Web force measurement with electronic amplifier CV 0203

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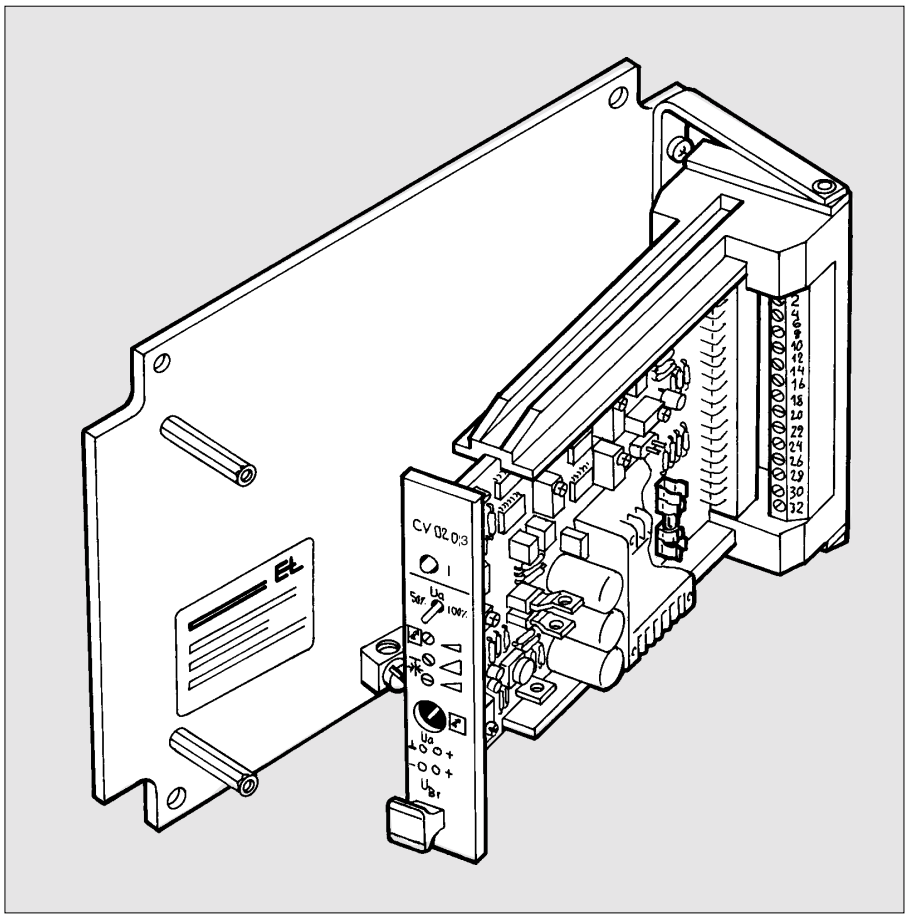


1. General Instructions

1.1 Key to symbols

➜ performing operations

❙ important additional information and remarks

! sections worthy of special note to guarantee safe operation of the amplifier CV 0203.

1.2 Description

Look after this description carefully and make sure it is available to the personnel at all times.

This description is integral part of the delivery. It should be read carefully before performing any job whatsoever on the equipment, be it for mounting, operating or maintenance.

All activities and jobs may be performed by specialized personnel only or by personnel especially trained for that purpose.

1.3 Safety hints

Never insert your hand or tools in the roller when in motion.

Never touch the edges of moving webs.

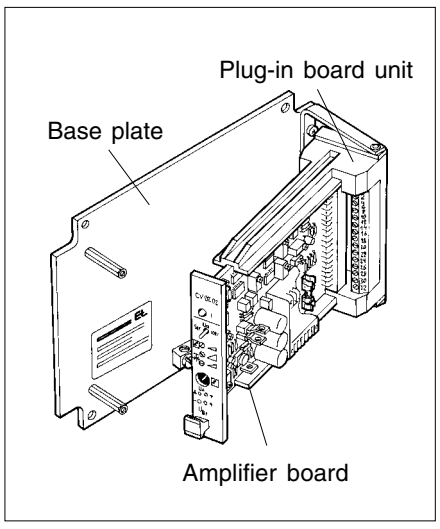
2. Function

2.1 Purpose

Amplifier CV 0203 is a component part of a web force measuring unit PDV 0202. It amplifies the signal voltage emitted by the PD 2... load cell (maximum two cells), the magnitude of which changes in proportion to the web force.

The nominal voltage of 0 to ±10 mV at the entry of the ampllifier is amplified to an output voltage of 0 to ±10 V (or 0 to 20 mA / 4 to 20 mA).

2.2 Design



Amplifier CV 0203 consists of:

- the amplifier board in standard Euro-format (100 x 160 mm)

and optionally with

- a plug-in board unit
- a base plate for mounting the amplifier in a switch cabinet.
- and an enclosure

The amplifer board consists of the high-precision amplifier and a stabilized power pack.

The input amplifier has an exceptionally low temperature drift, high longterm stability and linearity.

Amplification is factory preset to 1000 : 1. This means e.g. thatan input signal of 1 mV will be amplified to an output signal of 1 V.

3. Mounting

! Please observe the locally applicable and customary safety and accident prevention regulations.

➜ Mount the amplifier as near as possible to the load cells.

4. Installation

! Please observe the locally applicable safety regulations.

➜ Connect the electrical leads according to the attached circuit diagram and observe the cross-section and screening instructions quoted therein.

➜ Install the signal lead **away** from disturbing or power cables (e.g motor cables) and connect it directly to the amplifier without connecting clamps.

➜ Please ensure that the signal lead screening is only grounded at the amplifier.

| White or black/white wires in cables on E+L products denote ground.

4.1 Supply voltage

➜ Check that the supply voltage corresponds to the value quoted on the type plate.

Check the fuse value if the supply voltage is changed and if necessary, replace the fuse.

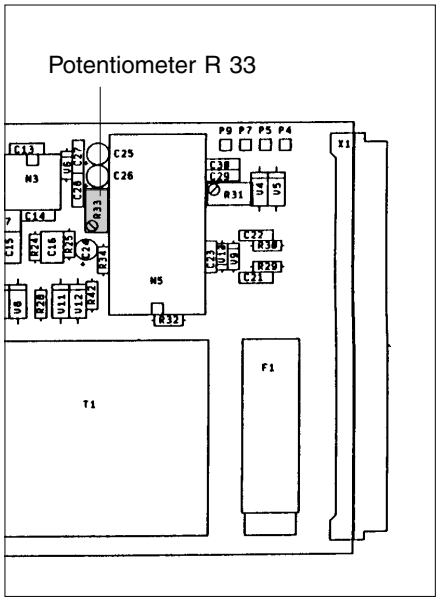
5. Commissioning

! The measuring rollers must be free from mechanical strains and move smoothly.

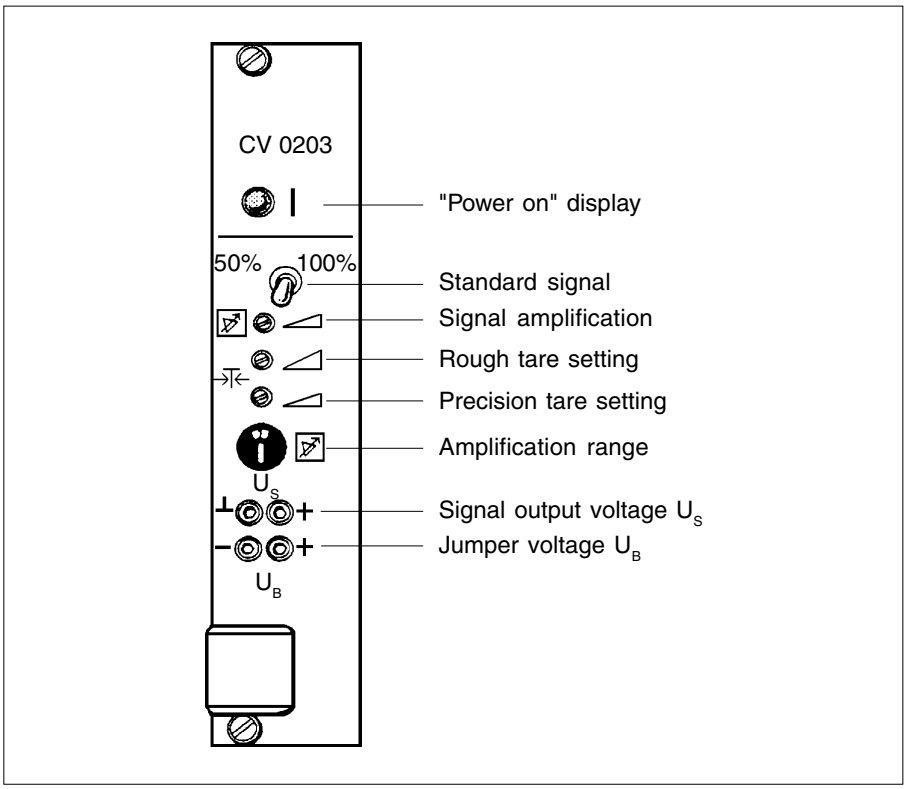
Please observe the following instructions when commissioning your web force measuring unit:

➜ Check that the correct mains voltage is being supplied and that the "power on" display is illuminated.

! In conjunction with safety barriers, the jumper voltage U_B must be set from 10 V DC to maximum (right stop) using potentiometer R 33 (see fig. on left).



Amplifier board CV 0203



Amplifier CV 0203, front view

➜ Connect a digital voltmeter with a measuring range of 15 V/DC to the signal output voltage U_S sockets (see fig. above).

➜ Set the amplification range switch to position "2".

➜ Now adjust the **amplifier to its tare or zero setting**.

In this way external factors that might influence the measuring result are compensated, e.g. roller weight.

➜ There is still no web on the measuring roller. Using the potentiometer for rough and fine adjustments (see fig. above) set the signal output voltage to as near 0.0 V as possible or at least less than 0.05 V.

5.1 Calibrating the measuring amplifier

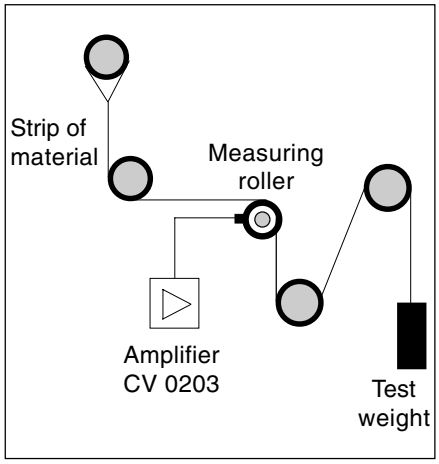
You can calibrate the measuring amplifier with or without a test weight (see page 5).

! Calibration without a test weight is not possible in conjunction with safety barriers.

The resultant web force in the measuring direction should not exceed the load cell nominal measuring capacity greatly, thus ensuring that the individual load cells can still operate in the linear range when the web force is unequally distributed.

| We recommend you opt for setting with a test weight as it is much more precise.

5.1.1 Setting amplication with a test weight



Calibrating the measuring amplifier

➜ Establish the maximum web force.

The above is determined at the project planning stage. If this was not the case, you must ascertain the web force using empirical methods.

➜ Place a strip of material over the measuring roller in the way the web will lie afterwards (see fig. on left). Attach a test weight to the strip representative of the typical web force you wish to use on your unit.

➜ Now measure the signal input voltage on the measuring amplifier (terminals 4 and 6).

If the signal input voltage U_E is **greater than 15 mV**, your load cell is too small. You must either alter the angle at which the web curves round the roller or change the measuring direction.

➜ Set amplification using the "signal amplification" potentiometer.

Given a test weight the equivalent of the maximum web force, the signal input voltage U_E must be amplified to a signal output voltage U_S of 10 V.

If a smaller test weight is used, the output signal must be set accordingly lower.

Example:
If the maximum web force to be measured is 1000 N and a test weight of 750 N is hanging over the measuring roller, the signal output voltage U_S must be 7.5 V.

The corresponding equation is:

$$\text{Signal output voltage} = \frac{\text{Test weight force (N) x 10 V}}{\text{maximum web force (N)}}$$

If you can't reach the signal output voltage U_S you require, you must change the amplification range. If the signal output voltage is too low, set the amplification range to "3", if the amplification range is too wide, set it to "1".
If you still can't reach the required signal output voltage U_S, please contact our service department.

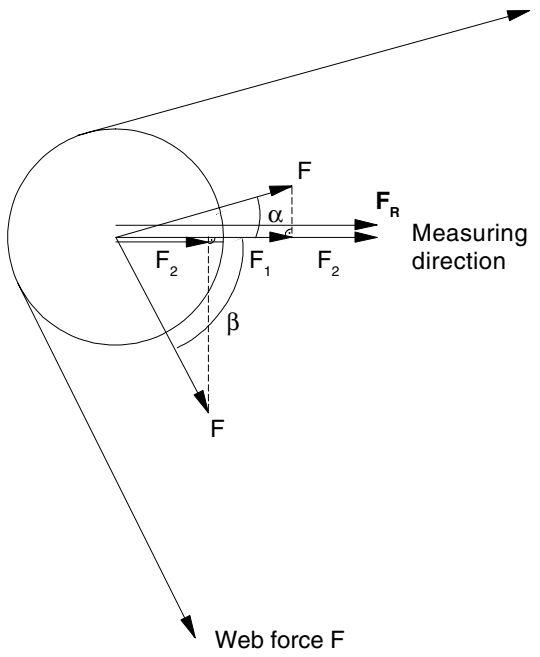
5.1.2 Calibrating the measuring amplifier without a test weight

Use the "standard signal" switch to supply a reference voltage to the amplifier input and thus set the amplification factor.

➜ Establish the maximum web fore F at which the signal output voltage U_S should equal 10 V.

The above is established at the project planning stage. If this was not the case, you must ascertain it using empirical methods.

➜ Calculate the resultant force in the measuring direction F_R.



$F_1 = F \times \cos \alpha$

$F_2 = F \times \cos \beta$

$F_R = F_1 + F_2$

$$V = \frac{F_N}{F_R} \times 1000$$

F = web force (N)
F_1 = web force component F in measuring direction (N)
F_2 = web force component F in measuring direction (N)
F_R = resultant web force in measuring direction (N)
V = amplification factor

Calculating resultant web force

➜ Calculate the signal output voltage U_S using the equation below:

Standard signal 50%	**Standard signal 100%**
$\mathbf{U_S} = \frac{F_N}{F_R} \times 5\ V$	$\mathbf{U_S} = \frac{F_N}{F_R} \times 10\ V$
U_S = signal output voltage (V) F_N = nominal measuring force (N), (applies to the load cells, when measuring at two sides, add both nominal measuring forces) F_R = resultant web force (N)	

If F_R is **less than** F_N , use the 50 % standard signal equation.
If F_R is **greater than** F_N , use the 100 % standard signal equation.

If F_R is less than 0.5 x F_N calibration without a test weight is not possible. In this case, you must set the maximum web force higher and repeat the calibration process.

➜ Set the "standard signal" switch to the appropriate value.

The switch must be held down during setting.

➜ Set the calculated signal output voltage U_S using the "signal amplification" potentiometer.

If you can't reach the signal output voltage U_S you require, you must change the amplification range. If the signal output voltage U_S is too low, set the amplification range to "3", if the amplification range is too wide, set it to "1".

Amplifier calibration is thus complete.

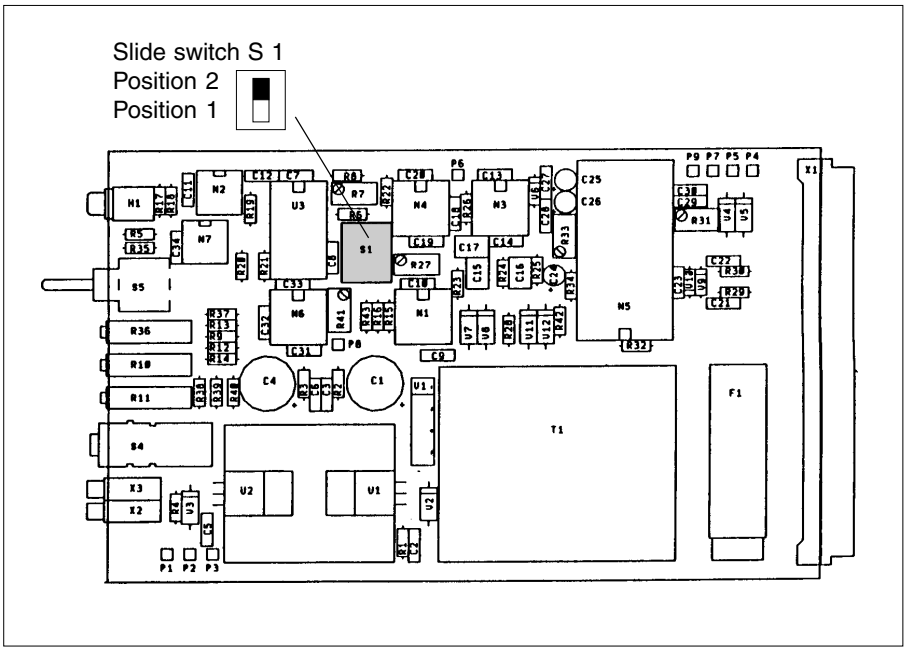
5.2 Amplifier CV 0203 outputs

The web force is available to you in three different signal forms:

- direct output (U_S 0 to ±10 V/10 mA
  The direct output enables fast measured value recording and serves connected control loops.
- filter output
  (U_{AF} 0 to ±10 V/10 mA, rise time 2 s)
  The filter output may be used for display instruments.
- Current output I_A (0 to 20 mA or 4 to 20 mA)
  For long-range measured value transfers we recommend the fail-safe current output. Use slide switch S1 (see fig. below) to select which current shall be supplied to the output.

Slide switch S 1 in position 1	4 to 20 mA
Slide switch S 1 in position 2	0 to 20 mA

Please ensure that the burden (shunt) is not greater than 600 Ohms!



Amplifier board CV 0203

6. Spare parts

We recommend you keep a supply of the following spare parts:

Fuses	Material number
1.6 AM 5 x 20 for 24 V AC	004020
0.4 AM 5 x 20 for 110 V AC	004117
0.2 AM 5 x 20 for 220 V AC	002004
0.8 AM 5 x 20 for 24 V DC	004019

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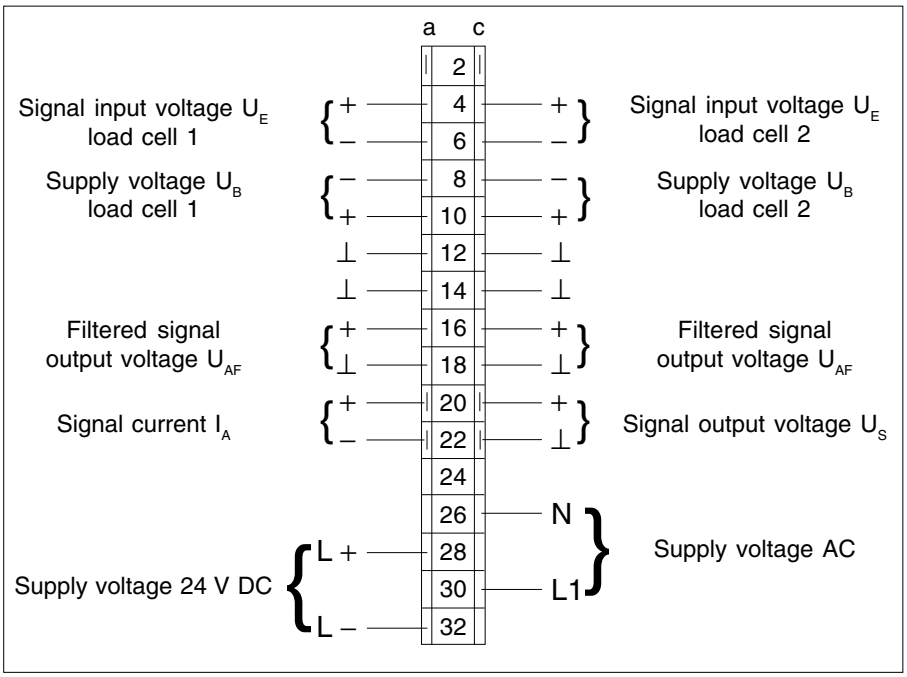
7. Connection



8. Technical data

AC voltage supply	
Supply voltage	24 V / 110 C / 220 V AC
Apparent power	4 VA
Frequency	50/60 Hz
DC voltage supply	
Supply voltage	24 V DC
Active power	4 W
Jumper supply voltage	
Nominal value	10 V
Nominal range	6.5 to 12 V
Signal input U_E	
Nominal voltage	0 to ±10 mV
Signal outputs	
Signal current I_A Rise time	0 to 20 mA or 4 to 20 mA 5 ms
Signal voltage U_S Rise time	0 to ±10 V 5 ms
Filtered signal voltage U_{AF} Rise time	0 to ±10 V 2 s
Nominal temperature range	0 °C to +60 °C
Precision class	0.1
Amplification range	300 - 1025 600 - 2050 990 - 3400
Protection class	IP 00
Protection class with enclosure	IP 54
Dimensions	see dimensoned

Subject to technical modifications without notice