches serve to switch over between RS485 or RS422 and to switch the terminating resistors. There are no DIL switches in the RS232 component variant.

| ⚠ H | It should be observed that the RS485 interface must be terminated at both cable ends with 120 Ohm and the RS 422 interface with 100 Ohm at the last receiver. |

Meaning of 4-fold DIL-switch (RS485/422	SW500-1	SW500-2	SW500-3	SW500-4
RS485 *)	ON	ON	OFF	OFF
RS422 with receiver open-circuit fail-save	OFF	OFF	ON	ON
RS422 without receiver open-circuit fail-save	OFF	OFF	OFF	OFF

Meaning of 3-fold DIL-switch (termination)	SW501-1	SW501-2	SW501-3
RS 485 with 120 Ohm terminating resistor *)	ON	ON	OFF
RS 485 without termination	OFF	OFF	OFF
RS 422 with 100 Ohm terminating resistor	OFF	ON	ON
RS 422 without termination	OFF	OFF	OFF

*) Default setting

Table 2   Meaning of the IF1 DIL-switch

6.5 IF2 interface card

The optional IF2 interface card provides two high resolution pulse outputs, each with 2 phases and a frequency range of 0.4 Hz up to 25 kHz. Resolution and error equal 20 ns each. The maximum cable length is 50 m. Additionally, an optically isolated analog output (16 bit resolution, 4 to 20 mA or 0 to 20 mA) can be assembled.
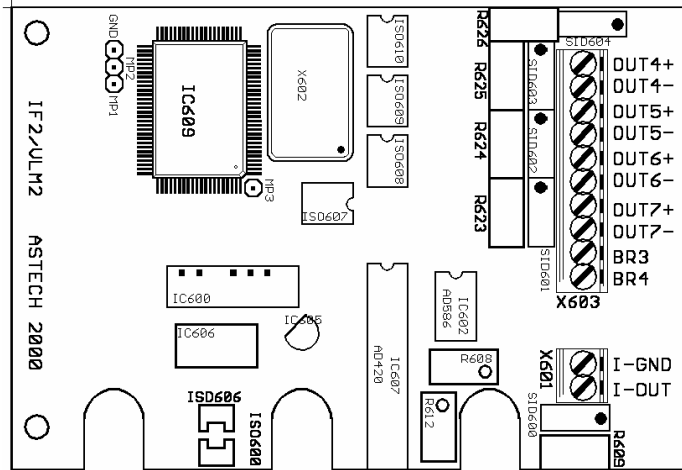
Figure 8   IF2 interface card

The four ´OUT4´ to ´OUT7´ outputs are electrically isolated by optical couplers. The OUT4/5 and OUT6/7 outputs can be scaled independently of each other. NPN transistors are used. The necessary external voltage equals 24 Volt. A clock out of phase by 90° is provided (refer also to programming of the pulse output).

6.6 IF2/PP interface card

The optional IF2/PP interface card provides two high resolution pulse outputs, each with 2 phases and a frequency range of 0.4 Hz to 50 kHz. Resolution and error each equal 20 ns.
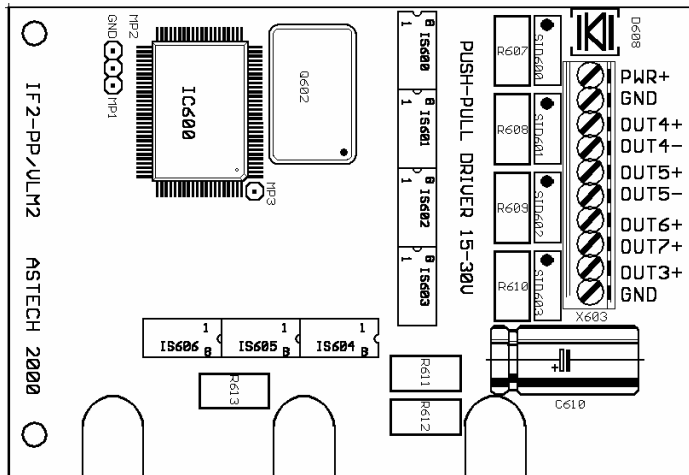
Figure 9   IF2/PP interface card

The seven ´OUT3´ to ´OUT7´ outputs are electrically isolated by optical couplers. The outputs are designed as balanced driver stages (HP3120A driver). The maximum output current is ±100 mA per channel. The maximum cable length is 200 m. The necessary external voltage equals +15 to +30 Volt. OUT4+ is the pulse output A2, OUT4- is /A2, OUT5+ is B2, OUT5-

is /B2, OUT6+ is A3 and OUT7+ is B3. The OUT3 status output is available too (see chapter on Outputs and also on Programming of the Pulse Output). The card needs an **external supply voltage of 15 to 30 V max.**

⚠	The outputs of the IF2F/PP interface card are only short-circuit proof against GND. Connection to the operating voltage can lead to destruction of the relevant channel!

6.7 IF2F/422 and IF2F/5V interface cards

The IF2F/422 and IF2F/5V interface cards provide two high resolution pulse outputs, each with 2 phases and a frequency range of 0.4 Hz to 500 kHz. Resolution and error equal 20 ns. Additionally, an optically isolated analog output (16 bit resolution, 4 to 20 mA or 0 to 20 mA) can be assembled.
The four ´OUT4´ to ´OUT7´ outputs are electrically isolated by optical couplers, but have the same reference potential. The OUT4/5 and OUT6/7 outputs can be scaled independently. A clock out of phase by 90° is provided (refer also to programming of the pulse output).

⚠	The outputs of the IF2F/422 and F2F/5V interface cards are only protected against ESD but not however against surge.

6.7.1 IF2F/422 interface card

The outputs are designed as RS422 drivers (MC3487 interface driver).
The maximum cable length for RS 422 is 500 m, for the asymmetrical pick-off against O-GND maximum length is 5 m (H-level approximately 3,5 V).
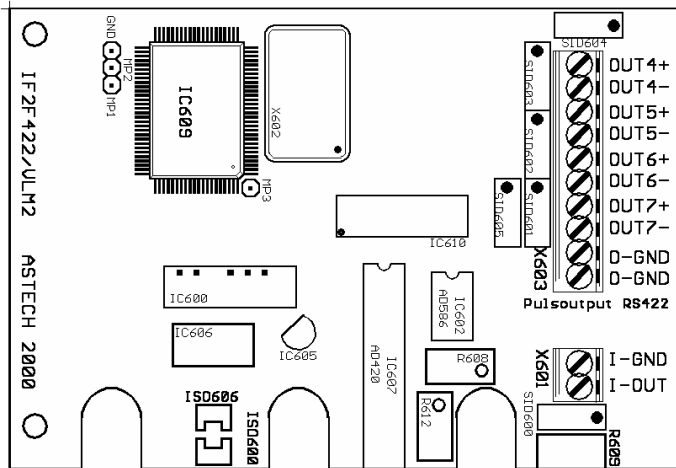
Figure 10a   IF2F/422 interface card

H	It should be observed that the **receiver side of the RS 422 cable must be terminated with 100 Ohm**.

6.7.2 IF2F/5V interface card

The outputs are designed as 5 Volt driver steps (74ACT04 interface driver). OUT4+ is the pulse output A2, OUT4- is /A2, OUT5+ is B2, OUT5- is /B2, OUT6+ is A3 and so on. The maximum output current is ±24 mA per channel. The maximum cable length is 200 m; in the case of an output frequency of less than 50 kHz maximum cable length is 500 m.
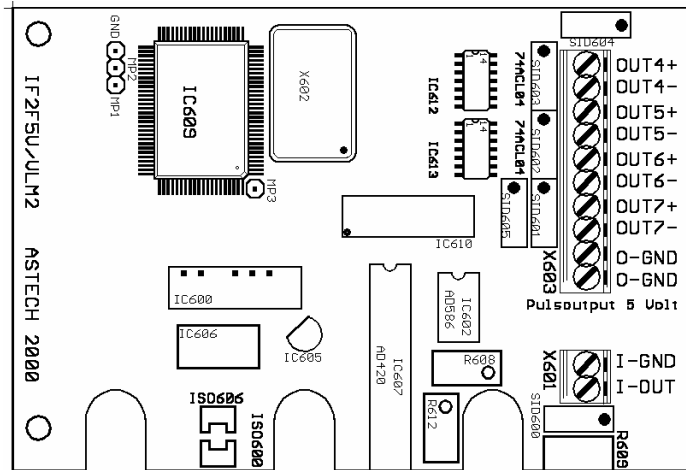
Figure 10b   IF2F/5V interface card

6.8 IF-PROFI and IF-ETHER interface card

The optional interface card allows IF-PROFI direct connection to Profibus DP.
The interface card IF-ETHER provide 10 MBit Ethernet with UDP/IP and TCP/IP protocol.
Please note the additional information comes inside of the delivery with this cards and in internet www.astech.de.

6.9 ECC2 interface card

The optional ECC2 interface card allows the connection of an external shaft encoder or a second VLM 200 velocity measuring device. When the value falls below a selectable velocity or the measuring rate, the pulse output is switched over to the shaft encoder or the second measuring device. The two ´COU1´ and ´COU2´ outputs are electrically isolated by optical couplers. They correspond in function and programming to the 'OUT1' and 'OUT2' outputs (default setting for DIL-switch output). The criteria for switching over are programmable (refer to ECC-control). The switch-over is implemented by the status signal, which can be picked up parallel to 'OUT3' and then indicates which measuring device is active.

A direction signal will be generated from the phase direction of the input ´INC´. This can connected via the lateral terminal to the direction input on board AB1

The DIL-switch is controlling the ´COU2´ output. It is possible to switch between phase B or direction output.

Additionally, the second serial interface (S2 as RS232 or RS485) can be assembled.
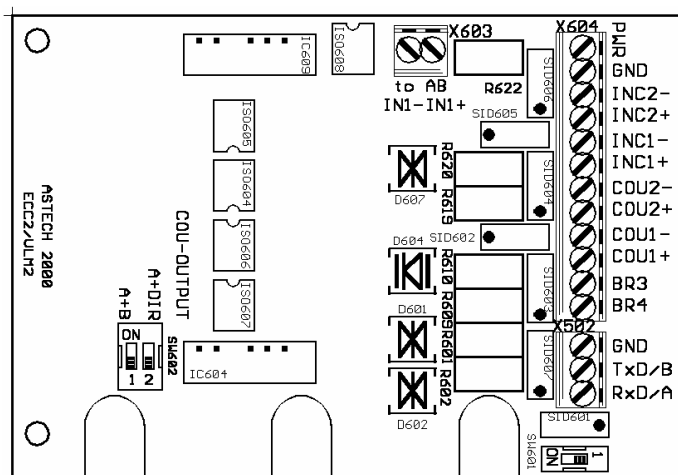
Figure 11   ECC2 interface card

Meaning of DIL-switch termination (for RS 485 option)	SW601.1
RS 485 with 120 Ohm terminating resistor *)	ON
RS 485 without termination	OFF

Meaning of DIL-switch output	SW602.1	SW602.2
Phase A and phase B *)	ON	OFF
Phase A and direction	OFF	ON

*) default setting

Table 3a/b   Meaning of the DIL-switch ECC2

Note: When using the IF1, IF2 or IF2F interface cards the function of the ECC2 interface card can be realised by the ECC1 designed as an independent device (IP65). The ECC1 allows the above described switch-over function and additionally provides a power supply of 24 Volt, e. g. for the shaft encoder. The ECC1 is controlled by the 'OUT3' status output.

7 Operating instructions

The VLM 200 operates autonomously after programming and requires only very little maintenance. If need be, the maintenance is limited to the cleaning of the windows and the replacement of the halogen lamp (refer to chapter on Maintenance).

During operation the *Test* and *Error* commands can be used for diagnostic purposes (refer to chapter on Programming).

The different modes of operation are indicated by LED's, with the following meaning:

LED	Colour	Meaning
Signal-LED	green	Signal exists or is good, see also *Minrate* and *ECCOn*
Signal-LED	red	Signal does not exist or is not over the established threshold, see also *Minrate* and *ECCOn*
Signal-LED	yellow	Device is being initialised
Busy-LED	yellow	Command processing, also in the case of calibration, simulation and offline measuring
Error-LED	red	Flashes in the case of a fatal error (refer to appendix)
		Flashes briefly in the case of a critical error (refer to appendix)

Table 4   Meaning of the LED's

Signal LED

In the case of a moving measuring object and adequate signal quality the LED is green. A red LED indicates a poor signal quality. A red signal LED can be caused by various things.:

1. No measuring object exists, measuring object outside the VLM 200 operating range,
2. Measuring object is standstill or is out of velocity range,
3. Measuring object has insufficient structure,
4. Measuring object too bright or too dark,
5. Dirty windows (refer to chapter on Maintenance),
6. Measuring rate is too low
    (only if measuring rate monitoring is switched on, see *Minrate* command)
7. Velocity or measuring rate outside the permissible range
    (only if ECC-function is switched on, see *ECCOn* command).

The ´OUT3´ (status) output is switched just as is the signal LED. If this indicates green, ´OUT3´ is switched through.

During initialisation after switching-on the device or after the **Restart* command the signal LED is yellow.

Busy-LED

This LED is yellow while processing commands (refer to chapter on Programming), during calibration (refer to *Calibrate* command) or during offline measurement (refer to chapter on Offline). While the busy LED is yellow, the output channels are not addressed or addressed with a delay!

Error-LED

If the red error LED constantly flashes after switching-on, this is due to a technical defect. If it flashes at short intervals or constantly during operation, parameters are incorrectly set or there were transmission errors. In all cases, the cause should be determined using a PC and the *Error* command and then eliminated, as otherwise errors in the measuring results are possible.

8 Maintenance

8.1 Windows

The VLM 200 operates optically, i.e. it must "see" the measuring object. Therefore, it is necessary to check the windows at regular intervals and, if necessary, to clean them. The windows should be cleaned with a soft, non-fuzzy cloth and a normal detergent for windows.

Window for optional laser receiver

Window for lens

Window for lighting
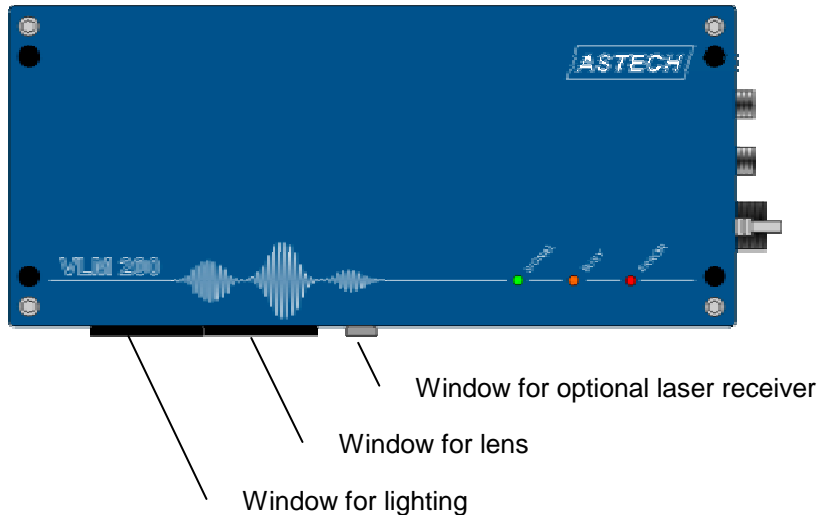
Figure 12 VLM 200 window

Destroyed windows need to be replaced. To do this the device has to be dismantled from the plant and cleaned. The window may only be replaced in a clean environment. The 4 hexagon socket screws (key width 2.0) should be loosened. The window can be lifted off the seal with a flat screwdriver. Neither the inside of the window nor the lenses may be touched! The new window should be secured with 4 screws. The screws should be cleaned first, moistened with very little screw lubricant and screwed in.

Device	Replacement window lens	Replacement window lighting
VLM 200 H measuring device	OW 4	OW 3
All other VLM 200s	**OW 2**	**OW 2**
LI 35 external lighting	-	OW 3

Table 5   Ordering codes for replacement window

The OW 2 and OW 3 windows consist of special glass with high transmission. The OW 4 window reflects infrared rays. The OW 3 and OW 4 windows have an increased temperature resistance.

If the windows need to be washed often or if they wear quickly, protective measures may be necessary (e.g. PA2 free blowing unit or CB5 cooling and protecting case with AC5 air generation).

8.2 Lighting

A special 6 volt halogen lamp with a limited life is used in the VLM 200. As a precaution, the lamp should therefore be replaced by a new one every 2,000 operating hours. Very strong vibrations and improper handling may lead to premature lamp failures.

Switch-on time per day	Hours per year	Replacement cycle for lamps
8 hours (1 shift operation)	2,920	8 months
16 hours (2 shift operation)	5,840	4 months
24 hours (3 shift operation)	8,760	2.5 months

Table 6   Replacement cycle for lamp

The actual halogen lamp is aligned and secured in an aluminum block. The block is led through two set pins in the VLM 200 and held with a hexagon socket screw (cylinder head, M3 x 10 mm). The electrical contact is made with cable connectors. This allows fast and simple replacement.

The lamps must be purchased either from your dealer or directly from the manufacturer. The ordering designation can be found in the VLM 2000 casing lid and on the packaging of the reserve lamp. It is imperative that you observe the **instructions for lamp replacement**:

⚠	Non-installed lamps are very sensitive. Please handle these with extreme care. The glass body of the new lamp may not be touched!

New lamps may only be stored in their original packaging. Do not remove the lamp from the packaging until just before you are about to install it. If your fingers touch the bodies of the glass, this can cause a drastic reduction in the life of the lamp.

Instructions for lamp replacement

1. **The device must be cleaned from outside before replacing the lamp.** In case of extremely bad environment conditions, the device should be removed from the plant prior to lamp replacement, in order to be able to carry out the replacement in a clean place.

2. After **disconnecting the unit from the power supply**, release the four hexagon socket screws and remove the cover of the VLM 200.

3. The tow blue connectors as well as the hexagon socket screw (see arrow) must be loosened The old lamp block can then be removed (Attention: high temperature! Use a cloth!).

4. The new lamp block should be inserted very carefully. Be sure that nothing gets wedged**. Do not touch the glass of the new lamp!**

5. The hexagon socket screw should then be fixed and the two connectors connected until they lock together. The cables may not lie in the optical path of the lighting unit!

6. Close the cover plate properly and then reconnect the power supply.
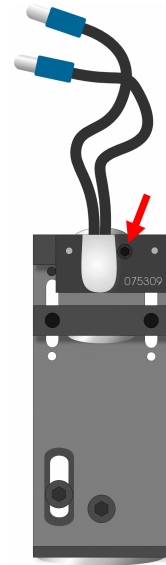
Figure 13 Lamp unit
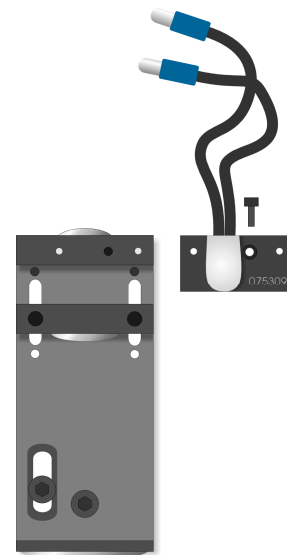
Figure 14 Lamp unit with lamp and mounting screw

⚠	Please ensure that no damage is caused to the structural components on the circuit board when the cover is open. No dirt may penetrate into the device!

9 Programming

For programming the VLM 200 programming interface (serial interface 1, RS232) should be connected to the serial interface of a PC via an interface cable.

Install the VLMTERM terminal program for Windows 95/98 and NT from the disk included in the scope of delivery. On the disk you will also find a simple terminal program for MSDOS (*xterm.exe*). If the VLM 200 is connected to COM 2, enter ´*xterm.exe 2*´. The program operates with 9600 baud, no parity and XON/XOFF-protocol (9600, 8N1, XON/XOFF).

If the setting of the serial interface corresponds to that of the terminal program, the VLM 200 responds with the following display after switching-on:

> VLM 200 V...
> (C) by ASTECH Rostock 20...
> ROM-DATE ...
> S/N ...
> ->

If data transfer is switched-on at serial interface 1 (refer to *S1On* command), this display will be suppressed.

The connection has been made to the device and programming can begin. Commands can be entered in abbreviated form. Input as many characters as necessary to make the syntax unique. The VLM 200 does not differentiate for commands between small and large case letters. Parameters are separated by space characters. Figures before and after the decimal point are separated by the decimal point. If the command is called without an optional parameter, the current value of this parameter is displayed. All commands described here are listed again in the appendix. The default value specified there may already have been adjusted.

⚠	During the processing of most commands the actual measuring function is interrupted or delayed and the data transmission to serial interface 1 is stopped! This status is indicated by the yellow BUSY-LED.

The modified parameters are lost, if they were not stored by *Store* prior to switching off the measuring device.

Please heed that some parameter have a different meaning if using devises of the F - and S-series.

9.1 General commands

9.1.1 The *Average* command

This command serves to set the averaging time for velocity and measuring rate calculation. The internal length calculation is independent of the set averaging time!

Within the time determined by *Average* all signals (bursts) occurring are compressed into an average value. The average value can then be output to the respective interfaces. The command without parameter indicates the averaging time.

The value selected should be as large as the process dynamic allows. Common values are 10 ms to 250 ms.

Syntax: *Average* [n]   (n = 5 ... 65535)   unit: ms

9.1.2 The *Calfactor* command

This command allows a calibration factor to be entered manually or to be displayed. The value of the calibration factor is usually close to one.

Syntax: *Calfactor* [n]   (n = 0.950000 ... 1.050000)

Calculation of the calibration factor based on the length or velocity indicated by the VLM 200 and the actual values:

$$new\ calibration\ factor = old\ calibration\ factor * \frac{actual\ value}{indicated\ value}$$

9.1.3 The *Calibrate* command

This command performs a calibration of velocity or length. For this purpose, 3 parameters must be entered in the following sequence:

c: V - velocity calibration, L - length calibration,
n1: duration of the measurement in the case of velocity calibration in seconds or quantity of objects to be measured in the case of length calibration,
n2: exact value of velocity or length to be calibrated (set value).

For the calibration only amounts are used, i.e. negative velocity or length values are converted into positive values.
During calibration, the measurement progress is indicated in percent and the busy LED is yellow. The pressing of ESC causes an abort. After the measurement has been completed, the new calibration factor is indicated. The value is saved by *Store* as are all other parameter modifications !

The calibration factor is calculated according to the following formula:

$$calibration\ factor = \frac{set\ value}{actual\ value}$$

Syntax: *Calibrate* c, n1, n2   (c = V, L)
                                             (n1 = 1 ... 65535)
                                             (n2 = 0.0001 ... 10000)
Units: n1 -   s (seconds) for velocity calibration
                       n (quantity) for length calibration
              n2 -   m/s for velocity calibration
                       m for length calibration

In order to increase the calibration safety, *signal error* can be set to 1, thus prohibiting a velocity of 0. Via *Minrate* it is possible to determine a minimum measuring rate. If the value falls below this, an error message occurs (refer to appendix).

9.1.4 The *Chold* command

This command is only useful for the measuring of individual parts (refer to *Trigger* command). With the *Chold 1* command the lighting regulation can be blocked for the period, in which no part is located in the measuring window, i.e. the values for exposure time and lamp brightness valid at the end of a part are maintained until the beginning of the next part. If the individual parts have different colours or surface properties *Chold* should be deactivated.

Syntax: *Chold* [n]   (n=0 - off, 1 - on)

9.1.5 The *Clock* command

Clock displays and sets the time for devices with a real time clock (RTC). *Clock* without parameter displays the time in the hh:mm:ss format. The real time clock is optionally available.

Syntax: ***Clock***   [hh:mm:[ss]]

9.1.6 The *Date* command

Date displays and sets the date for devices with a real time clock (RTC). *Date* without parameter displays the date in the dd.mm.yy format. The real time clock is optionally available.

Syntax: ***Date***   [dd,mm,yy]

9.1.7 The *Direction* command

This command determines the source of the directional switch-over. If the direction of movement of the measuring object and the direction specified by an arrow on the device coincide, the movement is defined as forwards. For units without the optional directional identification, *Direction 4* is not permissible!

⚠	If a direction is incorrectly set this causes corrupt messages. The error can increase with growing speed!

The codes 5, 6, 7 and 8 have the same function as the codes 0, 1, 2 and 3 (see table 7). It should be observed that in the case of *Direction 4* to *8* the technical data changes (refer to chapter on Device Designs).
The use of the codes 5, 6, 7 and 8 can be useful to adjust the optical resolution of the device to the surface of the measured object. Thus, a higher signal rate can be achieved in the case of rough structures (e.g. rough steel, wood, paper with back light illumination).

Syntax: ***Dir**ection* [n]   (n = 0 ... 8)

Code	Meaning
0	Forwards
1	Backwards
2	Externally to ´IN1´ -40 to +0.3 mA: forwards +5 to +40 mA: backwards
3	Externally to ´IN1´ -40 to +0.3 mA: backwards +5 to +40 mA: forwards
4	Automatically, double grid constant (device with directional identification, optional)
5	As 0, forwards, double grid constant (see above)
6	As 1, backwards, double grid constant
7	As 2, externally to ´IN1´, externally, doubled grid constant
8	As 3, externally to ´IN1´, externally negated, doubled grid constant

Table 7   Directional setting

9.1.8 The *Error* command

This command indicates and then deletes the last error code (refer to appendix). Code 'E00 No ERROR' means no error. In the case of fatal errors starting of 'E40' the device must be repaired.

Syntax: ***Err**or*

9.1.9 The *Echo* command

The *Echo 0* command deactivates the echo function during command input.

Syntax: ***Echo*** [n]   (n=0, 1)

9.1.10 The *Help* command

This command outputs a help text containing a list of all commands with short explanations. The output can be interrupted by ´Escape´ (ESC) and continued by pressing any other key.

Syntax: ***Help***   or   ***?***

9.1.11 The *Holdtime* command

This command sets the hold time, which is to be bridged in the case of signal failures, i.e. the last velocity value is output at the appropriate interfaces over this time. If the signal fails for longer than *Holdtime*, an zero or an error is output (refer to *Signalerror*). A signal failure is indicated by a red SIGNAL-LED after the hold time has expired.

⚠	Normally, *Holdtime* should be greater or equal to *Average*. Common values for *Holdtime* are 50 to 1000 ms.

Syntax: ***Hold**time* [n]   (n = 10 ... 65535)   unit: ms

9.1.12 The *Info* command

This command displays the device information with software version and serial number, as after switching-on the unit.

Syntax: ***Info***

9.1.13 The *Minrate* command

The measuring rate monitoring is activated by the *Minrate* command and a parameter greater than 0. *Minrate* without a parameter reads the set value.
If the measuring rate falls below this value, the signal LED is red and the OUT3 (status) output is opened (refer to chapter on Outputs).
A dirt level control of the windows can be programmed with the *Minrate* command for example. Useful values for *Minrate* are 5 to 20. The measuring rate is always monitored after the time set by the *Average* command. *Average* should be set not too low in the case of low velocities. Note that the OUT3 output is open, even in case of material standstill or if no material is located in the working range. Then, the signal LED is red.
If the measuring rate monitoring is activated and *Signalerror* set to 1, the measuring value is marked as incorrect if the value falls below the minimum measuring rate, then E.EEE is output for example (refer to *Signalerror* command).
When switching-on the ECC-control (refer to *ECCOn* command) the measuring rate monitoring is deactivated.

Syntax: ***Min**rate* [n]   (n = 0 - off, n = 1 ... 99 - on)

9.1.14 The *Number* command

This command sets the object counter to the value n. *Number* without parameter reads out the counter. Switching-off the unit sets the counter to zero. Each trigger event increases the counter by one (refer to *Trigger* command).
The object counter serves to measure individual parts for the parts count.

Syntax: ***Num**ber* [n]   (0 ... 65535)

9.1.15 The *Parameter* command

Lists the current setting of the parameters. There are separate commands for the parameter display of the output channels.

Syntax: ***Para**meter*

9.1.16 The *Readpara* command

This command reads out the parameter setting of the device. The following commands are automatically executed: *Serialnumber, Parameter, PInc, PAn, PAl, PECC, POff, PS1* and *PS2*. The outputs can be protocoled in a terminal program with log function.
For this purpose, the *Readpara* command should be entered, the 'Log' or 'Protocol' function of the terminal program should be activated, the command should then be executed with 'ENTER'. The log should be terminated by storing the file. The stored file can be sent to a measuring device for later re-configuration via 'Send file', thus making a quick configuration of the VLM 200 possible (then save via **Store*).

Syntax: ***Read**para*

9.1.17 The *REM* command

All following characters are ignored. *REM* serves to insert comment lines into parameter files, which can be sent via the programming interface to the measuring device to program the VLM 200 .
The characters *';'* (semicolon), *'S/N'* and *'->'* have the same effect as *REM*, thus it is possible to send back the parameter setting read out by the *Readpara* command to the device.

Syntax: ***REM*** [s]

9.1.18 The *Serialnumber* command

This command displays the serial number of the unit.

Syntax: ***Serial**number*

9.1.19 The *Signalerror* command

This command influences the error handling in the case of signal failures, the parameter 1 causing the output of an error after a signal failure and the exceeding of *Holdtime*, i.e. the velocity and length values are marked as incorrect, then E.EEE is output for example. The same effect is achieved with switched-on measuring rate monitoring (refer to *Minrate* command), if the value falls below the selected measuring rate.
In the case of parameter 0 no error is recognised, but instead the velocity is output as zero and length integration is stopped. This also allows a standstill of the measuring object.

The signal lamp and the status output (OUT3) are not influenced by the *Signalerror* command.

Syntax: ***Sig**nalerror* [n]   (n = 0, 1)

Code	Value
0	Signal failures permitted
1	Error, if no signal

Table 8   Signal error

9.1.20 The *Start* command

The effect of the *Start* command depends on the *Trigger* command , which determines whether an individual part measurement or a continuous measurement occur. In the case of an individual part measurement the integration of the length is started as of the length value of 0. In the case of a continuous measurement the integration of length is stopped and simultaneously restarted.

Syntax: ***Start***

9.1.21 The *Stop* command

The effect depends on the *Trigger* command. Only in the case of an individual part measurement is the integration of the length stopped.

Syntax: ***Stop***

9.1.22 The *Test* command

This command displays a number of values, which provide information about the system functionality. The following set values are displayed: velocity, length, measuring rate, IN1, IN2 inputs and lighting (incl. "Over" for overdrive of the CCD-sensor). The display is updated every 333 ms. During the test command the S1 output is blocked!
The procedure can be aborted by ESC, otherwise the command terminates automatically after 60 seconds. The automatic abort can be stopped by specifying the *C* parameters.

```
-> TEST
V(m/s)        L (m) RATE IN1 IN2 EXPOSURE
-99.999 -99999.999  99   1   0     3
->
```

Figure 15   Screen display *Test* command

Syntax: ***Test*** [C]   (Parameter C suppresses the automatic abort)

The test command can possibly delay the output to other channels. Therefore, it should only be called when necessary.

9.1.23 The *Trigger* command

The *Trigger* command serves to determine the type of trigger signal. Each trigger event increases the object counter by 1 (refer to *Number* command).

Syntax: ***Trigger*** [n]   (n = 0, 1, 2, 3)

Code	Trigger event at	Level at ´IN2´	Application
0	H-level	High: +5 to +40 mA	Individual part measurement
1	L-level	Low: -40 to +0.3 mA	Individual part measurement
2	L/H-edge	Low/high edge	Continuous measurement
3	H/L-edge	High/low edge	Continuous measurement

Table 9   Trigger type

Individual part: If the signal goes to the active level, the length measurement is started and stopped at the next level change.

Continuous measurement:
Measurements are made continuously. A trigger edge stops the measurement and simultaneously triggers the next measurement.
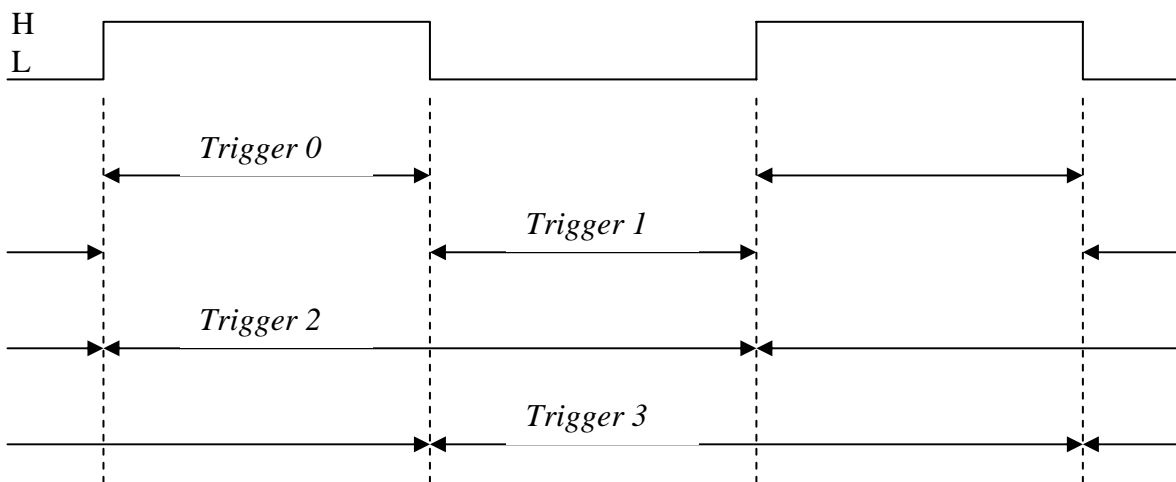
Figure 16   Measured length depending on the trigger level and the *Trigger* command

If a stop of the length measurement, the relevant output channel is simultaneously updated in the case of a trigger synchronous output (see commands *ANOutput, INCOutput, S1Output*).

9.2 Alarm output

A limit monitoring with a minimum and a maximum value has been realised. The length or average velocity can be monitored. The query occurs either after expiry of *ALTime* or after a trigger event (refer to *ALOutput* command). The amount of the value is always monitored, i.e. a negative sign will be ignored!
The limit value excesses or inadequacies are output to the electrically isolated OUT1 and OUT2 outputs. For this reason, the alarm output and pulse output can only be used alternatively.

9.2.1 The *ALOn* command

This command switches the alarm output on or off.

Syntax: ***ALOn*** [n]   (n = 0 - off, 1 - on)

9.2.2 The *ALMax* command

The *ALMax* command sets the MAX value for the alarm function. *ALMax* without parameter indicates the value. If the measuring value is greater then MAX, OUT2 switches.

Syntax: ***ALMax*** [n]   (n = 0.0001 ... $2^{31} * 10^{-4}$)   unit: m/s or m

9.2.3 The *ALMin* command

The *ALMin* command sets the MIN value for the alarm function. *ALMin* without parameter indicates the value. If the measuring value is less than MIN, OUT1 switches.

Syntax: ***ALMin*** [n]   (n = 0.0001 ... $2^{31} * 10^{-4}$)   unit: m/s or m

9.2.4 The *ALTime* command

This command determines the time interval in ms after monitoring has occurred. *ALTime* without parameter indicates the set value.
In the case of a **velocity monitoring** the value must be the **same** as that set for ***Average*** or a multiple of it. In the case of the **length monitoring**, e.g. for a length control, the time to be selected depends on the **permissible error** for the length. In the case of short lengths but also in the case of small velocities a solution with pulse output and length counter should be preferred over the alarm output as a higher precision is achieved.

Syntax: ***ALTime*** [n]   (n = 1 ... 65535)   unit: ms

9.2.5 The *ALOutput* command

This command determines whether the control is carried out after the time interval specified by *ALTime* (*ALOutput 0*) or when a trigger event occurs (*ALOutput 1*, see *Trigger* command).

Syntax: ***ALOutput*** [n]   (n = 0, 1)

9.2.6 The *ALValue* command

This command determines whether the velocity (in m/s) or length (in m) should be monitored. *ALValue* without parameter indicates the set value.

Syntax: ***ALValue*** [c]   (c = V, L)

9.2.7 The *PAL* command

Indicates all parameters of the alarm output.

Syntax: ***PAL***

⚠	In order to minimise the burden of the micro processor all unnecessary output channels should be switched off!

9.3 Analog output

In the case of an analog output (optional IF1/IF2 interface card with AI option) an analog current can be output. A digital/analog converter with 16 bit resolution is used. The range for the output of measuring values is set by the *ANMin* and *ANMax* commands. *ANMin* determines the value at which the minimum current value is output. *ANMax* applies accordingly to the maximum value.

Example: with *ANMin = 0* and *ANMax = 1* the following parameters result:

Current value	Velocity	Length	Measuring rate	Object counter
4 mA	0 m/s	0 m	0	0
12 mA	0.5 m/s	0.5 m	50	500
20 mA	1 m/s	1 m	100	1000

Table 10   Example for the analog output (*ANMin = 0* and *ANMax = 1*)

If the current measuring value is less than *ANMin,* the lowest current value is output, if greater than *ANMax,* the highest current value is output. In the case of a missing the measuring signal, the lowest value is output. The output is updated either after reaching *Average* or after a trigger event (refer to *ANOutput* command).

9.3.1 The *ANOn* command

This command switches the analog output on or off.

Syntax: *ANOn* [n]   (n = 0 - off, 1 - on)

9.3.2 The *ANMin* command

This command allows to set the minimum value for analog output.

Syntax: *ANMin* [n]   (n = $-2^{30} * 10^{-3}$ ... $2^{30} * 10^{-3}$)

9.3.3 The *ANMax* command

This command allows to set the maximum value for the analog output.

Syntax: *ANMax* [n]   (n = $-2^{30} * 10^{-3}$ ... $2^{30} * 10^{-3}$)

> ⚠ H   According to the individual direction it can become necessary to set a negative value for *ANMAX*, if e.g. the device is assembled in the opposite direction to the direction of movement. Use the *Test* command to check the sign character.

9.3.4 The *ANOutput* command

This command determines whether the output value is updated after the time interval set by the *Average* command (*ANOutput 0*, refer to *Average* command) or when a trigger event occurs (*ANOutput 1*, refer to *Trigger* command*).

Syntax: *ANOutput* [n]   (n = 0, 1)

9.3.5 The *ANValue* command

This command determines whether the velocity, the length, the quantity of objects or the measuring rate should be output.

Syntax: *ANValue* [c]   (c = V, L, N, R)

If the "Option Analog Output for Exposure" exists *) and *ANValue R* is set, at the velocity of zero the value of the exposure time is output to the analog output. This function can be used as an adjustment help in pipe, profile and wire measurement applications.

*)   The message "Option Analog Output for Exposure" is output via the S1 interface when the device is switched on.

9.3.6 The *PAN* command

Indicates all parameters of the analog output.

Syntax: *PAN*

9.3.7 Example of analog output

In the following diagram output 4 to 20 mA is represented in a velocity range of –3 up to +3 m/s at different values for *ANMIN* and *ANMAX*. The velocity is output to the analog output (*ANValue V*).
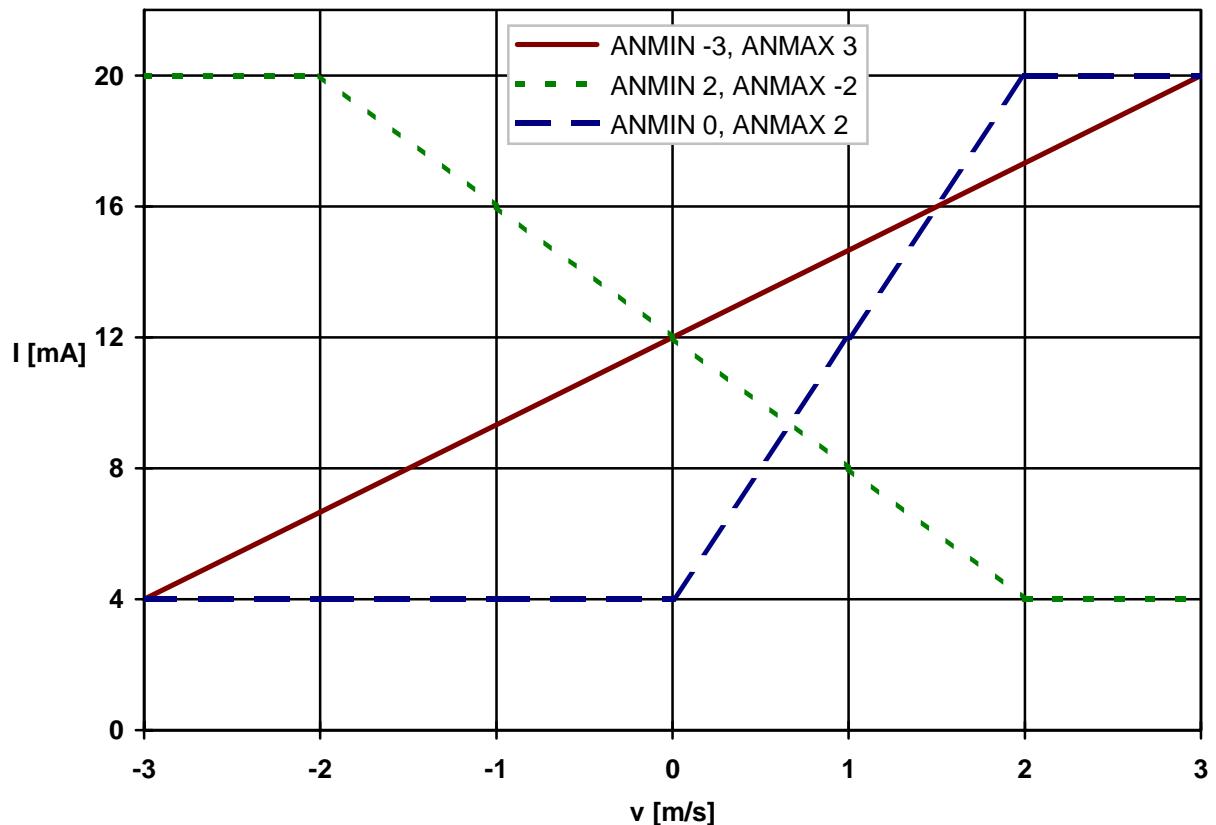
Figure 17 Examples of analog output

⚠	Currents less than or greater than the range determined by the hardware (e.g. 4 to 20 mA) are not possible. If e.g. the value to be output exceeds *ANMAX*, the maximum current value is output.

9.4 ECC control

A monitoring of the measuring rate and the velocity with hysteresis can be realized via the ECC control. The ECC control represents an extension of the measuring rate monitoring with the *Minrate* command. It is required when using the ECC2 interface card or the external ECC1 switched-over device.

The ECC2 card or the external ECC1 device allow the connection of an external shaft encoder or a second VLM 200 velocity measuring device. When falling below the value of a selectable velocity or measuring rate the pulse output is switched over to the shaft encoder or the second measuring device. The switch back occurs, if velocity and measuring rate are again greater than further values that can be set.

Velocity and measuring rate are observed after reaching the average time (*Average* parameter). The switch-over occurs via a status signal 'OUT3'. This signal being updated every 10 ms. If the *Holdtime* has expired, the status signal is immediately switched. When using the ECC-control *Average* should be set to 10 ms, in order to ensure a fast switch-over.

9.4.1 The *ECCOn* command

This command switches the ECC control on or off. When activating the ECC control the measuring rate monitoring is automatically deactivated (refer to *Minrate* command).

Syntax: *ECCOn* [n]   (n = 0 - off, 1 - on)

9.4.2 The *ECCR1* command

This command determines the minimum measuring rate at which switch-over to the external device occurs. Usual values are 3 to 10.

Syntax: *ECCR1* [n]   (n = 0 .. 99)

9.4.3 The *ECCR2* command

This command determines the measuring rate, at which switch back reoccurs. Usual values are 8 to 20. The value must be greater than *ECCR1*.

Syntax: *ECCR2* [n]   (n = 0 .. 99)

9.4.4 The *ECCV1* command

This command determines the minimum velocity at which switch-over to the external unit occurs. Usual values are 0.05 to 0.2 m/s.

Syntax: *ECCV1* [n]   (n = 0 ... $2^{31} * 10^{-4}$)   unit   m/s

9.4.5 The *ECCV2* command

This command determines the velocity (amount), at which switch back reoccurs. Usual values are 0.1 to 0.3 m/s. The value must be greater than *ECCV1*.

Syntax: *ECCV2* [n]   (n = 0.0001 ... $2^{31} * 10^{-4}$)   unit   m/s

9.4.6 The *PECC* command

Indicates all parameters of the ECC control.

Syntax: *PECC*

9.5 Pulse output

The pulse output provides two clock sequences A and B, with a phase by 90° (max. phase deviation ± 10°) and with a mark-space ratio of 1:1 at the OUT1 and OUT2 outputs, electrically isolated by optical couplers. The phase shift can be controlled by the ´IN1´ directional input or the internal directional identification between +90° or -90°.

Two additional pulse outputs, each with 2 phases (A, B) are optional on the interface cards of the IF2 series.

The output is updated at the next pulse edge either after reaching *Average* or after a trigger event (refer to *INCOutput* command).

9.5.1 The *INCOn* command

This command switches the pulse output on or off. When activating the pulse output the alarm output is automatically deactivated.

Syntax: *INCOn* [n]   (n = 0 - off, 1 – on); (with IF2 series n= 1, 2, 3)

In devices with the IF2 or IF2F interface cards the n = 2 parameter means that the additional two pulse outputs are switched-on and the standard pulse output is switched-off. All 3 pulse outputs are switched-on with n = 3.

⚠	In order to minimise the burden of the micro processor all unnecessary output channels should be switched off!

9.5.2 The *INCFactor* command

A scaling factor can be set by this command. 100 Hz are output with a factor of 1, if the velocity is 0.1 m/s or the measuring rate 100 (refer to *INCValue* and the Programming Examples in appendix).

Syntax: *INCFactor* [n]   (n = 0.000001 ... $2^{31} * 10^{-6}$)

The possible output frequency for the pulse output ranges from 0.5 Hz to 7 kHz. At 7 kHz a maximum output error of +0.2 % results, at 3.5 kHz of +0.1%, etc. If the value to be output is less than 0.5 Hz, no pulses are output!

In the case of devices with the optional IF2 series interface cards 3 parameters are possible.

Syntax IF2:   *INCFactor* [n1] [n2] [n3]   (n = 0.000001 ... $2^{31} * 10^{-6}$)

The n1 up to n3 parameters set the scaling factors for the three pulse outputs. n2 and n3 are the factors for the two additional pulse outputs (IF2 interface card series). The possible pulse frequency range of the interface card should be observed.

The additional pulse outputs always output velocity values, even if *INCValue R* is set for example (refer to *INCValue*). In this case the measuring rate is output to the standard pulse output (OUT1/OUT2) and the velocity to the high resolution pulse outputs (OUT4 to OUT7).

9.5.3 The *INCOutput* command

This command determines whether the output value should be updated after the time interval specified by *Average* (*INCOutput 0*, refer to *Average* command) or by a trigger event (*INCOutput 1*, refer to *Trigger* command).

Syntax: ***INCOut*put** [n]   (n = 0, 1)

9.5.4 The *INCValue* command

This command determines whether the velocity or the measuring rate should be output to OUT1/2.

Syntax: ***INCV*alue** [c]   (c = V, R)

⚠	When using the IF2 series interface cards the velocity is output to the additional pulse outputs independently of the set value for *INCValue*.

9.5.5 The *PINC* command

Indicates all parameters of the pulse output.

Syntax: ***PINC***

9.6 Output via serial interface 1

9.6.1 The *S1On* command

This command switches the data output at the serial interface on or off. The data output is interrupted during command input and processing!

Syntax: *S1On* [n]   (n = 0 - off, 1 - on)

9.6.2 The *S1Format* command

In addition to programming data can also be output via the serial interface 1. The transfer format can be pre-set in wide limits. Data are output in ASCII format. The individual parameters can be separated either by commas or space characters. However, the separators between the parameters may also be omitted.

Syntax: *S1Format [s]*   (s – character chain of the parameters, max. 32 characters)

Parameter	Meaning
V	Inserts the velocity in m/s
L	Inserts the length in m
N	Inserts the status of the object counter
´...´	Inserts the string enclosed in apostrophes
a[*x][:n[:m]]	Formats the value a (V, L, R…) multiplied by x as a figure with n digits and m digits after the decimal point, [1])
a[*x]:H[:n]	Outputs the value a as hexadecimal figure with n characters [2])
S	24 Bit velocity (sign + 6 nibble, hexadecimal output, decimal 123456 means 1.23456 m/s), <SPACE>, 12 Bit measurement rate *10 (3 nibble), firmware version from V6.6 [3])
D	Inserts the current date (e.g. 31.12.99), only for units with RTC
C	Inserts the current time (e.g. 12:50:28), only for units with RTC
R	Inserts the measuring rate
E	Inserts the exposure, 0 to 14 or OVER (as in *Test* command)
B	Inserts the number of bursts since the last trigger event
T ´str´	Changes the end identifier of the output string from CR LF to ´str´

Table 11   Parameter for output formatting at S1

1)   If no positions are specified in the case of a numerical output, length and velocity are output with three digits after the decimal point in the standard unit (refer to appendix). All other values are output without digits after the decimal point.

2)   The hexadecimal output in a:H:n format is output with first a sign character (minus sign or space) afterwards n decimal digits. Every byte needs two decimal digits. Without parameter n, 9 characters are output for 4 bytes and the sign character (32 bit number). Leading zeros are not suppressed.

3)   The special-format S realise a fast output of velocity and measurement rate.

	The hexadecimal output should be preferred, if values are to be output in a time base faster than 50 ms (refer to *S1Time*), as the conversion in hexadecimal digits requires considerably less computation time. If time base < 20 ms use only format S.

Without format indication the output is left-justified, leading zeros are suppressed, except in the case of hexadecimal output. In the case of format specifications space characters are used as fillers. If the value exceeds the possible number of the format specifications, the necessary number of places is output.

The decimal point and a possibly existing sign character (only for negative figures) also occupy one place.

The standard end identifier of the output string is CR LF (13 10 or 0DH 0AH). With the parameter T it is possible to replace the standard end identifier on the following string. The characters are enclosed in apostrophes or specified by the appropriate ASCII Code (for example *T ´A´ 10* for 'A' LF or *T42* for ´*´). A maximum of two characters is permitted. The ASCII code should always be specified in decimals.

9.6.3 The *S1Interface* command

The *S1Interface* command configures the serial interface. Baud rate, type of protocol and parity are set. All parameters can be set individually or simultaneously. The sequence of parameters is of no significance. All unspecified parameters are reset to the pre-set values (no protocol, no parity). The format is determined as 8 data bits and 1 stop bit. If the parity is activated, the 8th data bit is replaced by the parity bit. A parity error is indicated by "E11 S1 parity" and a buffer overflow by "E12 S1 buffer overflow" (refer to error messages in the appendix).

Syntax: *S1Interface* [n] [c] [c]   (n, c see below)

For the Baud rate the following values are possible:
     n: 0 *); 600; 1200; 2400; 4800; 9600; 19200; 38400

Type of protocol	Code c1	Parity	Code c2
No protocol	- **)	No parity	N
Software protocol	X	Odd-numbered parity	O
(XON/XOFF codes)		Even-numbered parity	E

Table 12   Setting of RS 232 interface
*)   Automatic baud rate identification
**)   No parameter indicated

If the baud rate is specified as 0, the VLM 200 identifies the baud rate automatically after switching on, provided that the first character arriving is a CR (0DH).

9.6.4 The *S1Output* command

This command determines whether the measuring value should be sent either within a selectable time interval (refer to *S1Time* command), when a trigger event occurs (refer to *Trigger* command) or at each burst.

Syntax: *S1Output* [n]   (n = 0, 1, 2)

9.6.5 The *S1Time* command

This command determines the time interval in ms, in which the data is to be output to interface S1.

During the velocity measurement, all values occurring (bursts) are averaged in the averaging time (refer to *Average* command). The data are then output at the same intervals as the time set by *S1Time*.

Syntax: ***S1T****ime* [n]   (n = 10 ... 65535)   unit: ms

9.6.6 The *PS1* command

Indicates all parameters of the serial interface 1.

Syntax: ***PS1***

9.7 Output via serial interface 2

Via serial interface 2 (optional IF1 or ECC2 interface card) data can be output in the same way as via serial interface 1. All commands apply accordingly, only S1 should be replaced by S2. Serial interface 2 can, however, only be used for data output and not for command input.
In the case of the *S2Interface* command it should be observed that the baud rate is limited by the hardware depending on the interface used.
The baud rate of the 2nd serial interface can be set as follows : 2400; 4800; 9600; 19200; 38400 and 57600. The *H* parameter can be specified for the *S2Interface* command , this activates the handshake lines (only option IF1 with RS232).

9.8 Offline measurement

9.8.1 The *OFFLine* command

In the *OFFLine* operating mode the measuring values (as described before) are not output to an interface, but instead written into the internal memory. The operating mode serves to create the velocity/time processes and to accommodate very fast processes.

> ⚠ During the offline measurement none of the output channels are updated, i.e. pulse, analog and serial specifications are not possible!

The *OFFLine* command starts the Offline measurement. The optional T parameter causes a trigger event to be awaited (refer to *Trigger* command). A maximum of 16256 values (64 bit each) can be accommodated. Each value is filed as a time and measuring value (32 bits each). The BUSY-LED (yellow) is on during the measurement. The measured data are written over by a restart only and are lost in the case of a power off. A premature abort is possible via ESC. An abort by ESC or a full memory causes an error message to be output (refer to Error messages in appendix).

Syntax: *OFFLine*   [T]   T - wait for trigger event

9.8.2 The *OFFactor* command

This command allows a scaling factor to be set. However, the scaling factor is only taken into consideration in the case of an output with *OFFRead*.

Syntax: *OFFactor* [n]   (n = 0.000001 ... $2^{31} * 10^{-6}$)

9.8.3 The *OFFMeasure* command

This command sets the duration of the offline measurement in seconds.

Syntax: *OFFMeasure* [n]   (n = 1 ... 65535)   unit: s

9.8.4 The *OFFOutput* command

This command determines whether the measuring value is to be output to the memory in a selectable time interval (refer to *OFFTime* command), when a trigger event occurs (refer to *Trigger* command) or at each burst.

Syntax: *OFFOutput* [n]   (n = 0, 1, 2)

9.8.5 The *OFFRead* command

This command outputs the measured data to serial interface 1 after an offline measurement . The reading format is fixed, i.e. the time since the measurement start is output in ms and the value with maximum resolution. The two figures are separated by a space character. A new line (CRLF) is added behind the value.
If no measurement has yet been started, a read attempt causes an error message (refer to appendix).

Syntax: *OFFRead*

In the case of premature abort by ESC an error message is output (refer to appendix).

9.8.6 The *OFFTime* command

This command determines the time interval in ms, in which the data is to be saved (refer also to *OFFOutput* command). During the velocity measurement all measuring data (bursts) captured within this time interval are compressed into an average and saved. The time set by the *Average* command is not be taken into consideration in offline mode!

Syntax: ***OFFTime*** [n]   (n = 2 ... 65535)   unit: ms

9.8.7 The *OFFValue* command

This command determines whether velocity, length, number of objects or the measuring rate should be measured.

Syntax: ***OFFValue*** [c]   (c = V, L, N, R)

9.8.8 The *POFF* command

Indicates all parameters for the offline measurement.

Syntax: ***POFF***

9.9 Read commands

The read commands serve to asynchronously read out the measuring values. They are especially quickly processed by the command interpreter. All read commands are entered with a letter and executed according to the following CR (0AH). The value is output with fixed formatting (see below) and terminated with CR LF (0DH 0AH).

Command	Return value	Unit	Digits after decimal point	Example
V	Velocity	m/s	5	-1.23456
L	Length	m	4	1234.5678
R	Measuring rate	-	0	45
N	Object counter	-	0	123
F	Frequency of the last burst	kHz	2	1234.45

Table 13   Read commands

The *Start* command can also be abbreviated by the letter *S* in order to start a new length measurement.

9.10 System commands

9.10.1 The *Password command

The system *Store command is protected by a password, which can be changed by the *Password command. The password consists of up to eight characters, including large and small case letters, figures, special and space characters, which are represented by asterisks when input. By inputting a single asterisk, the password protection is deactivated. The input can be aborted by ´Enter´ before inputting the first character. Three failed attempts to input a password will result in the message ´Illegal use!´. 60 seconds must then elapse before the next command is accepted.
No distinction is made between large and small case letters when inputting the password. The password 'WEGA' is pre-set.

Syntax: *Password

9.10.2 The *Restart command

This command releases a cold start. The device carries out the initialising in the same way as it does after switching-on. The parameters are reset to the values last saved by the *Store command. The command must be written out.

Syntax: *Restart

9.10.3 The *Restore command

This command releases a warm start. This causes the device to be reset to the parameters last saved by the *Store command.

Syntax: *Restore

9.10.4 The *Simulation command

The command serves to simulate velocity and measuring rate to the outputs of the measuring devices in the case of synchronous output (as of firmware V 6.5). It interrupts the measurement! The n1 parameter must be specified for the velocity. The second parameter for the measuring rate, n2, is optional.

Syntax: * Simulation n1 [n2]   (n1 = 0 ... 100.000; velocity in m/s)
                                               (n2 = 0 ... 99; measuring rate)

The following outputs are supported during the simulation: pulse output, analog output, output to interface S2 incl. IFPROFI and IFETHER, rate monitoring with Minrate and ECC control. Trigger synchronously output is supported from firmware version V6.7!
The simulation is terminated by ESC.

9.10.5 The *Store command

The command saves the current setting, which is maintained even after switching-off the device. After switching-on the device or executing the *Restore command, the last settings saved by *Store are loaded. The command is protected by a password.

When entering the password no distinction is made between large and small case letters. The password 'WEGA' is pre-set.

Syntax: *Store

⚠	During the execution of the system commands the actual measurement is interrupted!

9.11 The VLM 200 F and S device series

⚠ H	Compared with the description of the previous chapter the meaning of some commands in the F or S device series are different. Important modifications are marked with *) in the following

9.11.1 On the operating principle of the F-series

The F-series was developed for highly dynamic velocity measurements in the production process and is especially suitable for use in closed control loops.

The F series has been extended to include an averaging processor (ASIC). This calculates the weighted gliding average value *) according to the signal quality via the frequency of the single bursts. A ring memory with 4 or 8 averaging cycles is used (see figure 18). The temporal length of a cycle is represented in figure 18 as a section and corresponds to the averaging time. The incoming individual values are asynchronously added, the result is synchronously read out once per *Average*. This allows an updating rate for the outputs 8 times higher *) than that of the VLM 200 standard. The internal calculation of the length is not possible *).
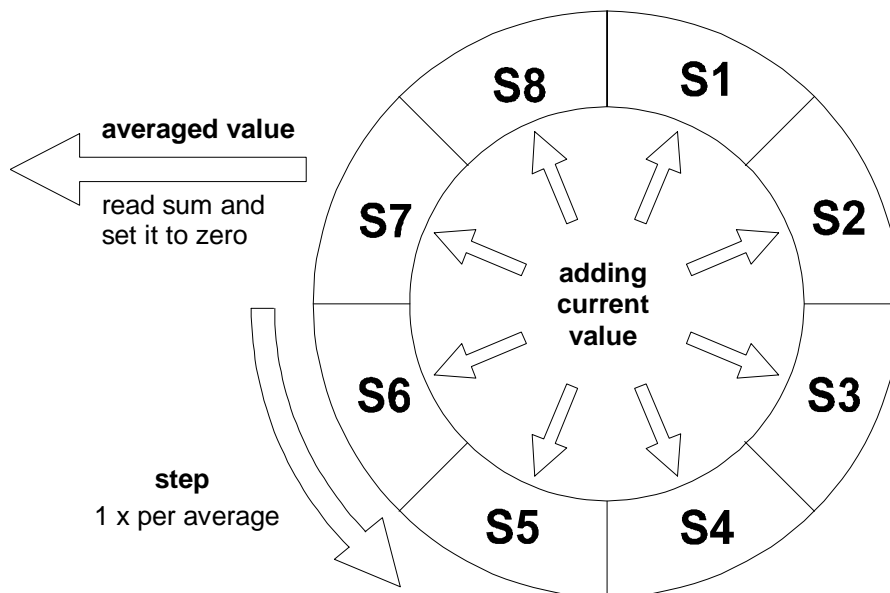
Figure 18   Simplified functional principle of the averaging processor with 8 cycles (sums S1 to S8)

The averaging time (set by *Average* command) is selected as high as the desired update time for the quickest output channel used. Normal values for *Average* are 4 to 20 ms *).

If only the pulse output or the analog output is switched-on, *Average* ≥ 2 ms is permissible. If pulse output as well as analog output are switched-on, *Average* ≥ 5 ms must be selected. If the serial output (S1 or S2) is switched on *Average* should be set to ≥ 20 ms, depending on the string length.

When using the EEC control *Average* should be set to 5 ms *).

⚠ In order to minimise the load of micro processor unnecessary output channel should be switched off!

Via the *WINDOW 1 *)* command the gliding average can be switched off. *WINDOW 4* reduces the number of averaging windows to 4. *WINDOW 8* is the standard setting (from Software V 6.5).

H Note that all internal processes and outputs are synchronised to *Average*. Outputs, which are not released at the *Average* moment (e.g. output time differs by a multiple from *Average* or trigger controlled outputs), are only carried out after achieving the next cycle specified by *Average*.

9.11.2 On the operating principle of the S-series

Devices of the S-series also allow the synchronisation of the averaging processor and thus of the complete system via an external signal. In order to reach this a clock frequency of 30 to 500 Hz must be connect to the trigger input (IN2). The *Average* and *Trigger* parameter must be set both to 0.
The *INCOutput 1*, *S1Output 1* etc. commands allow the configuration of the externally synchronised output of the velocity value.
If, for example, two or more measuring devices of the types VLM 200 S or VLM 200 SD are controlled by the same clock frequency, it is possible to carry out highly precise and dynamic differential velocity measurements.

The following conditions must be observed:
- The parameterisation of the devices is the same. The devices should be mounted in the same direction of movement and are equipped with a high resolution pulse output (IF2 or IF2F interface card) or a fast serial output.
- A serial transfer can also be realised with medium and low dynamic.
- A necessary directional switch-over is carried out via an external signal (command *Direction ≤ 3*).

Programming examples of the S-series with pulse output IF2F

Average 0	(external synchronisation)
Window 8	(8 windows)
Trigger 0	(H-active)
Direction 1	(devices mounted in the opposite direction to that of movement)
Minrate 10	(programming of the monitoring output)
INCOn 2	(high resolution pulse outputs switched-on)
INCFactor 1 10 10	(factor 10 pulses/mm for high resolution outputs)
INCOutput 1	(updating of the pulse output trigger-synchronous)

The 24 Volt cycle at the 'IN2' input - allows a maximum synchronisation frequency of 500 Hz (2 ms). A frequency of 100 up to 300 Hz is recommended. The 'OUT 3' output is used as a monitoring output and is controlled by the *Minrate* parameter. All other outputs are switched off.

9.11.3 Commands of the F- and S-series with significant differences

Command	Meaning	Unit	Possible values	Default value
Average	Cycle time for averaging processor	ms	2 ... 65535 0 for S-series	10 ms 0 with S-series
Window	Number of windows of the averaging processor	-	1, 4, 8	8
Calibrate	Calibration n1, n2 n1 - Measuring time in s n2 - Calibration value m/s		1 ... 65535 0.0001 ... 10000	-
Test	Test command	-	-	-

Table 14   Commands of the F-series and S-series with different meanings

The *Calibrate* command does not allow calibration via the length (only two numerical parameters). The *ALValue* command is not required (the velocity is always monitored). No length indication is carried out by the *Test* command. Output of length to the interfaces is not possible (*S1Format* and *S2Format).*

10 Appendix

10.1 Command overview

10.1.1 General commands

Command	Meaning	Unit	Possible values	Default value
Average	Averaging time	ms	5 ... 65535	250 ms
Calfactor	Set calibration factor	-	0.950000 ... 1.050000	1.000000
Calibrate	Calibration c, n1, n2 c - velocity or length n1 - meas. time in s or numb. n2 - Calibr. value m/s or m		V- Velocity L- Length 1 ... 65535 0.0001 ... 10000	-
Chold	Maintenance of exposure (only for individual part measurement)	-	0- off, 1- on	-
Clock	Indicates and sets clock time	-	hh:mm[:ss]	-
Date	Indicates and sets date	-	dd.mm.yy	-
Direction	Direction	-	0- Forwards 1- Backwards 2- Externally forwards low/-40...+0.3 mA 3- Externally forwards high/+5 ...+40 mA 4- Automatic (option) 5-8 (refer to text)	0
Echo	Echo function for commands	-	0- Off 1- On	1
Error	Indicates the last error	-	-	-
Help or *?*	Help pages	-	-	-
Holdtime	Hold time	ms	10 ... 65535	250 ms
Info	Indicates the software version and the serial number	-	-	-
Minrate	Measuring rate monitoring	-	0 - off, 1 ... 99 - on	0
Number	Sets the part counter	-	0 ... 65535	0
Parameter	Indicates all general parameters	-	-	-
REM	Comments	-	-	-
Readpara	Indicates all parameters	-	-	-
Serialnumber	Indicates the serial number	-	-	-
Signalerror	Behaviour in the case of signal failures (or standstill)	-	00- No error indicated at failures 1- Error indicated at failures	0

Start	Starts length integration	-	-	-
Stop	Stops length integration	-	-	-
Test	Test command	-	-	-
Trigger	Trigger	-	0- H-level (as *Dir*) 1- L-level (as *Dir*) 2- L/H-slope 3- H/L-slope	0
Window	Window length (F series only)	-	1, 4, 8	8

Notes! The *Test* command is automatically interrupted after 60 seconds. The Parameter *C* suppresses the automatically abort.

10.1.2 Alarm output- commands

Command	Meaning	Unit	Possible values	Default values
ALOn	Activates alarm function	-	0- Alarm off 1- Alarm on	0
ALMax	Max. value	-	$0.0001 \dots 2^{31} * 10^{-4}$	1.0
ALMin	Min. value	-	$0.0001 \dots 2^{31} * 10^{-4}$	0.5
ALOutput	Time or trigger controlled monitoring	-	0- Time 1- Trigger	0
ALValue	Value to be monitored	-	V- Velocity L- Length	V
PAL	Indicates the alarm parameters	-	-	-

10.1.3 Analog output commands

Command	Meaning	Unit	Possible values	Default values
ANOn	On/Off	-	0- Off 1- On	0
ANMin	Minimum value	-	$-2^{30} * 10^{-3} \dots$ $2^{30} * 10^{-6}$	0.000
ANMax	Maximum value	-	$-2^{30} * 10^{-3} \dots$ $2^{30} * 10^{-6}$	1.000
ANOutput	Time or trigger controlled output	-	0- Time 1- Trigger	0
ANValue	Value	-	V- Velocity L- Length N- Object counter R- Measuring rate	V
PAN	Indicates analog parameters	-	-	-

10.1.4 ECC control commands

Command	Meaning	Unit	Possible value	Default value
ECCOn	On/Off	-	0- Off 1- On	0
ECCR1	Measuring rate 1	-	0 ... 99	5
ECCR2	Measuring rate 2	-	0 ... 99	10

ECCV1	Velocity 1	m/s	$0 ... 2^{31} * 10^{-4}$	0.0800
ECCV2	Velocity 2	m/s	$0.0001 ... 2^{31} * 10^{-4}$	0.1200
PECC	Indicates ECC parameters	-	-	-

10.1.5 Pulse output commands

Command	Meaning	Unit	Possible values	Default values
INCOn	On/Off	-	0- Off 1- On (OUT1/2) 2- On (IF2/IF2F) 3- On (OUT1/2+IF2)	1
INCFactor	Scaling factor(s)	-	$0.000001 ... 2^{31} * 10^{-6}$ 3 values for IF2/IF2F	0.100000
INCOutput	Time or trigger controlled output	-	0- Time 1- Trigger	0
INCValue	Value	-	V- Velocity R- Measuring rate	V
PINC	Indicates the parameters	-	-	-

10.1.6 Output via serial interface 1 commands

Command	Meaning	Unit	Possible values	Default value
S1On	On/Off	-	0 - Off 1 - On	0
S1Format	Output format	-	Refer to description	V*60:6:2 ' m/min'
S1Interface	Sets the serial interface	-	Refer to description	9600 N X
S1Output	Time or trigger controlled output	-	0 - Time 1 - Trigger	0
S1Time	Output time	ms	10 ... 65535	500 ms
PS1	Indicates the S1 parameters	-	-	-

10.1.7 Output via serial interface 2 commands

Command	Meaning	Unit	Possible values	Default value
S2On	On/Off	-	0 - Off 1 - On	0
S2Format	Output format	-	Refer to description	´VL´RT42
S2Interface	Sets the serial interface	-	Refer to description	9600 N X
S2Output	Time or trigger controlled output	-	0 - Time 1 - Trigger	0
S2Time	Output time	ms	3 ... 65535	500 ms
PS2	Indicates the S2 parameters	-	-	-

10.1.8 Offline measurement commands -

Command	Meaning	Unit	Possible values	Default values
OFFValue	Value	-	V - Velocity L - Length N – Object counter R- Measuring rate	V
OFFactor	Scaling factor	-	$0.000001 ... 2^{31} * 10^{-6}$	1.000000
OFFLine	Starts the Offline measurement	-	[T] awaiting trigger	-
OFFMeasure	Measuring time	s	1 ... 65535	10 s
OFFOutput	Moment of the output to the memory	-	0 - Time 1 - Trigger 2 – Burst synchronous	1
OFFRead	Reading of the offline data	-	-	-
OFFTime	Average and storing time	ms	2 ... 65535	100 ms
POFF	Indicates the parameters for the offline operation	-	-	-

10.1.9 Read commands

Command	Return value	Unit	Digits after the decimal point	Example
V	Velocity	m/s	5	-1.23456
L	Length	m	4	1234.5678
R	Measuring rate	-	0	45
N	Object counter	-	0	123
F	Frequency of the last burst	kHz	2	1234.45

10.1.10 System commands

Description	Meaning	Remarks
Password	Set password	Default password ´WEGA´
Restart	Cold start, new initialisation	Interrupts the measurement
Restore	Warm start, only reset parameters	Interrupts the measurement
Simulation	Simulation n1, [n2] n1 - velocity in m/s n2 – measuring rate	Interrupts the measurement
Store	Save parameters	With password protection, Interrupts the measurement for a short time

10.2 Programming examples

Print protocol

A production company cuts steel plates. A VLM 200 measuring device with optional laser light barrier and real time clock is used for the final control. A print protocol is to be generated containing date, time, consecutive numbering with factory identification number and plate length.

A light barrier is connected to the 'IN2' input (trigger input), the beginning and the end of the plates are detected. A printer with serial interface is connected to interface 1 of VLM 200 after programming.

Programming:

Command line	Meaning
Trigger 0	Individual part measurement
S1Interface 9600 N	Baud rate of printer, no protocol
S1Output 1	Output at plate end (Trigger)
S1Format D ´ ´ C N:6 ´/KW1´L:8:3	Output of date, time, counter, length
S1On 1	Switch-on
*Store	Save with password input

The abbreviated form without space characters can also be entered for the format specification:

> *S1Format D´ ´CN:6´/KW1´L:8:3*

Pulse output

A wheel with shaft encoder is to be replaced. The shaft encoder produced 2 pulses per millimetres. Due to the process dynamics, the scan frequency is set to 50 ms. The VLM 200 shaft encoder emulation output is connected to the existing process control unit.

Calculation:

> Output frequency [in kHz] = Factor [1/mm] · Velocity [in m/s]

equivalent to:

> Pulse number = 1000 · Factor [1/mm] · Length [m]

> Factor = Pulse number / (1000 · Length [m])
> = 2 / (1000 · 0.001)
> <u>Factor = 2</u>   (direct input of pulse per mm is possible!)

Programming:

Command line	Meaning
Average 50	Average time 50 ms
INCValue V	Velocity
INCOutput 0	Update in equivalent time intervals
INCFactor 2	2 pulses per mm
INCOn 1	Switch-on
*Store	Save with password input

10.3 Error messages

All error messages begin with the letter 'E' and a two-digit error number. Starting of error code 'E10' the last error occurring during operation is intermediately saved and can be displayed via the *Error* command or deleted.

Code	Meaning	Reason
E00 No ERROR	No error occurred	-
E01 Missing parameter	No or insufficient parameters specified	Incorrect command input
E02 Value out of range	Figure too small or too big	Incorrect command input
E03 Invalid command	Command does not exist	Incorrect command input
E04 Invalid parameter	Parameter not allowed	Incorrect command input
E05 No data	No data	Offline measurement
E06 Memory full	Memory full	Too many measuring values during offline measurement
E07 ESC abort	Abort by ESC	Offline measurement and calibration
E08 Signalerror	Signal failure	Signal failure during calibration
E09 Illegal Use	3x wrong password	3inputs of an incorrect password (V6.5)

Error during command input and processing

Code	Meaning	Reason
E10 S1 output error	Error at S1 output	Output too fast
E11 S1 parity	S1 parity error	Transfer error, refer to *S1Interface*
E12 S1 buffer overflow	S1 buffer overflow	Transfer error, refer to *S1Interface*
E13 S2 output error	Error at S2 output	Output too fast
E14 S2 parity	S2 parity error	Transfer error, refer to *S2Interface*
E15 S2 buffer overflow	S2 buffer overflow	Transfer error, refer to *S2Interface*
E16 Alarm output error	Error at alarm output	Output too fast
E17 Analog output error	Error at analog output	Output too fast
E18 Incremental output error	Error at pulse output	Output too fast
E19 Offline output error	Error at Offline measurement	Output too fast
E30 Periods out of range	Error in the signal processing	Invalid number of periods
E31 Arithmetic overflow!	Arithmetic overflow	Parameters set incorrectly
E32 Division by zero!	Division by 0	Parameters set incorrectly
E33 Watchdog timer reset!	Reset by watchdog	Processor crashed (also in the case of overload)
E34 Oscillator Watchdog timer reset!	Reset by watchdog	Processor crashed

Critical errors

Code	Meaning	Reason
E40 Parameter lost, service necessary!	Data in EEPROM corrupt	Fatal error, check all parameters
E41 Loading ASIC 1 failed, service necessary!	ASIC 1 failed	Fatal error, device must be repaired
E42 Loading ASIC 2 failed, service necessary!	ASIC 2 failed	Fatal error, device must be repaired
E99 Unknown error!	Unknown error	Software error

Fatal error, in which case the device must be checked.

10.4 Significance of LED's

LED	Colour	Meaning
Signal-LED	Green	Signal exists
Signal-LED	Red	Signal quality is not good, refer also to *Minrate* and *ECCOn*
Signal-LED	Yellow	Device is being initialised
Busy-LED	Yellow	Command processing, also during calibration and offline measurement
Error-LED	Red	Flashes in case of 'E40' to 'E42' fatal errors Flashes briefly in case of 'E10' to 'E32' critical errors

Meaning of the LED's

10.5 Output values units

Description	Unit	Value range for output	Max. resolution
Velocity	1 m/s	± 21474	0.0001 *)
Length	1 m	± 214748 (internal: ± 360288)	0.0001 *)
Object counter	1 piece	0 .. 65535	1
Measuring rate	non	0 .. 100	1

Values and their units, which are output to the corresponding channels

*) Without format specification the value is output to the S1- and S2-output with three digits after the decimal point

10.6 Pin assignments

10.6.1 Device connection 1, RS 232

Pin number	Colour internal	Assignment
1	Brown	RxD (RS 232 interface S1))
2	White	TxD (RS 232 interface S1))
3	Blue	GND (RS 232 interface S1))
4	Black	GND (test signal), do not use
5	Grey	Test signal (analog signal, 50 Ohm), do not use

10.6.2 Device connection 2, signal (2 examples only !)

Pin number	Colour internal	Digital OUT / digital IN	Digital OUT, RS 485 assignment
1	Brown	OUT1 + to OUT3 +, IN1 +	OUT1 +, OUT2 +
2	White	OUT1 - (phase A)	OUT1 - (phase A)
3	Blue	OUT2 - (phase B)	OUT2 - (phase B)
4	Black	OUT3 - (status)	A, RS 485
5	Grey	IN1 - (directional input)	B, RS 485

10.6.3 Device connection 3, power supply 230V/AC, 115V/AC

Pin number	Colour cable	230V/AC (Hirschmann connector no. CA3LD09ZS) assignment
2	Brown	Phase *)
3	Blue	Null *)
PE	Green/yellow	Ground conductor

*) Phase and null may be interchanged, both conductors are protected.

10.6.4 Device connection 3, power supply 24/DC

Pin number	Colour cable	Assignment 24V/DC
3	Black 1	0 V
4	Black 2	24 V
PE	Green/yellow	Ground conductor

*) Phase and null may be interchanged; both conductors are protected.

> ⚠ Attention! Before connecting power, ground the device with the earthing screw via the grounding cable.

10.7 Ordering identification

10.7.1 VLM 200 measuring device

No.	Item No./Description	Order code
1.1	**VLM 200 A – Standard Type** Device (working distance 185 mm) for measuring velocity and length **Notice for VLM 200 Types:** Standard 230 V / AC power supply, with serial interface RS 232 and one output with two phases, velocity range to customer request at no extra cost **Scope of delivery:** Device, handbook, power supply cable, spare lamp, RS 232 programming cable, cover plug for programming connection, connection plug, grounding cable, adjustment aid for working distance and terminal program for configuration via PC (3.5´´ disk)	VLM 200 A
1.2	**VLM 200 FA - Type** See notes to VLM 200 A, design for regulating tasks with high measuring dynamic due to gliding average, minimum update time at output 2 ms (pulse) or 5 ms (analog)	VLM 200 FA
1.3	**VLM 200 D - Type** See notes to VLM 200 A, design with increased distance variance and working distance (240 mm), with internal length measurement , low 2 m/min velocity possible	VLM 200 D
1.4	**VLM 200 FD - Type** See notes to VLM 200 A, design for regulating tasks with high measuring dynamic due to gliding average, minimum update at output 2 ms (pulse) or 5 ms (analog), increased distance variance and increased working distance (240 mm), low 2 m/min velocity possible, without internal length measurement	VLM 200 FD
1.5	**VLM 200 SD - Type** See notes to VLM 200 A, design for synchronous differential speed measurements with high reproducibility and high measuring dynamic, due to gliding average, minimum update time at output 2 ms (pulse) and 5 ms (analog), increased distance variance and increased working distance (240 mm), low 2 m/min velocity possible, without internal length measurement	VLM 200 SD
1.6	**VLM 200 L - Type** See notes to VLM 200 A, design for low speed up to 0.5 m/min, working distance 170 mm, can be compatibly assembled with VLM 200 standard type (185 mm), with internal length measurement	VLM 200 L
1.7	**VLM 200 FL - Type** Notes see above, design for regulating tasks with high dynamic due to gliding average, minimum update time at output 2 ms (pulse) and 5 ms (analog), design for low speed up to 0.5 m/min, working distance 170 mm, can be compatibly mounted with VLM 200 Standard (185 mm), without internal length measurement	VLM 200 FL
1.8	**VLM 200 SD - Type** See notes to VLM 200 A, design for synchronous differential speed measurements with high reproducibility and high measuring dynamic, due to gliding average, minimum update time at output 2 ms (pulse) and 5 ms (analog), design for low speed up to 0.5 m/min, working distance 170 mm, can be compatibly mounted with VLM 200 Standard (185 mm), without internal length measurement	VLM 200 SL
1.9	**User manual for VLM 200 in advance** Price is set off on purchase, indicate when placing order	UM / VLM 2

Measuring Devices of the VLM 200 /h Series for Glowing Surfaces

No.	Item No./Description	Order code
1.10	**VLM 200 D /h - Type** for glowing surfaces, design with increased distance variance and working distance (240 mm), with internal length measurement , low 2 m/min velocity possible **Notice for VLM 200 Types:** Standard 230 V / AC power supply, with serial interface RS 232 and one output with two phases, velocity range to customer request at no extra cost **Scope of delivery:** Device, handbook, power supply cable, spare lamp, RS 232 programming cable, cover plug for programming connection, connection plug, grounding cable, adjustment aid for working distance and terminal program for configuration via PC (3.5´´ disk)	VLM 200 D /h
1.11	**VLM 200 FD /h - Type** for glowing surfaces, see notes to VLM 200 A, design for regulating tasks with high measuring dynamic due to gliding average, minimum update at output 2 ms (pulse) or 5 ms (analog), increased distance variance and increased working distance (240 mm), low 2 m/min velocity possible, without internal length measurement	VLM 200 FD /h
1.12	**VLM 200 SD /h - Type** for glowing surfaces, see notes above, design for synchronous differential speed measurements with high reproducibility and high measuring dynamic, due to gliding average, minimum update time at output 2 ms (pulse) and 5 ms (analog), increased distance variance and increased working distance (240 mm), low 2 m/min velocity possible, without internal length measurement	VLM 200 SD /h
1.13	**VLM 200 L /h - Type** for glowing surfaces, see notes above, design for low speed up to 0.5 m/min, working distance 170 mm, can be compatibly assembled with VLM 200 standard type (185 mm), with internal length measurement	VLM 200 L /h
1.14	**VLM 200 FL /h - Type** for glowing surfaces, see notes above, design for regulating tasks with high dynamic due to gliding average, minimum update time at output 2 ms (pulse) and 5 ms (analog), design for low speed up to 0.5 m/min, working distance 170 mm, can be compatibly mounted with VLM 200 Standard (185 mm), without internal length measurement	VLM 200 FL /h

10.7.2 Interface cards and options for VLM 200

No.	Item No./Description	Order code
2.1	**Interface board IF 1** (built in to VLM 200) **IF 1 with analog output** Optically isolated, 4 - 20 mA (other ranges specified 0-20 mA or 0–24 mA)	IF1-AI / VLM 2
2.2	**IF 1 with RS 232** Optically isolated, can be combined with option IF 1-AI option	IF1-RS 232 / VLM 2
2.3	**IF 1 with RS 422 / RS 485** Optically isolated, can be combined with option IF 1-AI option	IF1-RS 422 / VLM 2
2.4	**Interface board IF 2** (built in to VLM 200, incl. additional connection socket with plug) 2 programmable optically isolated pulse outputs, each with two phases, passive NPN transistor, frequency 0.4 Hz-25 kHz, resolution 20 ns)	IF2 / VLM 2
2.5	**Interface board IF 2F/422** (built in to VLM 200, incl. additional connection socket with plug) 2 programmable optically isolated pulse outputs, each with two phases, RS422-driver, frequency 0.4 Hz – 500 kHz, resolution 20 ns	IF2F422 / VLM 2
2.6	**Interface board IF 2F/5V** (built in to VLM 200, incl. additional connection socket with plug) 2 programmable optically isolated pulse outputs, each with two phases and inverted signals, 5 V driver, RS422 compatible, frequency 0.4 Hz – 500 kHz, resolution 20 ns)	IF2F5V / VLM 2
2.7	**Option for Interface board IF 2, IF2F** IF2 card with analog output 16 bit as additional component version, optically isolated, 4-20 mA (please specify other ranges 0-20 mA or 0–24 mA)	IF2-AI / VLM 2
2.8	**Interface board IF 2/PP** (built in to VLM 200, incl. additional connection socket with plug) 2 programmable optically isolated pulse outputs, frequency 0.4 Hz-50 kHz, 7 push-pull drivers with ± 100 mA per output, external power supply +15 to 30 Volt; A2, /A2, B2, /B2, A3, and B3 pulse outputs and OUT3 status output)	IF2PP / VLM 2
2.9	**Interface board IFETHER** (built in to VLM 200, incl. connection socket with plug with 5 m patch cable RJ45) output measuring rates over Ethernet, TCP/IP, UDP/IP and Telnet	IFETHER / VLM 2
2.10	**Connection board AB 1 with NPN outputs** built in to VLM 200; Hint: a AB1 is in the standard scope of delivery of the VLM 200	AB1 / VLM 2
2.11	**Connection board AB 2/PP with push-pull outputs** built in to VLM 200 instead of AB 1; OUT1, 2 and 3 push-pull diver with ±20 mA per output, internal power supply +24 Volt (for new device without AB 1 only 250,00 Euro extra charge)	AB2PP / VLM 2
2.12	**Connection board ABETHER** (built in to VLM 200 instead of AB 1, incl. connection socket and 5 m patch cable RJ45) VLM 200 programming over Telnet and output of measuring rates over TCP/IP, UDP/IP and Telnet (for new device without AB 1 only 350,00 Euro extra charge)	ABETHER / VLM 2
2.13	**ECC 2 shaft encoder controller slot card** (controller for connection of a encoder, measurement as of 0 m/s, directional identification from the shaft encoder signal; built in to VLM 200, incl. additional connection socket with plug)	ECC2 / VLM 2

No.	Item No./Description	Order code
2.14	**Option for ECC 2 shaft encoder controller slot card** ECC 2 with RS 422 / RS 485, optically isolated	ECC2-RS 422 / VLM 2
2.15	**Option for ECC 2 shaft encoder controller slot card** ECC 2 with RS 232, optically isolated	ECC2-RS 232 / VLM 2
2.16	**Interface board IF-PROFI for Profibus DP** for VLM 200 firmware version 6.7, binary data at the Profibus, different modes, min update time 10 ms, delivery incl. special connection sockets and two standardised circular connectors	IFPROFI / VLM 2
2.17	**Automatic directional detector** (built in to VLM 200, retrofit possible, cannot be combined with F- and S-series)	DIR / VLM 2
2.18	**Real time clock RTC** date and time, built in to VLM 200, retrofit not possible	RTC / VLM 2
2.19	**Power supply 24 Volt / DC** built in to VLM 200, retrofit not possible	24DC / VLM 2
2.20	**Additional connection socket with plug** built in to VLM 200, 5-pole, for device connections 4 and 5, 1-2 pieces are possible	CONPG9 / VLM 2
2.21	**Additional filter board FB1** Please specify velocity ranges, range depends on VLM200 – type and setting of *DIRECTION* parameter!	FB1 / VLM 2
2.22	**PC-Software VLMTOOL** Convenient parameter setting and device administration including graphic online output with protocol, designed for Windows 98, 2000, NT, XP	VLMTOOL

Notes: Only one Interface board can be plugged in; for the IF 1 interface card and ECC2 controller slot card RS 232 option can not be combined with the RS 422 option! An analog output is not available for IF 2/PP!

10.7.3 Spare parts for VLM 200 and external LI35 lighting

No.	Item No./Description	Order code
3.1	**Spare lamp for VLM 200** valid from October 1996	LM6H10W / VLM 2
3.2	**Spare lamp for VLM 200** valid until September 1996, old version	LB6H10W / VLM 2
3.3	**Spare lamp for LI 20**	LM12H20W / LI 20
3.4	**Spare lamp for LI 35**	LS12H35W / LI 35
3.5	**Spare window OW 2** for VLM 200 and LI 20	OW 2
3.6	**Spare window OW 3** for VLM 200 H lighting window and LI 35	OW 3
3.7	**Spare window OW 4** for VLM 200 H lens window	OW 4
3.8	**External lighting LI 35** IP 65 casing, power supply 230V/AC, 35 W halogen lamp LS12H35W, incl. mains cable; please order spare lamp LS12H35W / LI 35 at the same time	LI 35

10.7.4 Options for measurement of individual parts

No.	Item No./Description	Order code
4.1	**Laser light barrier LA** for measurement of individual parts consisting of a built in receiver in the VLM 200 and an external laser with adjustable holder	LA / VLM 2
4.2	**External laser light barrier LE** for measurement of individual parts; consisting of an external receiver with adjustable holder and an external laser with adjustable holder	LE / VLM 2
4.3	**Light barrier controller LBC 2** to increase the accuracy of individual part measurements; for connection of 2 x LE / VLM 2; 230V/AC power supply, incl. connection plugs	LBC 2
4.4	**Light barrier controller LBC 2 with PG9 screw fittings**	LBC 2 / PG9
4.5	**Light barrier controller LBC 8 with PC and Windows Software** Complete solution to the increase of the precision of single part measurement; connection of up to 9 light barriers possible, including LBC8 electronic, PC-card, PC, Windows XP, LCHECK-Software: displays as histogram, store as file as well output serial or via Profibus-DP	LBC 8 Package

10.7.5 Counters and displays

No.	Item No./Description	Order code
5.1	**Comfortable counter/display PAXI** for switchboard mounting; 85-250 V/AC RS 485 and optional RS 232 for display VLM 200 measuring rate, two switching outputs, display red, programmed for VLM 200 connection	PAXI / RS485 or PAXI / RS232
5.2	**Comfortable counter/display PAXICA** IP65 steel housing: data as PAXI, all connections can be screwed, incl. all connection cables (a 5 m), short documentation	PAXICA / RS485 or PAXICA / RS232
5.3	**Digital display for analog signals PAXD** for switchboard mounting; 85-250 V/AC; input 0/4 to 20 mA, display red, programmed for VLM 200 connection, displays 0..100 at 4..20 mA analog signal, all connections can be screwed, incl. all connection cables (a 5 m), short documentation	PAXD
5.4	**Digital display for analog signals IP65 PAXDCA** IP65 steel housing; 85-250 V/AC; input 0/4 to 20 mA, display red, programmed for VLM 200 connection, displays 0..100 at 4..20 mA analog signal, all connections can be screwed, incl. signal and power cable (a 5 m)	PAXDCA
5.5	**Analogue Current Meter ACM** aluminum housing, IP52; analogue current meter 4..20 mA, displays 0..100 %, incl. 5 m connection cable	ACM

10.7.6 Mounting accessories and protective equipment

No.	Item No./Description	Order code
6.1	**Mounting plate MP 3** with long holes for z-direction, upgrade to MP 3R possible	MP 3 / VLM 2
6.2	**Mounting plate MP 3R** with long holes for z-direction and rotation, incl. MP 3 and rotation plate	MP 3R / VLM 2
6.3	**Mounting plate MP5** rotation for CB5 (CB5 must provide a hole for MP5 pin)	MP 5 / VLM 2
6.4	**Mounting plate MP1** with long holes for y- and z-direction; for new applications please use MP 3	MP 1 / VLM 2
6.5	**Set of vibration absorbers for VLM 200** 4 x M6 hole on M6 thread, incl. 4 x M6 screws	ELM4 / VLM 2
6.6	**Air jet unit PA 2** with ¼´´ connection thread, protection against dry dust, mounted on the VLM 200; cannot be combined with LA option; tempered, clean compressed air required	PA 2 / VLM 2
6.7	**Linear unit LJ 1b for device adjustment Y-direction or Z-direction** incl. adapter plate for VLM 200, can be used optionally for X-direction, 30 cm procedural distance, other lengths on request	LJ 1b / VLM 2
6.8	**Linear unit LJ 2b for device adjustment Y- and Z-direction** incl. adapter plate for VLM 200, 30 cm procedural distance each, other lengths on request	LJ 2b / VLM 2
6.9	**Linear unit LJ 4 for cooling case CB 5 / Y- and Z-direction** incl. adapter plate for CB 5, 30 cm procedural distance each, other lengths on request	LJ 4 / VLM 2
6.10	**Cooling and protection case CB 5 for VLM 200** for rolling mill applications, cover has all-around seal, high-grade steel/ stainless; tempered, clean air required, not for L-series, design for 70 mm hose diameter; delivery incl. TB4 or TB5	CB 5 / TB x (x = 4, 5)
6.11	**Protection nozzle TB 4 for CB 5** Protection against oil, water, dust and steam; tempered, clean air required, high-grade steel/stainless, please specify the working distance xxx of VLM 200!	TB 4 / xxx (xxx = 185, 240, 330)
6.12	**Protection nozzle TB 5 for CB 5** Protection against oil, water and dust; tempered, clean air required, high-grade steel/stainless, short length Please specify the working distance xxx of VLM 200!	TB 5 / xxx (xxx = 185, 240, 330)
6.13	**Air supply and connection case AC 5** for CB 5, delivery includes 5 m air hose and cable for VLM 200, design for 70 mm hose diameter	AC 5
6.14	**Air hose, length 5 m, diameter 70 mm** Plastic air hose 70 mm, for connection AC 5 to CB 5, delivery incl. customised cables to the VLM 200; extra charge 25,00 Euro per meter, until maximum length 15 m	ATP / 70
6.15	**Metal air hose, length 5 m, diameter 70 mm** Metal air hose 70 mm, for connection AC 5 to the CB 5, delivery incl. customised cables to the VLM 200; extra charge 40,00 Euro per meter, until maximum length 15 m	ATM / 70
6.16	**Viton air hose, length 5 m, diameter 70 mm** Viton air hose 70 mm, for connection AC 5 to the CB 5, delivery incl. customised cables to the VLM 200; extra charge 60,00 Euro per meter, until maximum length 15 m	ATV / 70

10.7.7 Start up support and calibration of VLM 200

No.	Item No./Description	Order code
7.1	**Start up support in Germany** 1 engineer, incl. lodging and travel expenses, only in Germany, only in connection with purchase of a VLM 200	EPP / VLM 2
7.2	**Start up support in Europe (only EU and Switzerland)** 1 engineer, incl. expenses and travelling costs, only with purchase of VLM 200, <u>minimum two days</u> on the same place	EPPA / VLM 2
7.3	**Engineer in field per day (only Germany)** 1 engineer, <u>plus</u> expenses and travelling costs; cost for journey and departure days charge with € 600,00	ING
7.4	**Engineer in field per day (only EU and Switzerland)** 1 engineer, <u>plus</u> expenses and travelling costs; cost for journey and departure days charge with € 600,00	INGA
7.5	**Engineer in field per day (non EU)** 1 engineer, <u>plus</u> expenses and travelling costs; cost for journey and departure days charge with € 600,00	INGB
7.6	**Inspection and calibration** inspection, electrical inspection; calibration and measuring of velocity and distance linearity	INCAL / VLM 2
7.7	**Inspection and calibration with certification** inspection, electrical output inspection; calibration and measuring of velocity and distance linearity, delivery incl. certification paper	CZERT / VLM 2
7.8	**Dismantling and cleaning** clean from outside, dismantle the lower casing, clean from inside and then reassemble	DEMCL / VLM 2

10.7.8 Cables and cable connectors for VLM 200

No.	Item No./Description	Order code
8.1	**Cable for power supply 230V/AC (115 V/AC)** 5 m, 3 wires with protection contact	POCA-AC / VLM 2
8.2	**Cable for power supply 24V/DC** 5 m, 3 wires one side with open ends	PSC-DC / VLM 2
8.3	**RS 232 cable (programming cable)** screened, 5 m, 3 wires with PC connector for serial interface (D-SUB 9)	RSCs / VLM 2
8.4	**Connection cable for AB ETHER and IF ETHER** CAT 5 with RJ45 connection plug, 5 m	CABLE 4Ms-RJ45
8.5	**Connection cable for AB ETHER and IF ETHER** CAT 5 with RJ45 connection plug, 10 m	CABLE 4Ms-RJ45-10m
8.6	**Signal connecting cable with 2 female connectors** screened, 5 m with 2x CON5Fs	CABLE 5Fs-5Fs
8.7	**Signal connecting cable with female connector** one side with open ends, screened, 5 m with 1x CON5Fs	CABLE 5Fs-open
8.8	**Male cable connector for gauge connection 1** screened, standard version (RS232)	CON-5Ms
8.9	**Male angled connector for gauge connection 1** screened, angled, special version (RS232)	CON-5MsA
8.10	**Female cable connector 5 contacts** for connection 2, 4 and 5, screened, standard version	CON-5Fs
8.11	**Female angled connector 5 contacts angled** for connection 2, 4 and 5, screened, angled, special version	CON-5FsA
8.12	**Male angled connector 8 contacts** For IF2F/5V connection 5, screened, standard version	CON-8Ms
8.13	**Female cable connector for power supply** for connection 3, 230 V or 115 V, standard version	POCO-AC
8.14	**Female angled connector for power supply** for gauge connection 3, angled, 230 V or 115 V, special version	POCOA-AC
8.15	**Female cable connector for 24 V power supply** for gauge connection 3, standard version	POCO-DC
8.16	**Female angled connector for 24 V power supply** for connection 3, angled, special version	POCOA-DC
8.17	**Profibus Termination Resistor**	PTX
8.18	**Male socked PG9 for signal connection** interference-free, 5 contacts, male, open, for connection 2,4 and 5 (signal)	PG9-5M / VLM 2
8.19	**Female socked PG9 for Ethernet/Profibus** B-coded, 4 contacts, male, open, for connection 4 and 5	PG9-4F / VLM 2
8.20	**Female socked PG9 for IF2F/5V** 8 contacts, male, open for IF2F/5V, for connection 5	PG9-8F / VLM 2
8.21	**Male socked PG9 for RS 232** Interference-free, 5 contacts, female, open, for connection 3 (RS232)	PG9-5F / VLM 2
8.22	**Male socked 230 or 115V for gauge connection 3** Installation into the gauge	POSO-AC/ VLM 2
8.23	**Male socked 24V for gauge connection 3** Installation into the gauge	POSO-DC/ VLM 2

Explanation: open, i.e. with end splices

10.7.9 Installation accessories and other equipment for VLM 200

No.	Item No./Description	Order code
9.1	**NF-signal cable 5 wires, price per meter** PUR signal cable, 5x 0,25mm², screened, ∅ 5,2 mm	PUR5S
9.2	**NF-signal cable 8 wires, price per meter** PUR signal cable, 8x 0,25mm², screened, ∅ 6,2 mm	PUR8S
9.3	**HF-signal cable, price per meter** twisted pair wires, screened, ∅ 6,2 mm, recommended for IF 2 F/422 and analogue output	HF4S
9.4	**Resistor 1.2k for rail mounting**	RH1.2
9.5	**Resistor 1.2k with red LED for rail mounting**	RHLEDr1.2
9.6	**Resistor 1.2k with green LED for rail mounting**	RHLEDg1.2
9.7	**Resistor 120 Ohm for rail mounting** recommended for IF 2F/422	RH120
9.8	**Measurement resistor 500 Ohm / 0,1%**	RS500
9.9	**Tool for adjustment of working distance for VLM 200 L- series** 170 mm aluminum tube	WD170 / VLM2
9.10	**Tool for adjustment of working distance for VLM 200 A standard - series** 185 mm aluminum tube	WD185 / VLM2
9.11	**Tool for adjustment of working distance for VLM 200 D – series** 240 mm aluminum tube	WD240 / VLM2
9.12	**Tool for adjustment of working distance for VLM 200 H – series** 330 mm aluminum tube	WD330 / VLM2
9.13	**Converter RS 422 to two phases to TTL** for IF2F/422; rail mounting; output signal A, /A, B, /B; 24 Volt power supply; up to 500 kHz, output TTL 5V/24 mA	WAN422 / VLM2
9.14	**Profibus Gateway Unigate/VLM2** for VLM 200 series, rail mounting, power supply 24 V, RS232/RS485 to Profibus DP, different output modes	UNIGATE/VLM2
9.15	**Impulse transformer TR1702** for A/B signals up to 200 kHz, 5 or 24 V level input and output, opto isolated, rail mounting, power supply 24 V	TR1702
9.16	**Pulse divider TR1702/P1, dividing relation 1 up to 64** for A/B signals up to 200 kHz, 5 or 24 V level, opto isolated, dividing relation can set to 1 up to 64	TR1702/P1
9.17	**Gateway RS232-RS422** opto isolated, rail mounting, power supply 24 V	CON232/422
9.18	**S-Interface for VLM 200 S Series** generation of the synchronization trigger signal for S-Series for difference measurement applications; allows easy connection of 2 up to 3 gauges of the VLM 200 S-Series to a PLC; rail mounting, power supply 24 V	S-Interface

10.8 Additional distributors and assembly instruction for connectors

10.8.1 Cable connector for connection #1, RS232

Item	Manufacturer	Distributors	Type / Series	Order number
Male cable connector, screened	Binder	Esto/Börsig	Series 713	99-1437-814-05
Male angeld connector, screened	Binder	Esto/Börsig	Series 713	99-1437-824-05
Male cable connector, metal, not screened	Binder	Esto/Börsig	Series 713	99-0437-55-05
Male duo connector not screened	Binder	Esto/Börsig	Series 713	99-0437-142-05

10.8.2 Cable connector for connections #2, #4 and #5, signals IN/OUT

Item	Manufacturer	Distributors	Type / Series	Order number
Female cable connector, screened	Binder	Esto/Börsig	Series 713	99-1436-814-05
Female angeld connector, screened	Binder	Esto/Börsig	Series 713	99-1436-824-05
Female cable connector, metal, not screened	Binder	Esto/Börsig	Series 713	99-0436-55-05
Female duo connector not screened, not screened	Binder	Esto/Börsig	Series 713	99-0436-142-05

10.8.3 Cable connector for connection #3, 115V/AC, 230V/AC

Item	Manufacturer	Distributors	Type / Series	Order number
Female cable connector	Binder	Esto/Börsig	Series 693	99-4222-00-04
Female angeld connector	Binder	Esto/Börsig	Series 693	99-4222-70-04

10.8.4 Cable connector for connection #3, 24V/DC

Item	Manufacturer	Distributors	Type / Series	Order number
Female cable connector	Binder	Esto/Börsig	Series 693	99-4218-00-07
Female angeld connector	Binder	Esto/Börsig	Series 693	99-4218-70-07

Status January 2003, modifications possible!

10.8.5 Assembly instruction for screened connector
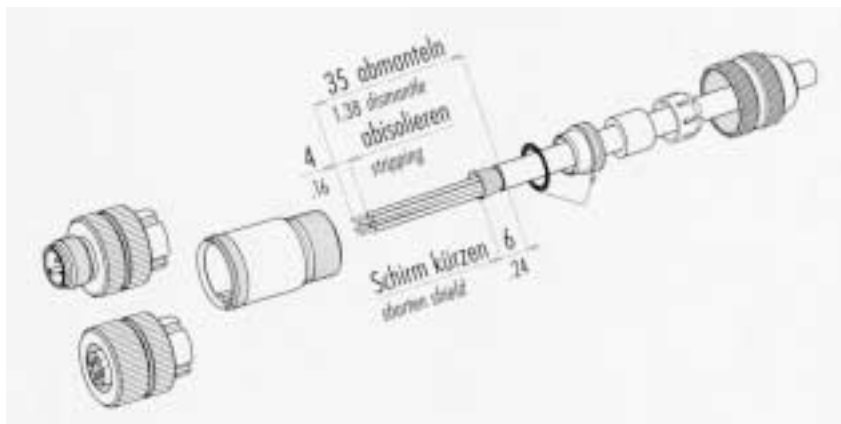
Figure A1a   Assembly instruction for screened connector #1, #2, #4 and #5

10.8.6 PIN assignments for cable connectors

⚠️   All drawings shows the counting-direction with **view to the screw-side**!

Male Cable Connector 5 Contacts
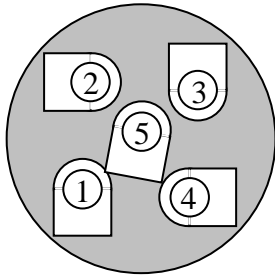
Female Cable Connector 5 Contacts
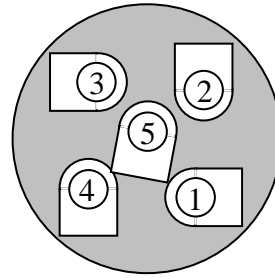
Male Cable Connector 8 Contacts
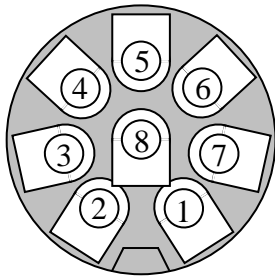
Female Cable Connector 8 Contacts
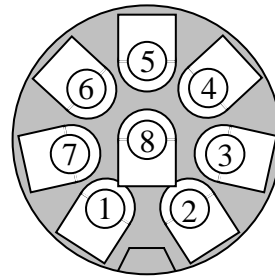
Male Cable Connector 4 Contacts (B-Coding)
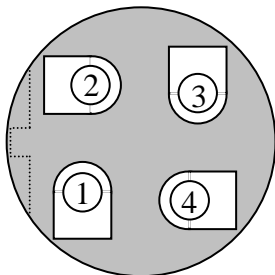
Figure A1b   Wiring instruction for screened connector #1, #2, #4 and #5

10.9 Ordering codes for interface cards

Basic function / Option	RS232, only output	RS485 / RS422, only output	Analog output, 4 ... 20 mA	Analog output, 0 ... 20 mA	25 kHz pulse, 2 x 2 phases, open collector, 24 Volt	50 kHz pulse, 2 x 2 phases, status output balancing, 15-30 Volt	500 kHz pulse, 2 x 2 phases, balancing, 5 Volt	500 kHz pulse, 2 x 2 phases, RS422 driver	ECC2 shaft encoder controller
Without	**IF1/ RS232**	**IF1/ RS422**	**IF1-AI, 4-20 mA**	**IF1-AI, 0-20 mA**	**IF2**	**IF2 PP**	**IF2F/ 5V**	**IF2F 422**	**ECC2**
RS232 only output	-	-	IF1 / RS232 IF1-AI, 4-20 mA	IF1 / RS232 IF1-AI, 0-20 mA	-	-	-	-	ECC2 / RS232
RS485/ RS422 only output	-	-	IF1 / RS422 IF1-AI, 4-20 mA	IF1 / RS422 IF1-AI, 0-20 mA	-	-	-	-	ECC2 / RS422
Analog output, 4 ... 20mA	IF1 / RS232 IF1-AI, 4-20 mA	IF1 / RS422 IF1-AI, 4-20 mA	-	-	IF2 IF2-AI, 4-20 mA	-	IF2F / 5V IF2-AI, 4-20 mA	IF2F 422 IF2-AI, 4-20 mA	-
Analog output, 0 ... 20mA	IF1 / RS232 IF1-AI, 0-20 mA	IF1 / RS422 IF1-AI, 0-20 mA	-	-	IF2 IF2-AI, 0-20 mA	-	IF2F / 5V IF2-AI, 0-20 mA	IF2F 422 IF2-AI, 0-20 mA	-
25 kHz pulse, 2 x 2 phases, open collector	-	-	IF2 IF2-AI, 4-20 mA	IF2 IF2-AI, 0-20 mA	-	-	-	-	-
500 kHz pulse, 2 x 2 phases, 5 volt	-	-	IF2F / 5V IF2-AI, 4-20 mA	IF2F / 5V IF2-AI, 0-20 mA	-	-	-	-	-
500 kHz pulse, 2 x 2 phases, RS422	-	-	IF2F 422 IF2-AI, 4-20 mA	IF2F 422 IF2-AI, 0-20 mA	-	-	-	-	-
ECC2 shaft encoder controller	ECC2 / RS232	ECC2 / RS422	-	-	-	-	-	-	-

Function of the standard connection board (AB1):
    RS232 interface; 2 phase pulse output 12-24 Volt, 7 kHz, open collector; status output; trigger and directional input
Additional interface boards:
    IF-PROFI for Profibus DP and IF-ETHER for 10 MBit Ethernet

10.10 Maximum velocity depending on the limit frequency of the filter board FB1

	VLM 200 A		VLM 200 FA		VLM 200 D		VLM 200 FD, SD		VLM 200 L		VLM 200 FL		
DIRECTION	0 ... 3	4 ... 8	0 ... 3	4 ... 8	0 ... 3	4 ... 8	0 ... 3	4 ... 8	0 ... 3	4 ... 8	0 ... 3	4 ... 8	*DIRECTION*
Vmax [m/min]													**Vmax [m/s]**
1	-	-	-	-	-	-	-	-	1,3	1,3	1,3	1,3	0,02
5	-	-	-	-	1,3	1,3	1,3	1,3	1,3	1,3	1,3	1,3	0,08
10	1,3	1,3	1,3	1,3	1,3	1,3	1,3	1,3	2,5	1,3	2,5	1,3	0,17
20	1,7	1,3	1,7	1,3	3	1,3	3	1,3	5	2,5	5	2,5	0,33
50	5	2,5	5	2,5	8	5	8	5	10	5	10	5	0,83
100	10	5	10	5	15	10	15	10	-	10		10	1,67
200	20	10	20	10	25	15	25	15	-	-	-	-	3,33
300	25	15	25	15	40	20	40	20	-	-	-	-	5
400	40	20	40	20	50	25	50	25	-	-	-	-	6,67
500	-	20	40	20	-	30	60	30	-	-	-	-	8,33
600	-	25	50	25	-	40	75	40	-	-	-	-	10
700	-	30	60	30	-	40	80	40	-	-	-	-	11,7
800	-	40	75	40	-	50	90	50	-	-	-	-	13,3
900	-	-	75	40	-	-	100	60	-	-	-	-	15
1000	-	-	80	40	-	-	-	60	-	-	-	-	16,7
1200	-	-	100	50	-	-	-	75	-	-	-	-	20
1400	-	-	120	60	-	-	-	80	-	-	-	-	23,3
1600	-	-	-	75	-	-	-	90	-	-	-	-	26,7
1800	-	-	-	75	-	-	-	100	-	-	-	-	30
2000	-	-	-	80	-	-	-	-	-	-	-	-	33,3
2200	-	-	-	100	-	-	-	-	-	-	-	-	36,7
2500	-	-	-	100	-	-	-	-	-	-	-	-	41,7
3000	-	-	-	120	-	-	-	-	-	-	-	-	50

Limit frequency of the FB1 filter board in kHz.

Note: In the case of an increase in the velocity range due to the replacement of the FB1 the RMAX and AMPLIFIER parameters should be adjusted. In the case of a reduction in the range an adjustment of the cited parameters is recommended. As these parameters are not described here, please consult your supplier.

10.11 Descriptions of the interfaces

10.11.1 RS 232 interface (AB1, IF1, ECC2)

The RS 232 interface serves to transmit serial data between two devices. As almost all computers are equipped with an RS 232 interface (COM1, COM2), the VLM 200 has an RS 232 interface (electrically isolated) for configuration.

Due to an electrical isolation the RS 232 is also suitable for an industrial environment.

The interface allows full-duplex operation, i.e. a party can simultaneously send and receive data from another party.

The TxD, RxD and GND signals are used. Data transmission is controlled via the XON/XOFF protocol (software handshake), i.e. if the receiver is not ready to receive he sends the XOFF signal to the transmitter, which then interrupts the transmission. If the receiver is ready to receive again, he sends the XON signal. The transmitter then continues the transmission.

RS 232 physical transmission parameters:

Maximum cable length	15 m (30 m with special low capacity cable)
Maximum send level	$\pm$ 15 V
Minimum send level	$\pm$ 5V
Minimum receive level	$\pm$ 3 V
Load resistance	3 to 7 kOhm
Load capacity	$\geq$ 2500 pF

10.11.2 RS 422 interface (IF1. IF2/422)

The RS 422 interface serves to transmit serial data over long distances. In the case of the VLM 200 the RS 422 interface is used to transmit measuring values. In addition, it can be useful to convert the programming interface (RS 232) to RS 422, in order to bridge greater distances.

The interface allows full-duplex operation, i.e. a party can send and simultaneously receive data from another party.

A maximum of 10 RS 422 receivers may be connected with a transmitter. The serial data are transmitted as voltage difference between the 2 wires of a cable.

RS 422 physical transmission parameters:

Maximum cable length	1200 m according to individual cable and transmission rate
Maximum send level	$\pm$ 5 V
Minimum send level	$\pm$ 2V
Minimum receive level	$\pm$ 200 mV
Load resistance	1x 100 Ohm at the cable end (receiver termination)

Of course encoder pulses can also be transmitted via an RS 422 interface, as the standard determines only the levels, impedance, etc, but not the type of data. Thus, the IF2/422 interface card provides 2 pulse channels, each with 2 phases according to the RS 422 standard.

10.11.3   RS 485 interface (IF1, ECC2)

The RS 485 interface serves to transmit data over great distances. The interface allows only semi-duplex operation, i.e. only one party can send at a time. A maximum of 32 parties can be connected. The serial data are transmitted as voltage difference between the 2 wires of a cable.

RS 485 physical transmission parameters:

Maximum cable length	1200 m according to individual cable and transmission rate
Maximum send level	$\pm$ 5 V
Minimum send level	$\pm$ 1.5 V
Minimum receive level	$\pm$ 200 mV
RS 485 load resistance	120 Ohm each on both cable ends (termination) and a "receiver open-circuit fail-save" switch

In the case of the VLM 200 the S2 interface can be operated as an RS 485. It is used for the transmission of measuring values. If other parties are sending the VLM 200 must be controlled by the XON/XOFF protocol or via the trigger input (trigger synchronous output).

10.11.4   Optical coupler input (AB1, ECC)

The IN1 and IN2 inputs of the VLM 200 are designed as optical couplers. Due to the integrated dropping resistance of 1 kOhm these can be directly operated with 24 V, 0/20 mA or $\pm$ 20 mA signals. As the positive and negative connection is optically coupled at the terminals of the AB1 connection card, the inputs can also be connected with PNP and NPN transistor outputs.
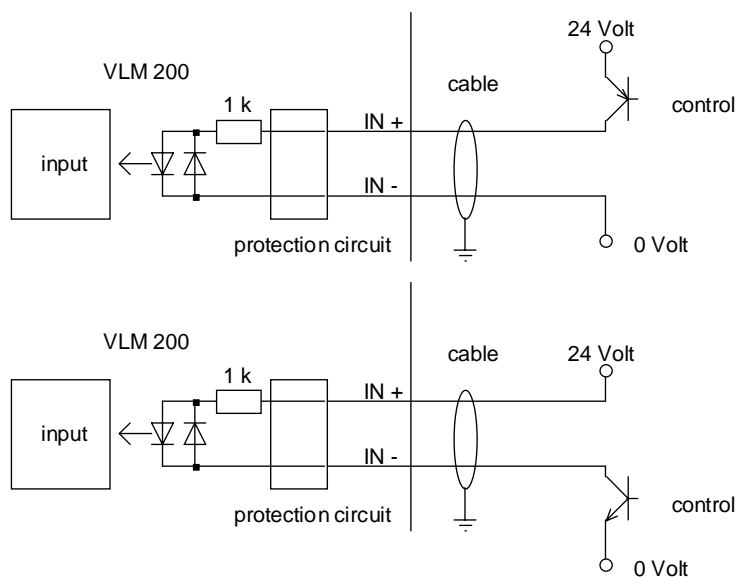
Figure A2   Wiring variants for optical coupling input

10.11.5 Passive transistor output (AB1, IF2)

The optically coupled transistor outputs can drive various inputs. It should be observed that a load resistance (approx. 1.2 kOhm at 24 V) exists, so that in switched through status approx. 20 mA load current results.
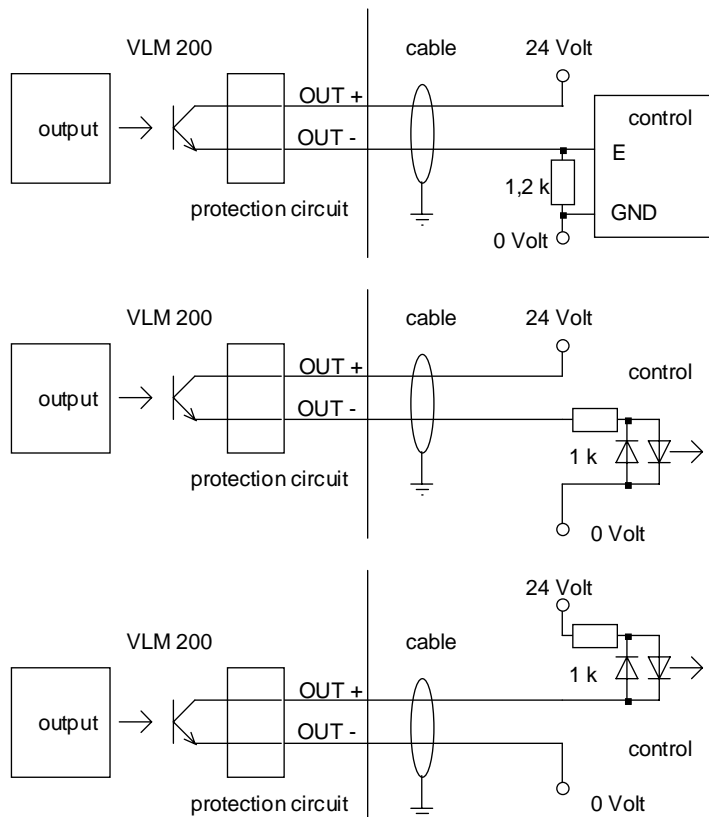
Figure A3   Wiring variants for passive transistor output

10.11.6 Active output driver (IF 2/PP and AB 2/PP)

The optically coupled balanced driver stages can drive load currents up to ±100 mA (IF 2/PP) or up to ±20 mA (AB 2/PP). In the case of long cables an additional load resistance of approx. 1.2 kOhm at the receiver side is to be recommended.

10.12 Wiring examples

10.12.1 Connection example 1, VLM 200 without options

Wiring example for VLM 200. Socket 2 is occupied by a two phase pulse output (OUT1 and OUT2), OUT3output (status) and directional input (IN1).
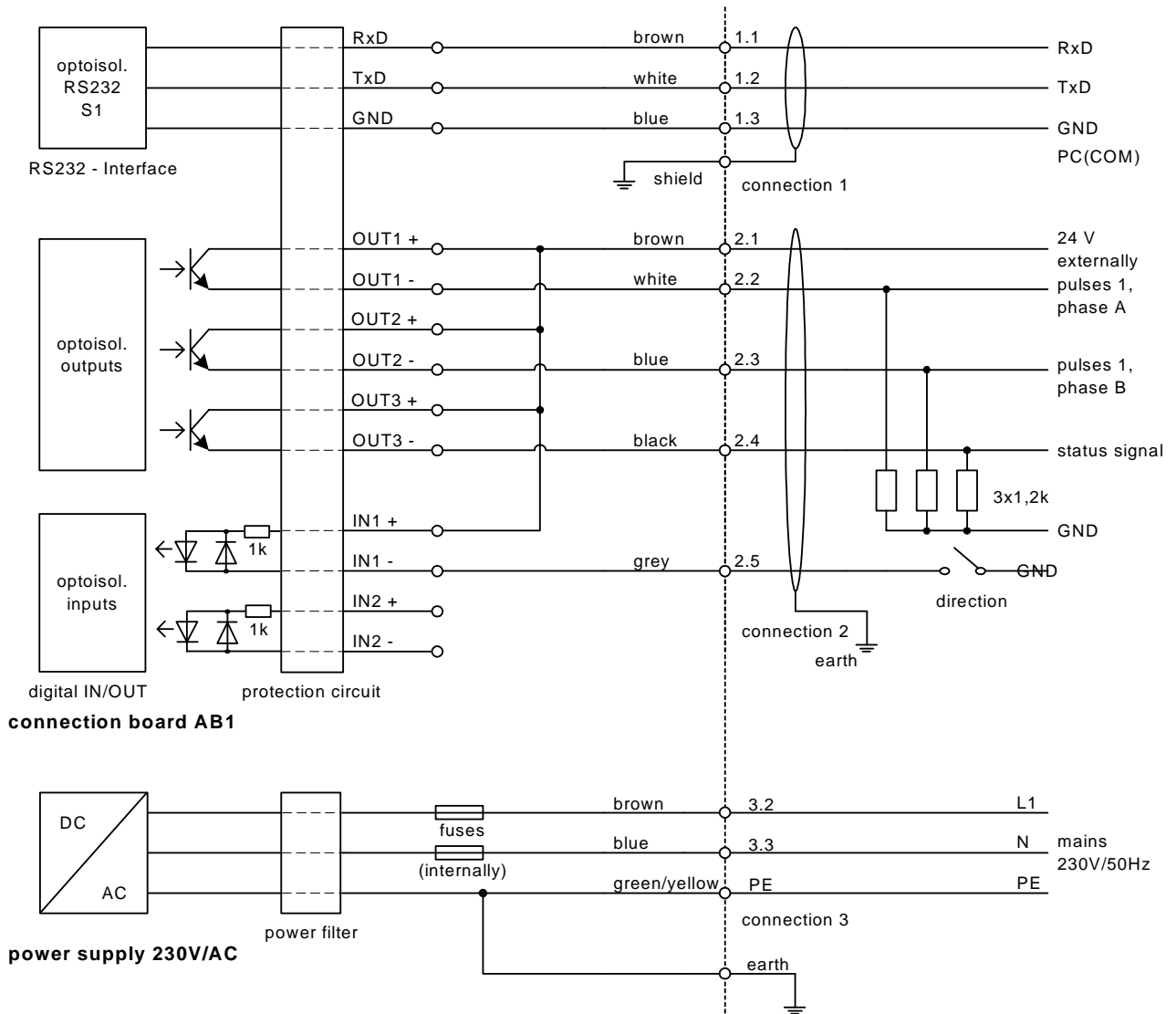
Figure A4   Connection example for VLM 200 without interface card

10.12.2 Connection example 2, VLM 200 with IF1/RS422

Wiring VLM 200: Socket 2 is occupied by a two phase pulse output (OUT1 and OUT2) and RS485 for the connection of the PAXICA counter. Socket 4 is occupied by OUT3 output (status signal), directional input (IN1) and trigger input (IN2).
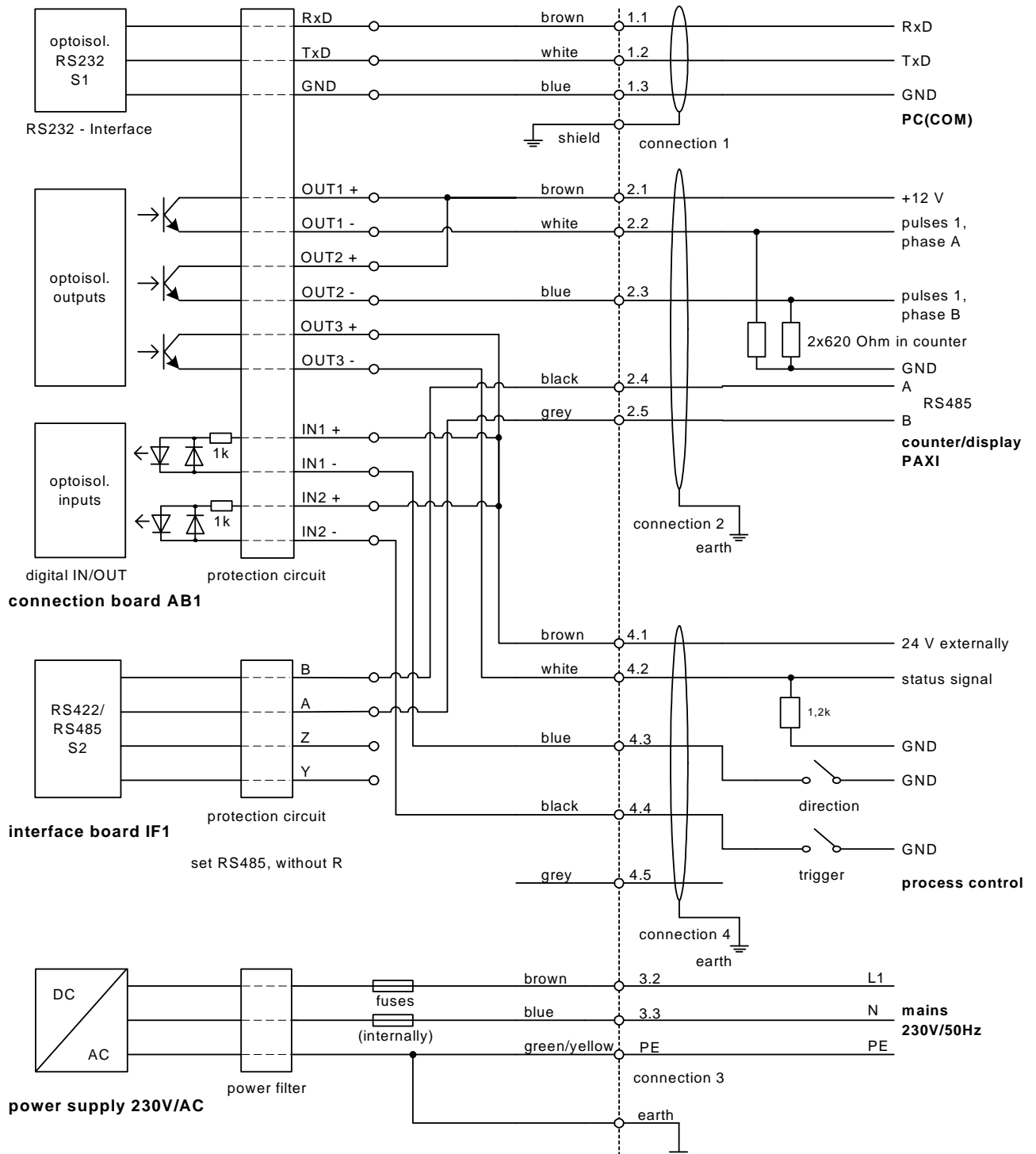
Figure A5   Connection example VLM 200 with IF1/RS422 interface card for the connection of the PAXICA counter (display of length, velocity and measuring rate)

10.12.3 Connection example 3, VLM 200 with IF2

Wiring VLM 200: Socket 2 is occupied by pulse output 1, status signal and directional input. Socket 4 is occupied by high resolution pulse outputs 2 and 3.
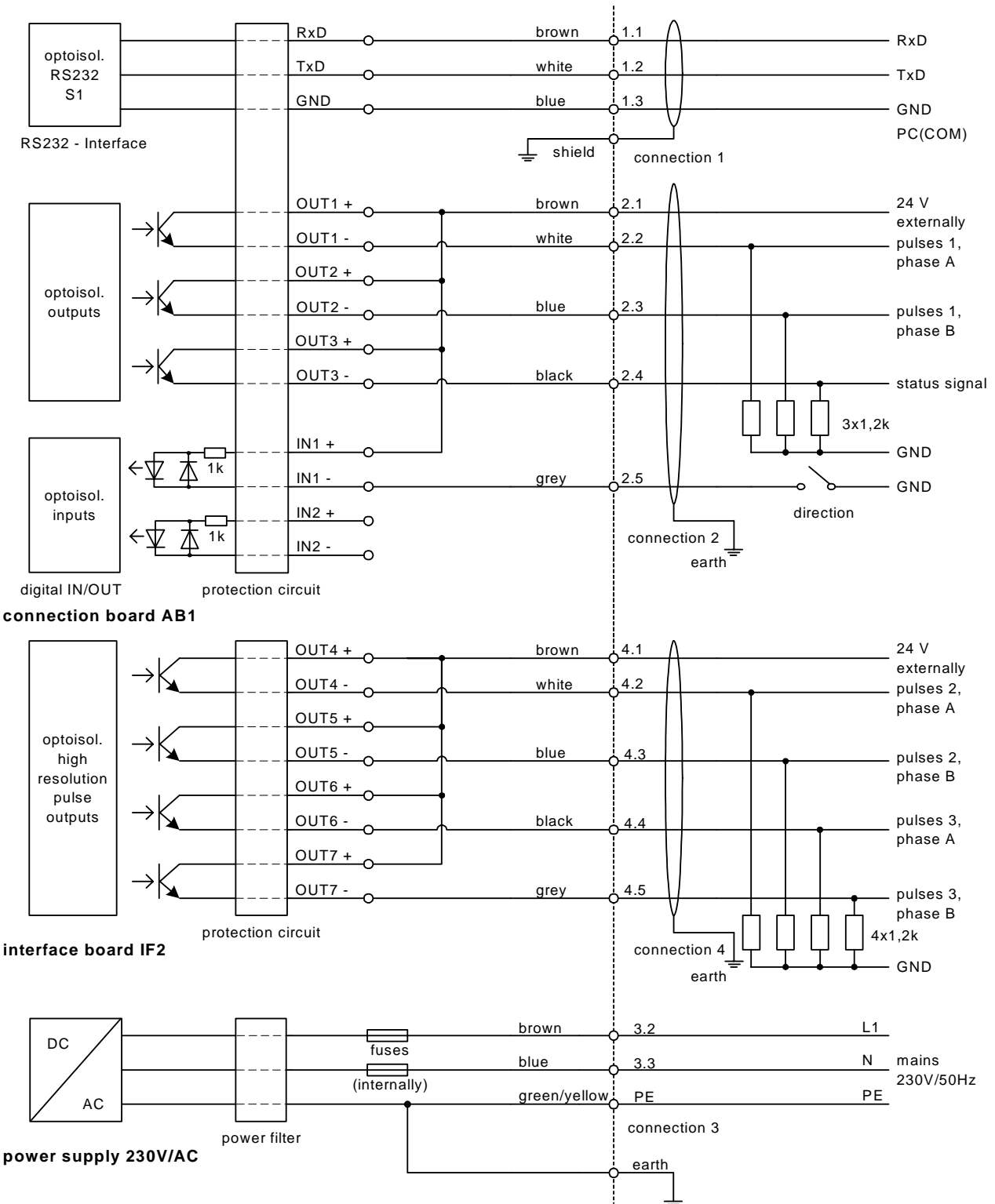
Figure A6   Connection example VLM 200 with IF2 interface card

10.12.4 Connection example 4, VLM 200 with IF2/PP

Wiring VLM 200: Socket 2 is occupied by active status signal, directional and trigger input. Socket 4 is occupied by high resolution active pulse outputs 2 (A, /A, B, /B, GND).
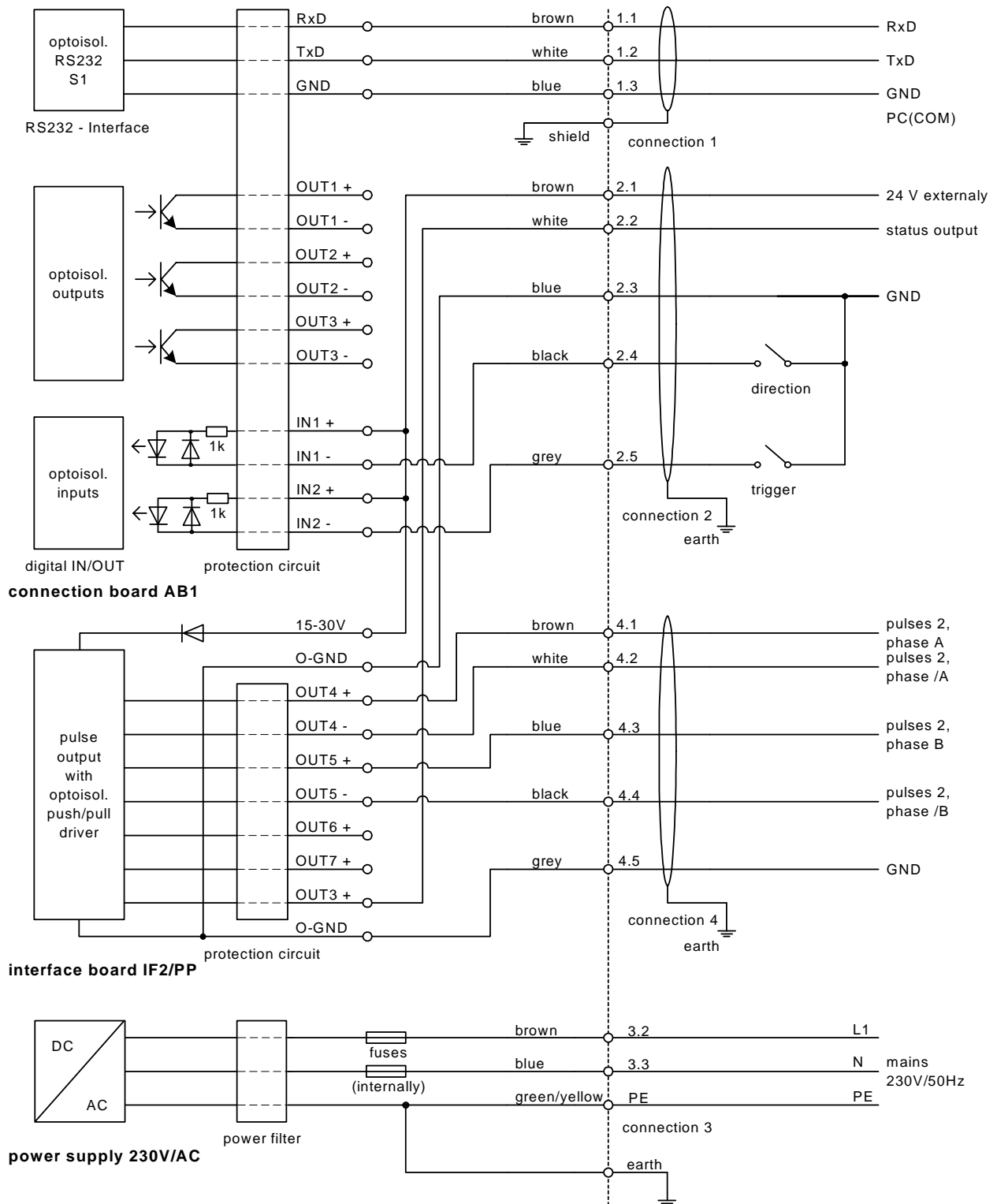
Figure A7   Connection example VLM 200 with IF2/PP interface card

10.12.5   Connection example 5, VLM 200 with IF2F/422 and analog output

Wiring VLM 200: Socket 2 is occupied by pulse output 1, status signal and directional input. Socket 4 is occupied by high resolution pulse outputs 2 and socket 5 with high resolution pulse outputs 3 and analog output.
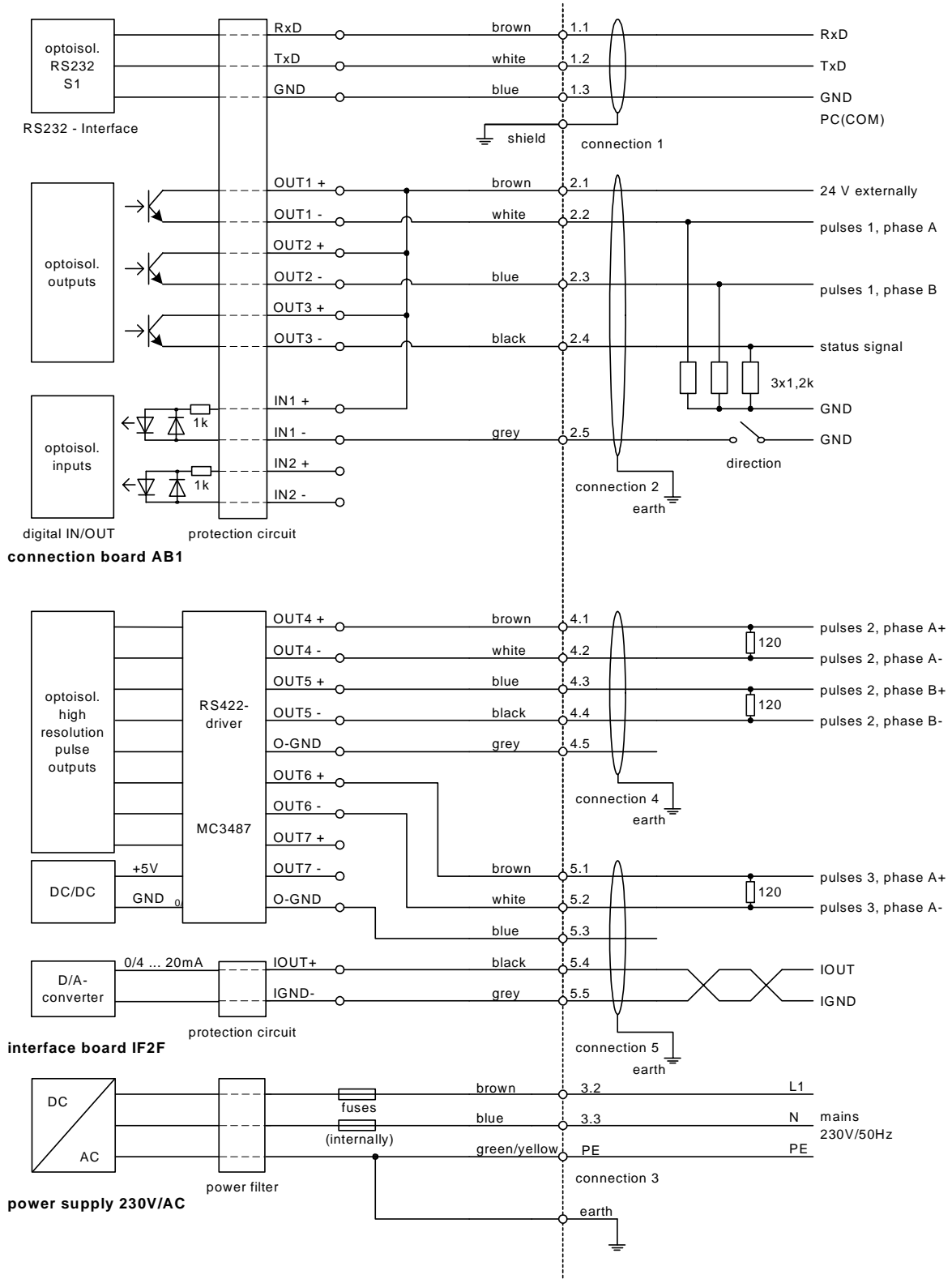
Figure A8   Connection example VLM 200 with IF2F/422 interface card with analog output 4 ... 20 mA option

10.13 Installation drawing
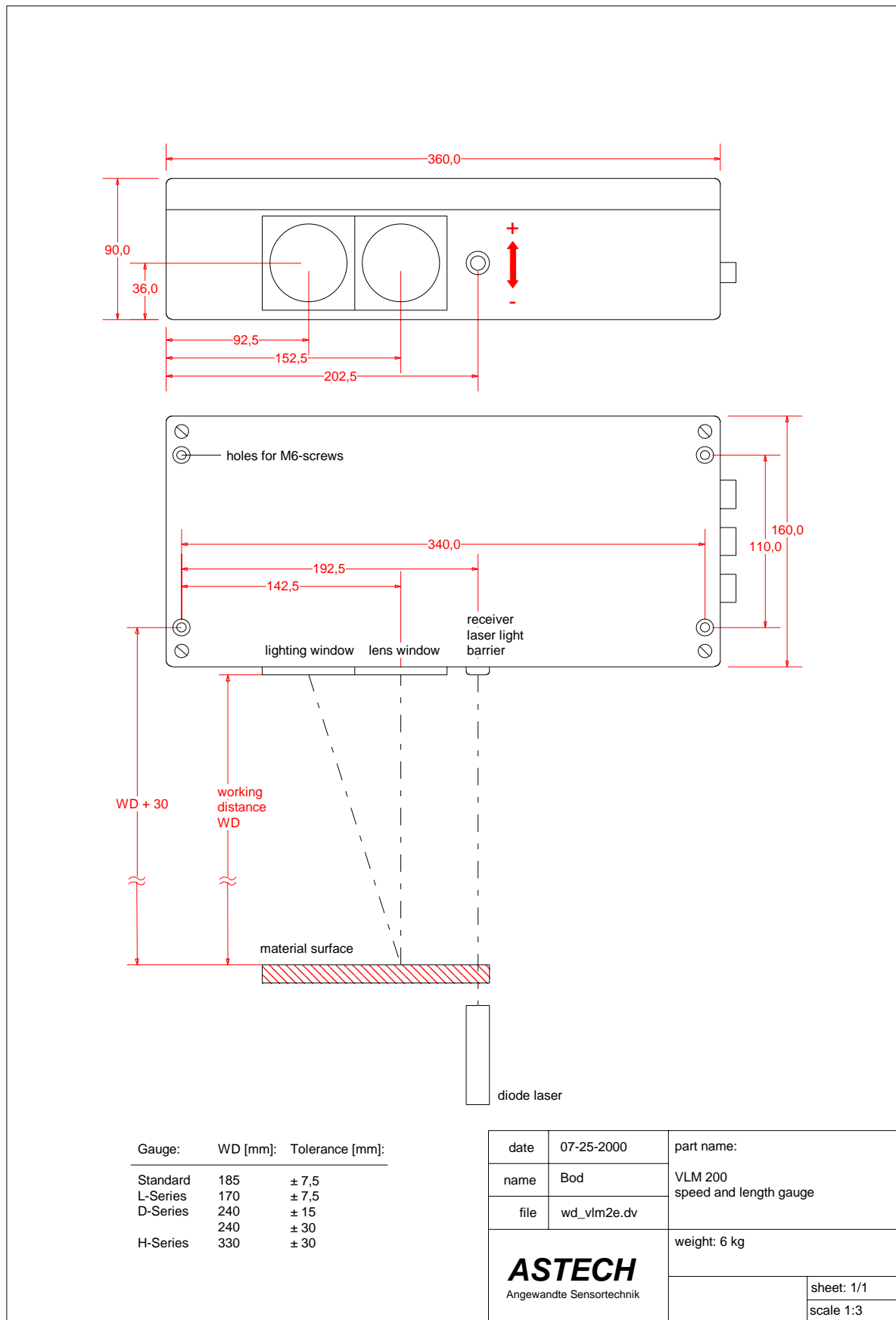
Figure A9   Installation drawing for different designs (specifications in mm)

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12 Conformity declaration

Manufacturer **ASTECH Angewandte Sensortechnik GmbH**
Address   D-18057 Rostock
                 Schonenfahrerstr. 5
                 Germany

Product name VLM 200
Description   optical measuring system for velocity and length

Conformity with the following standards
EN 50 081-2; interference transmission 30-230 MHz 30 dbµV/m, 230-1000 MHz 37 dbµV/m
EN 50 081-2; interference voltage 150 kHz-30 MHz
EN 50 082-2 resp. IEC 1000-4-2; ESD 8 kV air, 4 kV contact discharge
EN 50 082-2 resp. IEC 1000-4-3; EMV 27-1000 MHz
EN 50 082-2 resp. IEC 1000-4-4; burst 2 kV
EN 50 082-2 resp. IEC 1000-4-6; EMV 150 kHz-80 MHz

Place   Rostock

Date   April 2005

Volker Ahrendt / General Manager