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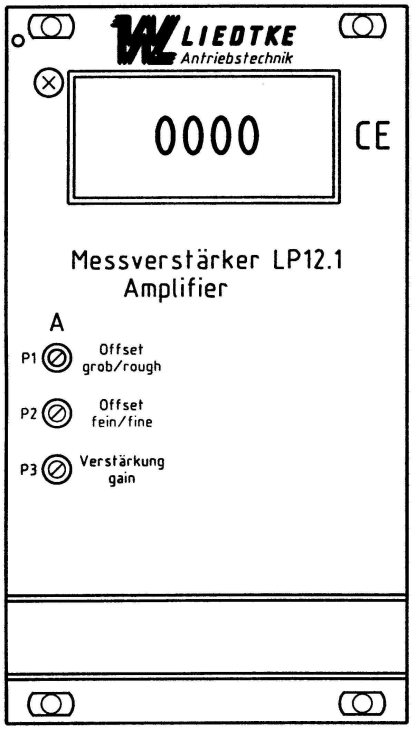
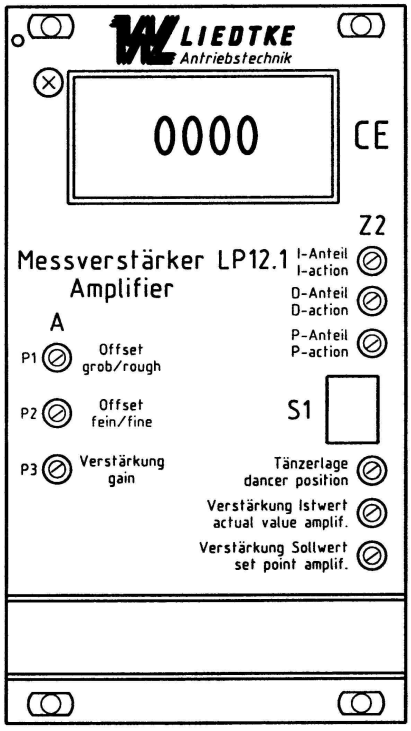
# Operating manual and adjustment instruction

# Measuring Amplifier LP12.1




**Amplifier**
**LP12.1**




**Amplifier**
**LP12.1**
**with tension controller Z2**

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**Appendix:**
- Functional scheme
- Terminal diagram

## Important Safety Instructions

The device may only be installed and connected by an electrically skilled person with the aid of this manual. National standards and safety regulations must be observed (see DIN V VDE V 0100534... or IEC 60364-5 534:...).
The device must be checked for external damage prior to installation. If any damage or other defects are detected in this check, the device must not be installed. Its use is only permitted within the limits shown and stated in these manual. The device and the equipment connected to can be destroyed by loads exceeding the values stated.
Opening or otherwise tampering with the device invalidates the warranty.

The manufacturer does not take over any responsibility for any consequences resulting from incorrect or negligent installation, change of existing parameters of the devices or the false combination with peripheral components.

A device-independent power shutdown must be guaranteed.
Fuses may only be replaced by fuses of the same type.
The operation of the device is only permitted with connected protective conductor.

For reference and actual signals you have to use shielded cable.
To this please also note the hints for an EMC-proper installation.

In the devices are used components which are sensitive to electrostatic discharges. During the operation, installation and maintenance, measures have to be taken in order to avoid electrostatic discharges.

**Attention:**
As a basic principle the device has to be made dead before any contact.
In case of non-observance there is the possibility of an electrical shock.

## 1. Product description Measuring amplifier LP12.1

The measuring amplifier LP12.1 serves for the amplification of low voltage signals in the range of only few mV.

It is structured specially for the connection of instrument transformers as load cells, traction bearings or torque measurement and is equipped with integrated ohmic resistance bridge (Wheatstone-bridge). The resistance bridge is supplied by a short-circuit proof constant voltage sources.

For building a sum of two resistance bridges of same construction, these can be connected in parallel at the entry of the amplifier LP12.1. The measurement signal will double itself. The amplifier LP12.1 enables a zero-point adjustment as well as a fine setting of the amplifier in the range of V = 500...10000. Additionally the amplifier is provided with an optic signal control.

The measuring amplifier LP12.1 supplies three different output signals:

1. **The direct amplified bridge signal.**
2. **The positive action of this bridge signal.**
3. **The amount of this signal.**

These analogues amounts are shown on the LC-Display in the front panel.

Any output signal ranging from 0 V to +10 V can be generated via the U-I-transformer which is integrated on the board, also as current signal of 0…20 mA or 4…20 mA. One output supplies a damped output signal ranging from 0…+10 V.

A further output supplies a damped output signal ranging 0 to 1 mA for the activation of measuring instruments.

A low pass filter of 5. order, which can be switched in, can limit the max. input frequency to 5 Hz.

## 2. Connecting the measuring amplifier LP12.1

The measuring amplifier LP12.1 needs a supply voltage of 230 VAC 50/60 Hz or 24 VDC (optionally) at the terminals 30a and 32a. The protective conductor is connected to terminal 28a.

**If the amplifier LP12.1 shall be operated with 24 VDC, then this has to be specified explicitly on the order sheet.**
For the 24 VDC option the terminals 32a/c are the positive pole, the terminals 30a/c are the negative pole. Incorrect polarity doesn't result any damage to the amplifier.

Measuring transducer are connected to the terminals 2a (S+), 4a (S-), 6a (UB-) and 8a (UB+) resp. 2c, 4c, 6c and 8c according to the terminal diagram.

Different output voltages are available at the terminals 10c, 16a, 16c and 18a. These can also be redirected to the input 14c of the U-I-transformer and can then be tapped as 0...20 mA or 4…20 mA current signal against GND at terminal 14a. It is also possible to direct one of the output voltages to the terminal 12a. This is the input for an active damping for connecting a display of an 1 mA measuring instrument between terminal 10a and GND.

| Periphery | Voltage | Terminal |
|---|---|---|
| GND | 0 V | 22 a+c |
| pos. supply | +15 V | 26 a+c |
| neg. supply | -15 V | 20 a+c |

### 2.1 Hints for an EMC-suitable installation

In order to observe the electromagnetic compatibility please note the appropriate guidelines and instructions.
This applies especially to:
- installation
- earthing
- filtration
- shielding

The next user is responsible for the observance of the EMC- guideline in case of industrial use.
If all components / plant components meet the CE- immunity requirement, then no electromagnetic impairments have to be expected.

# 3. Putting into operation and adjustment instruction

## 3.1 Preparing start-up

**Before switching on the supply voltage, all connections have to be checked for a correct terminal assignment according to the terminal diagram.**
Switch on the supply voltage. Now the yellow LED H3, H4, H5 and H6 must light up. If not, you have to check the input tension as well as the ± 15 V voltage supply lines for short circuits or interruptions. In addition check the mains fuse F1 (100mA).

## 3.2 Adjustment unloaded measuring bridge

**Before this adjustment the amplifier has to be connected to the mains voltage for at least 10 minutes.**
**The amplification, adjusted via potentiometer P3, should not be positioned in the maximum range (right stop) but in the first third.**

The zero-point will be roughly adjusted via the potentiometer **P1** in case of mechanically unloaded resistance bridges, so that the display shows in about 0 V.

The fine adjustment of the zero point is made via the potentiometer **P2**. The display will be adjusted exactly to 0 V.

## 3.3 Adjustment by loaded measuring bridge

If the loading of the measuring roll cannot be calculated exactly, then we recommend to calibrate the measuring system by putting weights on the measuring roll. To do so, conduct a belt webbing, following the run of the product, centric above the measuring roll and load it with weights up to the maximum tractive force. When measuring both sides, thus each force measurer takes up half of the load. Repeat the adjustment of the zero point and the amplifier alternately until no more deviations can be observed. To adjust the zero point, relieve the load on the measuring roll. A high measuring accuracy can be obtained if the measuring system is calibrated by putting weights on the measuring roll.

The output signal will be adjusted by means of amplification via the potentiometer **P3** ”gain” on load to 10 V (in case one measuring transducer is connected). If two equal measuring transducer are connected, the max. output signal may be only 5 V if one transducer is loaded.

The setting of the zero-points and the amplification has to be checked again and in case of need it has to be re-adjusted via the potentiometers **P2** and **P3**.

## 3.4 Adjusting signal outputs

When using the current output at terminal 14a, a current of 20 mA with a voltage of 10 V will flow at the terminal 14c. This value is factory pre-set. The current output range from 0…20 mA to 4…20 mA can be adjusted with jumper **J4** and **J3** (J5 up to Ver.10).

| Current range | Jumper J4 | Jumper J3 (J5 Ver.10) |
|---|---|---|
| 0...20 mA | 1 - 2 | 1 - 2 |
| 4...20 mA | 2 - 3 | 2 - 3 |

**Important: Both jumper must be in the same position.**

A display of an 1mA measuring instrument, connected to terminal 10a, should show at the test jacks 100 % at a value of 10 V of signal and GND. This is a factory default setting, which can be changed via the trimming potentiometer P1, if wanted.

## 3.5 Compensation of external disturbance

Should there arise EMC-problems caused by launching of high-frequency disturbing signals, for e.g. in the screened connecting lines to the resistance bridges, it is possible to leak them against earth potential by plugging the jumper **J2** (J3 up to Ver.10) over the capacitor C30.

| Jumper J2 (J3 Ver.10) | Capacitor C30 |
|---|---|
| 1 - 2 | active |
| 2 - 3 | inactive |

**Attention: When running the measuring amplifier with Zener barriers the measuring amplifier must be ground lifted. The Zener barriers are recommended.**

In case of radiation occurring on the measuring lines, the maximum input frequency can be limited to 5 Hz by changing the jumper **J1** (J6 up to Ver.10) from position 2-3 to position 1-2.

| Input frequency | Jumper J1 (J6 Ver.10) |
|---|---|
| 0...5 Hz | 1 - 2 |
| 0...20 Hz | 2 - 3 |

## 4. Product description Tension Controller Z2 (PID-Controller)

The tension controller Z2 enables with low effort the building up of a closed-loop control system (PID). Out of it result a multitude of application possibilities in the industrial production engineering.

The tension controller Z2 compares the set point value with the actual value (i.e. tensile force, pressure force or temperature) and creates a correction signal out of the deviation. The PID-control terms can be separately switched in and be regulated. The input signals can be fed to the tension controller Z2 independent of their polarity. Internal precision rectifier provide for a conditioning of the signals. The reference and actual value signals can be adjusted via the input potentiometers.
The output signal of the tension controller Z2 can be adjusted for further processing.
If the control inhibit is activated, the I-action will be deleted automatically.

### 4.1 Set point and actual value

The set point input of the PID-Controller is designed for an input voltage of 0…+10V or 0…-10V. In the controller this potential will be rectified negatively and amplified. Therefore the reference value can be fed directly to the controller without consideration the polarity. The amplification factor can be adjusted in the range from 0.5 to 2 by using the potentiometer "Verstärkung Sollwert / set point amplif.", in order to adjust the maximum set point value in the range of 5...14 V.
The factory setting of the amplification is =1.
**Measuring point P9 = set point value**

The actual value is led directly to the PID-controller. The range is assigned for an input voltage of optionally 0…+10V or 0…-10V. In the controller this potential will be rectified positively and amplified. Therefore the actual value can be fed to the controller without consideration the polarity. The amplification factor can be adjusted in the range from 0.5 to 2 by using the potentiometer "Verstärkung Istwert / actual value amplif.", in order to adjust the maximum actual value in the range of 5...14 V.
The factory setting of the amplification is =1.
**Measuring point P8 = actual value**

In case of a dancer position regulation the input of the set point can be placed on ground potential and an internal set point can be used for the adjustment of the dancer position. The internal, negative set point can be switched in with the switch S1.4. If the switch S1.4 is in ON position, the internal dancer position setting is active.

The internal set point can be adjusted with the potentiometer "Tänzerlage = dancer position" in the range from 0…-15 V.
**Measuring point P10 = dancer position.**

All measuring outputs are equipped with 3.3 kOhm series-connected protecting resistors. To avoid measuring errors we recommend therefore only to use measuring instruments with a high internal resistance.
With certain control operations it may be advisable to switch off the automatic precision rectification and to work with defined reference levels.

| | with precision rectifier | without precision rectifier |
|---|---|---|
| Set point value jumper J2 | position 1 - 2 | position 2 - 3 |
| Actual value jumper J1 | position 1 - 2 | position 2 - 3 |

## 4.2 Control functions

In the PID-Controller all components can be separately switched in and adjusted.
Thereby the respective controlling units are activated in switch position ON and deactivated in switch position OFF.
The **P-term** can be switched on with the switch **S1.3** and the amplification in the range from 0,15…3 can be adjusted with the potentiometer "P-Anteil / P-action".
The **D-term** can be switched in with the switch **S1.2** and is adjustable with the potentiometer "D-Anteil / D-action ". The control range is 0…0.2 seconds.
The **I-term** is switched on with switch **S1.1** and adjusted with the potentiometer "I-Anteil / I-action". The control range is 0.6…50s. Further more the time constant could be adapted by changing the capacitor C8.

| Switch | Function |
|---|---|
| S1.1 | I-action |
| S1.2 | D- action |
| S1.3 | P- action |
| S1.4 | dancer position |

The control inhibit will be activated by a control voltage of +10 VDC at terminal 10a. The PID-Controller will also be locked.
The remaining I-term of the PID-Controller will be deleted.

## 4.3 Special adjustments

The output signal of the PID-Controller can be adapted via potentiometer (**P7**) on the tension controller board. Slider on right end position gives the full output signal (factory preset).

The amount of the I-action can be changed via potentiometer (**P8**) on the tension controller board. Slider on right end position gives the maximum value (factory preset). The output signal could be transmitted to peripheral device via terminal 24c.
**Measuring point P13 = output signal PID-Controller/ amount I-action**

*Note: The potentiometer (P7) and (P8) are not accessible from front side.*

# 5. Summaries

## 5.1 Connections

| Terminal | Function | |
|---|---|---|
| 2a | Input for positive bridge signal of the first resistance bridge | (S+) |
| 2c | Input for positive bridge signal of the second resistance bridge | (S+) |
| 4a | Input for negative bridge signal of the first resistance bridge | (S-) |
| 4c | Input for negative bridge signal of the second resistance bridge | (S-) |
| 6a | GND for the first bridge | (UB-) |
| 6c | GND for the second bridge | (UB-) |
| 8a | Constant current feeding for the first bridge | (UB+) |
| 8c | Constant current feeding for the second bridge | (UB+) |
| 10a | Output for display with 1 mA measuring instrument | |
| 10c | Output for damped signal | |
| 12a | Input active damping | |
| 12c | Output for electronic +10 V ( max. 20 mA ) | |
| 14a | Output current 0...20 mA against GND | |
| 14c | Input for U-I transformer ( 0...10 V to 0...20 mA ) | |
| 16a | Output of the bridge signal ( -10...0...+10 V ) | |
| 16c | Output of the positive action of the bridge signal ( 0...+10 V ) | |
| 18a | Output of the amount of the bridge signal ( 0...+10 V ) | |
| 18c | Regulator lock for tension controller Z2 (PID-Controller) | |
| 20a | Output for electronic – 15 V ( max. 10 mA ) | |
| 20c | Output for electronic – 15 V ( max. 10 mA ) | |
| 22a | GND for electronic | |
| 22c | GND for electronic | |
| 24a | Tension controller set point | |
| 24c | Tension controller output | |
| 26a | Output for electronic +15 V ( max. 10 mA ) | |
| 26c | Output for electronic +15 V ( max. 10 mA ) | |
| 28a | Protective conductor PE | |
| 28c | Protective conductor PE | |
| 30a | Voltage supply 230 VAC (N) ( Optionally 24 VDC - pole ) | |
| 30c | Voltage supply 230 VAC (N) ( Optionally 24 VDC - pole ) | |
| 32a | Voltage supply 230 VAC (L) ( Optionally 24 VDC + pole ) | |
| 32c | Voltage supply 230 VAC (L) ( Optionally 24 VDC + pole ) | |

## 5.2 Technical data

| | |
|---|---|
| Bridge resistance | 120...800Ω |
| Supply voltage of the bridge | appr. 15 mA or appr. 1 mA |
| Influence of temperature on bridge feed | < 0,005 % · K |
| Compensation of resistances | by constant current regulation |
| Signal amplification | 500...10000 |
| Input resistance | ≥ 1 MΩ |
| Zero drift (at V=1000) | < 1,8 mV / K |
| Total drift (at V=1000) | < 2 mV / K |
| Linearity error | < 0,1 % |
| Range of measurement frequency | 0...5 Hz or 0...20 Hz |
| Load resistance at voltage output 0...10 V | R > 1 kΩ |
| Load resistance at current output 0...20 mA | R < 500 Ω |
| Zero suppression | ± 15 mV |
| Mains connection | 230 VAC 50/60 Hz |
| Mains connection (optionally) | 24 VDC |
| Input power | max. 4,5 VA |
| Connection via plug socket | DIN 41612 type C 32-pole |

## 5.3 Jumper, Potentiometer

**Jumper**

JP2(3) compensation of external disturbance
- position 1-2 active
- position 2-3 inactive

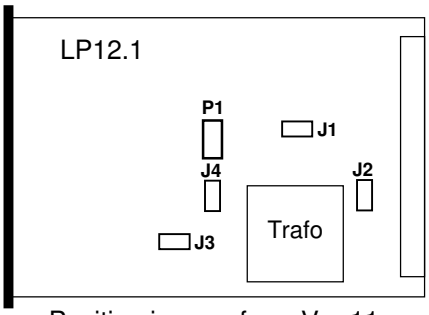
JP4+3(5) switch-over current output
- position 1-2 0...20mA
- position 2-3 4...20mA

JP1(6) limit frequency
- position 1-2 0...5Hz
- position 2-3 0...20Hz

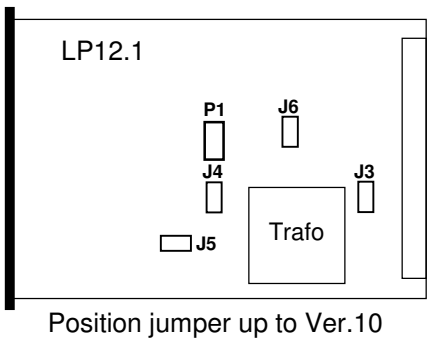
**Potentiometer (front side)**

| | |
|---|---|
| Offset rough | P1 |
| Offset fine | P2 |
| Gain | P3 |

**Potentiometer P1 (main print)**
adjustment for 1mA measuring instrument



Position jumper from Ver.11

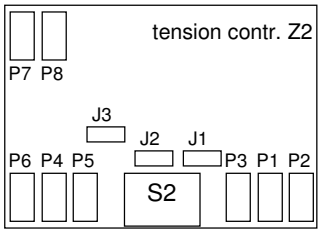


Position jumper up to Ver.10

## 5.4 Tension controller Z2 - Jumper, Potentiometer

**Jumper**

J1 Precision rectifier actual value
Position 1-2 active
Position 2-3 inactive
J2 Precision rectifier reference value
Position 1-2 active
Position 2-3 inactive
J3 Testing point
Position 1-2



Position Jumper/ Potentiom.

**Potentiometer**

| Function | Identifier | Value |
|---|---|---|
| scaling reference value | (P2) | 0...10V |
| scaling actual value | (P1) | 0...10V |
| dancer position | (P3) | 0...10V |
| P-action | (P5) | 0,15...3 |
| D-action | (P4) | 0...0.2s |
| I-action | (P6) | 0,6...50s |
| output signal | (P7) | 0...100% |
| amount I-action | (P8) | 0...100% |