

Technical data (continued):

Supply voltage: 230 V/ 50 ... 60 Hz
Housing: ABS plastic housing with 2 handles
Dimensions: approx. 260 x 150 x 210 mm
Mass: approx. 3.1 kg

Attention:

- The device is to be operated exclusively by qualified persons or by persons who have been instructed in the use of the device. Duty of supervision!
- Make sure that the unit does not fall down when being moved, packed or unpacked. If this should happen, have the unit repaired immediately by authorized specialists.
- If unexpected problems occur during installation or operation of the unit, immediately unplug the power cord and contact your dealer.
- If the device does not work properly, there is an increased risk of danger. Therefore, always make sure that the device is standing stably on a solid surface.
- Make sure that no objects are placed on the power cord. A damaged cable can cause a fire or electric shock.
- Do not expose the unit to dripping or splashing water.
- Before replacing the fuse, it is absolutely necessary to disconnect the device from the mains. Make sure that only fuses of the specified type and current rating are used.
- There are no user-serviceable components inside the instrument.
- The repair of this device may only be carried out by an authorized specialist.
- Never push objects of any kind through the ventilation slots or other openings in the housing and never attempt to touch any components inside the device for repair, maintenance or other reasons.
- Never place any containers with liquids on the housing of the device.
- Do not use connecting cables > 3 m
- EMC regulations: EN50081-1, EN50082-1, EN60555
- Errors and omissions excepted

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DR260-1D Digital counter, universal



Application:

The digital counter is a universally applicable instrument for time, frequency and pulse rate measurement for numerous experiments in the entire field of experimental physics. The measurements can be started or stopped by any signal. Any change in the level of the signals can be used. Besides a separate input for a Geiger-Müller counter tube, e.g. DR291-1Z, the digital counter has an additional input for connection of the forked photoelectric sensor with digital display, P1320-3LR for time measurement and continuity counting. Due to the universal inputs the quantification of events from many sources, such as electrical, mechanics and acoustics are possible.



1. 4 mm safety sockets for time measurement input 1
2. 4 mm safety sockets for time measurement input 2
3. Toggle switch for selecting the measurement logic (rising or falling edge) for input 1
4. Toggle switch for selecting the measurement logic (rising or falling edge) for input 2
5. LED for displaying the selected measuring logic at input 1
6. LED for displaying the selected measuring logic at input 2
7. Adjusting knob for triggering threshold at input 1
8. Control knob for triggering threshold at input 2
9. Toggle switch for selecting the time measurement mode
10. Toggle switch for switchable debouncing device (chatter) at input 1
11. Toggle switch for switchable debouncing device (chatter) at input 2
12. Reset button
13. Toggle switch for switchable repetition inhibit
14. 4 mm safety sockets for counter input for AC voltages
15. Toggle switch for switchable bias voltage (measurement of contact closures)
16. Step switch for selection of measurement mode (time, pulse, frequency)
17. BNC input for Geiger-Müller counter tube, DR290-1G (anode resistor in the digital counter built-in)
18. Step switch for selection of counter tube voltage
19. 4 mm safety sockets for display of counter tube voltage/100
20. LED 7-segment digital display
21. LEDs for display: Time measurement "s", pulse measurement "Imp" or frequency measurement "kHz"

Rear panel:

- 5-pin DIN socket for connecting the forked light barriers, P1320-3LR
 - Loudspeaker
 - Toggle switch "On/Off"- for the loudspeaker
 - Mains switch and cold appliance socket with built-in fuse.
- For connection values see technical data.



Handling:

The digital counter is connected to the AC mains via a socket using the accompanying power cord.

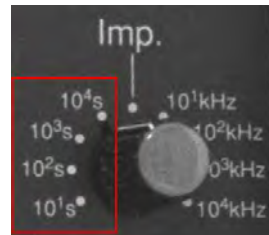
After switching on the mains switch on the back of the device the LED 7-segment digital display (20) on the front of the device lights up.

The digital counter enables three types of measurement in a total of nine measuring ranges.

1. time measurement

There are four measuring ranges in the time measuring mode:

Measuring range	End value	Resolution
10^1	9.99999s	10 μ s
10^2	99.9999s	100 μ s
10^3	999.999s	1ms
10^4	9999.99s	10ms



For time measurement, the device has two inputs (1/2). They can be controlled by voltages, resistance changes or contacts as well as light barriers P1320-3LR can be controlled. The rest potential of the input is about 1.8 V with an input resistance of about 20k Ω . The inputs are voltage safe up to ± 50 V. The threshold values are separately adjustable with the potentiometers (7/8) in the range of about 50 mV to 4 V.

Attention: The inputs (1/2) can be set active or inactive without external circuitry! This can lead to confusing results especially with inverse logic! The logic of the inputs can be switched individually with the toggle switches (3/4). To indicate the valid logic state there is a LED above each input socket (5/6). With proper connection of P1320-3LR and setting of sensitivity pot and switch for the logic direction, the corresponding LED lights up when the light beam is interrupted. The input states processed to a logic signal are internally linked via an exclusive-or gate. The gate of the counter can be controlled either directly or via a flip-flop. In position "START/STOP" of the flip-flop switch (9) the time measurement starts and ends with the rising edge, in position "GATE" the time measurement runs during the active time of the inputs.

To adapt to the problem of bouncing mechanical contacts, the unit has a "chatter" debouncing device that can be switched on for each input individually via a toggle switch (10/11). In position "FAST" the input for electronic contacts (e.g. case interface as well as light barriers P1320-3LR)

and offers high accuracy, also for fast events. In position "SLOW" single pulses below 10ms are ignored, but at the expense of the measuring accuracy.

The counter can be reset to zero at any time by pressing the "Reset" button (12). This also closes the counter gate. The instrument has a "LOCKING" function, which can be activated by means of a toggle switch (13). If it is switched on, the counter gate remains locked after completion of a measurement until the "Reset" key (12) is pressed.

For the connection of light barriers P1320-3LR applies:

The light barriers are to be connected at the rear of the device by means of the DIN - plugs

LG1 works on channel 1, LG2 on channel 2. So that the signals of the light barriers can be processed correctly, the corresponding SENS - potentiometers have to be set to maximum, the switches "Chatter" to FAST and the switches for the logic direction to DOWN otherwise there will be no or wrong results. The light barriers and the electrical inputs are electrically isolated from each other, so that no damage can occur. But because they are logically the simultaneous connection of electrical sensors and light barriers can lead to interesting, but not always comprehensible results.

Two counter inputs are available for pulse or frequency measurement.

The instrument has a counting input (19) for AC voltages in the frequency range up to approx. 5 MHz with a fixed sensitivity of approx. 100 mV rms and can also register register DC voltage pulses (switch, phototransistor photocouple path). The input resistance is about 33k Ω for small signals. The input is voltage resistant up to ± 20 V voltage resistant. The coupling is either DC or AC. In position "DC" the input has a bias voltage of about 330 mV, so that it is then also possible, to count contact closures.

Example: Passing a comb through a light barrier. For this purpose it makes sense to select the function type "PULSE" via the step switch (16). First press the "Reset key (12) as often as necessary to set the LED 7-segment digital display (20) to zero. zero. The next pressing enables the measurement. Since the input input must be sensitive to high frequencies, any use of bouncing mechanical contacts must be avoided!

The BNC input (17) is intended for the connection of a Geiger-Müller counter tube, e.g. DR291-1Z, is intended.

The high voltage for the operation of the tube is provided by the instrument with high accuracy. It can be set with the step switch (18) in the range from 325 V to 600 V in 25 V - steps. The accuracy of the setting is typically

± 1%. The high voltage divided by 100 is available for display purposes at the 4 mm-safety sockets (19) for display purposes. This output is decoupled from the actual high voltage and is short-circuit proof.

The registration of the tube's continuity is done by measuring the cathode current. Therefore, the ground line of the "BNC" socket (17) must not be connected to the instrument ground (black banana sockets) must not be connected!

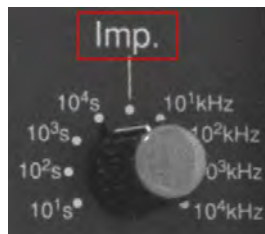
The inputs (1/2) of the two counter amplifiers are permanently connected internally and are therefore equal at any time. This combined signal is then the clock signal in the measuring modes pulse and frequency. These measuring modes differ only in the choice of the recording time! The counting signal can optionally be reproduced acoustically. The loudspeaker can be switched on and off by means of the toggle switch on the back of the instrument.

For the connection of light barriers P1320-3LR applies:

The light barriers are to be connected at the rear of the device by means of the DIN plugs. The signals of both light barriers are internally OR - linked. The signals of the light barriers, of the GM - input and of the counting input are electrically isolated from each other, so that no damage can occur. But because they are logically the simultaneous connection of electrical sensors, a GM - tube and light barriers can lead to and light barriers can lead to interesting, but not always comprehensible results. The most frequent application of the connection of photoelectric sensors in the counting mode is probably the counting of passes in a comb.

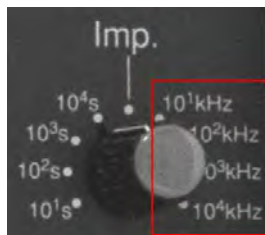
2. Impulse measurement

The pulse counting measuring mode (naturally only one measuring range) is used to count pulses in a manually defined time range. First, if necessary, the "Reset" key (12) is pressed until the LED 7-segment digital display (20) returns to zero. The next operation starts the measuring process, the next one ends it. One further operation sets the counter to zero again.



3. Frequency measurement

The following ranges are available in the frequency measurement mode:



Measuring range	End value	Resolution	Gate time
10 ¹	9.99999 kHz	0.01 Hz	100 s
10 ²	99.9999 kHz	0.1 Hz	10 s
10 ³	999.999 kHz	1 Hz	1 s
10 ⁴	9999.99 kHz	10 Hz	100 ms

Attention: The range 10¹ is only to be used for special cases due to its long waiting time (in the worst case it takes almost four minutes until the first valid result is obtained).

In contrast to other devices, the frequency measurement is fully automatic. Gate-control, display buffering and transparent zero setting is done independently and with an overhead of only 20 %. Therefore, only the desired measuring range has to be selected, everything else happens by itself.

4. Measurement with the external forked light barrier

Connect the forked light barrier, P1320-3LR, to the 5-pin DIN socket on the back of the instrument. The BNC input (17) and the counting input for AC voltages (14) must not be used now to avoid interference. Step switch (16) to position "Pulse".

Technical data:

Measured value display: LED 7-segment digital display, 6 digits, digit height: 26 mm

Time measurement:

Measuring ranges: 4 measuring ranges from 10¹ ... 10⁴ s
final value selectable by rotary switch
Level changes: Rising and falling edge selectable,
switchable debouncing device
Repeat inhibit: switchable

Pulse measurement: Time unlimited possible

Frequency measurement: 4 measuring ranges from 10 kHz ... 10 MHz,
Gate times: 100 s/ 10 s/ 1 s/ 100 ms

Input socket
for GM counter tube: Anode resistance: 10 MΩ

Input sockets: measurement of AC voltages in the frequency
range up to about 5MHz, sensitivity 100 mV,
4 mm safety sockets

Input socket
for forked light barriers: 5-pin DIN socket