

- S 103 B1 - Phase Comparison Protection**
- S 105 U - Translators**
- S 105 F - Blocking Relay**

**Technical parameters of S 103 B1 are completely identical with the former type S 105.**

## **S 103 B1 - Phase Comparison Protection**

### **S 105 U - Translators**

### **S 105 F - Blocking Relay**

S 103 B1 is a phase current comparison protection, suitable for protecting MV and HV lines both with earthed and unearthed neutrals. Interconnecting path between the protections of protected section is either DC (two-wire line) or AC (four-wire line).

S 105 U are insulating transformers (translators) which serve to galvanic (metallic) separation of the AC interconnecting cable path from the internal equipment of the relay.

S 105 F is the additional relay necessary to use in the case when S 105 relay has to protect both the line and the transformer. The purpose of S105F relay is to prevent tripping during magnetising inrush current of the transformer.

### **Protection S 103 B1**

The S103F protection scheme compares the phase of the currents of both ends of the protected line or, if you like, the phase of the outputs of three-phase summation transformers on each end of the line. The winding of the summation transformer is arranged so that resultant magnetomotor force is proportional to the positive sequence, negative sequence and the zero component of the current. The amplitude change of the sent signal, which is caused by connecting path, doesn't affect the protection operation. On the other hand the phase change, even a temporary one, must not exceed the limit.

In order to prevent maloperation due to pilot-wire failure, the tripping signal of S103F relay can be linked in series with:

- a) an additional O/C - Relay output (A15-Relay, 3 pcs) or
- b) the instantaneous time contact of AT 31X1 Relay. The time delayed contact serves as a backup protection. Or
- c) the underimpedance elements (e.g. of D115 Distance Protection)

False tripping caused by the disturbed pilot line is under normal conditions prevented by non-starting of the a), b) or c) relays. In case of the pilot-line failure, both S103 B1 Relays must be set out of service.

Considering function and general balancing of the S 103 B1 protection, this protection is supplied in mutually adjusted pairs.

### **Translators S 105 U**

Purpose of the S 105 U Translators is to insulate pilot-wires from the inner scheme of the relay. For one S103B1 Relay, two translators are necessary. One for transmission and the other one for the receiving side. Both of translators are accommodated in common case and they are safely insulated one from the other.

### **Blocking relay S 105 F**

If the S 103 B1 protection has to protect simultaneously both the line and the transformer then the inrush current, caused by switching-on on the transformer, would appear to the S 103 B1 protection like short-circuit protected section. I.e. the protection gives the tripping signal and the transformer could not, in fact, be switched on at all.

To protect this inadvertent tripping, the S103B scheme should be delayed (up to 3 s). A better method is to use the additional S105F blocking relay.

The S 105 F blocking relay is always used on the in-feeding side of the transformer. Following principles stand for feeding:

- the main current measuring transformers have to be star-connected, so that their neutral point could be connected to earth
- the neutral point must be at the side of bus-bars
- auxiliary transformers for simulating of the power transformer must have the same wiring group as the power transformer
- using auxiliary transformers, the protection is to be connected at that side where zero sequence current cannot arise.

Further particulars result from the appropriate wiring diagram:

Sign. 1 – AT 31x1 - back up operation

Sign. 2 – S 105 F – no inrush detection (conditions: AT 31x1 and S 103 B1 operating)

Sign. 3 – pilot failure. In order to prevent false tripping of the S 103 B1 by the inrush current of the transformer, the TD relay is delayed for about 6 sec.

The set of S 103 B1, S 105 F and S 105 U substitutes the former types S 103 B, or S 105, AF 13 and UL 11.

**Protection S 103 B1** is built into the case K II joined with other cases of the set of electromechanical protections and it results in the built-up area reduction. It allows connection of one Cu, or Al wire up to the cross-section 6 mm<sup>2</sup> or of two line-wires 1 to 4 mm<sup>2</sup>. Auxiliary cases S 105 U and S 105 F are in the housings of the dimensions K II, or K III for the mounting on the panel. Dimensioning of the clamps/terminals is identical. All case covers may be sealed with lead if needed.

**Orders:**

It is necessary to state:

For S 103 B1

- type and number of pieces
- rated current
- auxiliary voltage
- alternatively the requisition for the translators S 105 U and their design

For S 105 F

- type and number of pieces
- rated current
- auxiliary voltage

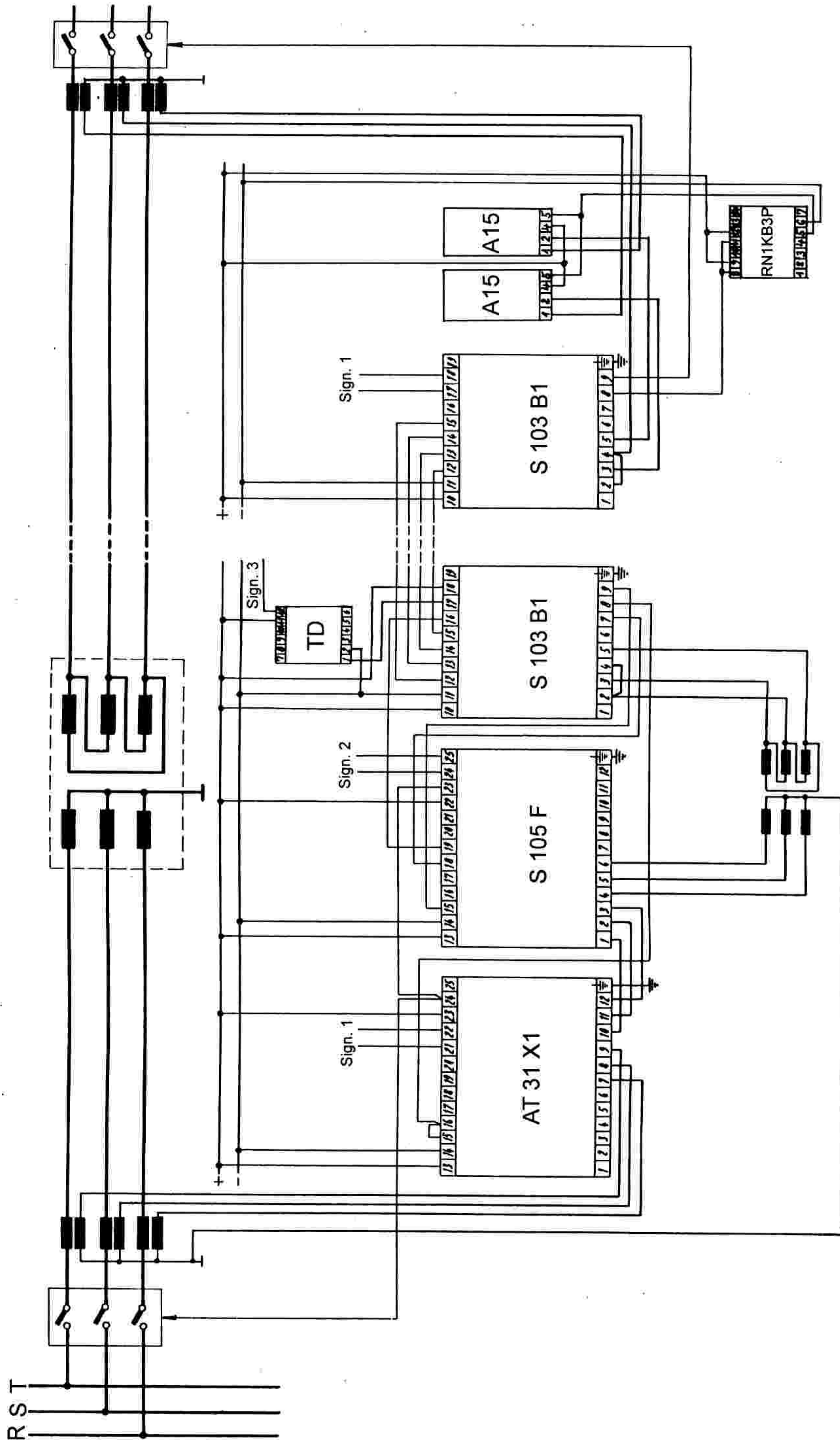
**NOTE:** With respect to the function and general setting of the protection S 103 B1, this is supplied always by twos (coupled) pieces.

**Technical specifications:**

S 103 B1	<p>Rated current <math>I_n</math>          Rated frequency          Auxiliary voltage          Power input in the current circuit          (at symmetrical load <math>I_n</math>)</p> <p>Consumption from the auxiliary supply          source at operation          Overload capacity - continuously              - thermal              - dynamic</p> <p>Contacts              Switching on capacity              Current carrying capacity              Breaking capacity</p> <p>Pilot link:              Maximum attenuation including S 105 U              Input and output fitted to impedance              Max. allowed cross-talk              Max. voltage and current of connecting line</p>	<p>1 or 5 A          50Hz          60, 110 or 220V DC          50 Hz          phase U &lt; 2,5 VA          phase V &lt; 5 VA          phase W &lt; 8 VA</p> <p>&lt; 10 W          max 2 <math>I_n</math>          50 <math>I_n</math>          100 <math>\sqrt{2} I_n</math></p> <p>20P (switch-over)          10 A          6 A          3 A at 220V, 50Hz, <math>\cos.\varphi = 0,4</math>          0,12A at 220V DC, T = 20ms</p> <p><math>\alpha_1 = 0,5(50\text{Hz}), \beta_1 = 0,5 (50\text{Hz})</math>          2000 e<sup>-j45°</sup> <math>\Omega</math> (50Hz)          60dB          75V, 40mA</p>
<p>Transfer by the two-wire application must enable to transmit DC pulses. Application of four line wires means only AC transmission.</p>		
	<p>Operate time          Covering          Weight</p>	<p>&lt; 100ms          IP 20          cca 5 kg</p>
S 105 U	<p>Insulating voltage          Operating loss at voltage 1 V          Covering          Weight</p>	<p>6 kV / 1 min          cca 0,65 dB          IP 20          cca 5,5 kg</p>
<p>The interconnecting line between the isolating translators can have total impedance:  <math>Z = 2000 e^{-j45^\circ} \Omega, \alpha_1 = \beta_1 = 0,5</math> (i. e. cca 27 km for the cable line <math>\square</math> 0,9mm).</p>		
S 105 F	<p>Rated current <math>I_n</math>          Rated frequency          Auxiliary voltage          Power input in the current circuit for          phases U, V, W          Consumption from the auxiliary supply          at operation          Overload capacity - thermal or dynamic          Contacts of the tripping relay              Switching on capacity              Current carrying capacity              Breaking capacity</p> <p>Covering          Weight</p>	<p>1 or 5 A          50Hz <math>\pm</math> 4 %          110 or 220V DC</p> <p>&lt; 4 VA</p> <p>cca 17 W          50 <math>I_n</math>          2 Z (closing)          10 A          6 A          1,5 A at 220V, 50Hz, COs <math>\varphi = 0,4</math>          0,2A at 220V DC, <math>\gamma = 20\text{ms}</math></p> <p>IP 20          cca 5 kg</p>

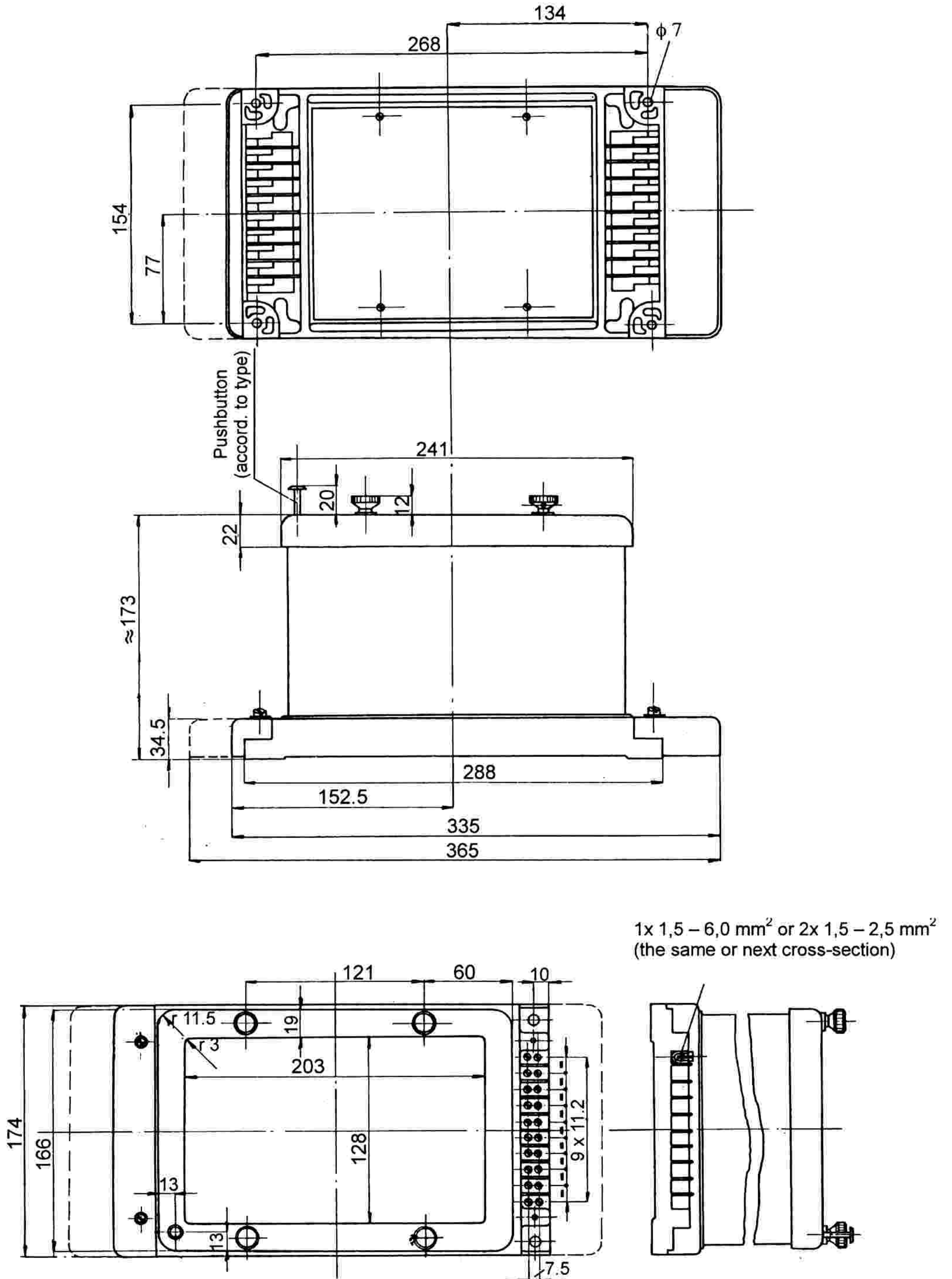
**S 103 B1 Phase-Comparison Protection**  
**S 105 U Translators**  
**S 105 F Blocking Relay**

**External circuit diagram of the S 103 B1 phase comparison protection for the transformer protection and interconnection with S 105 F blocking relay and back up AT 31X1 protection**

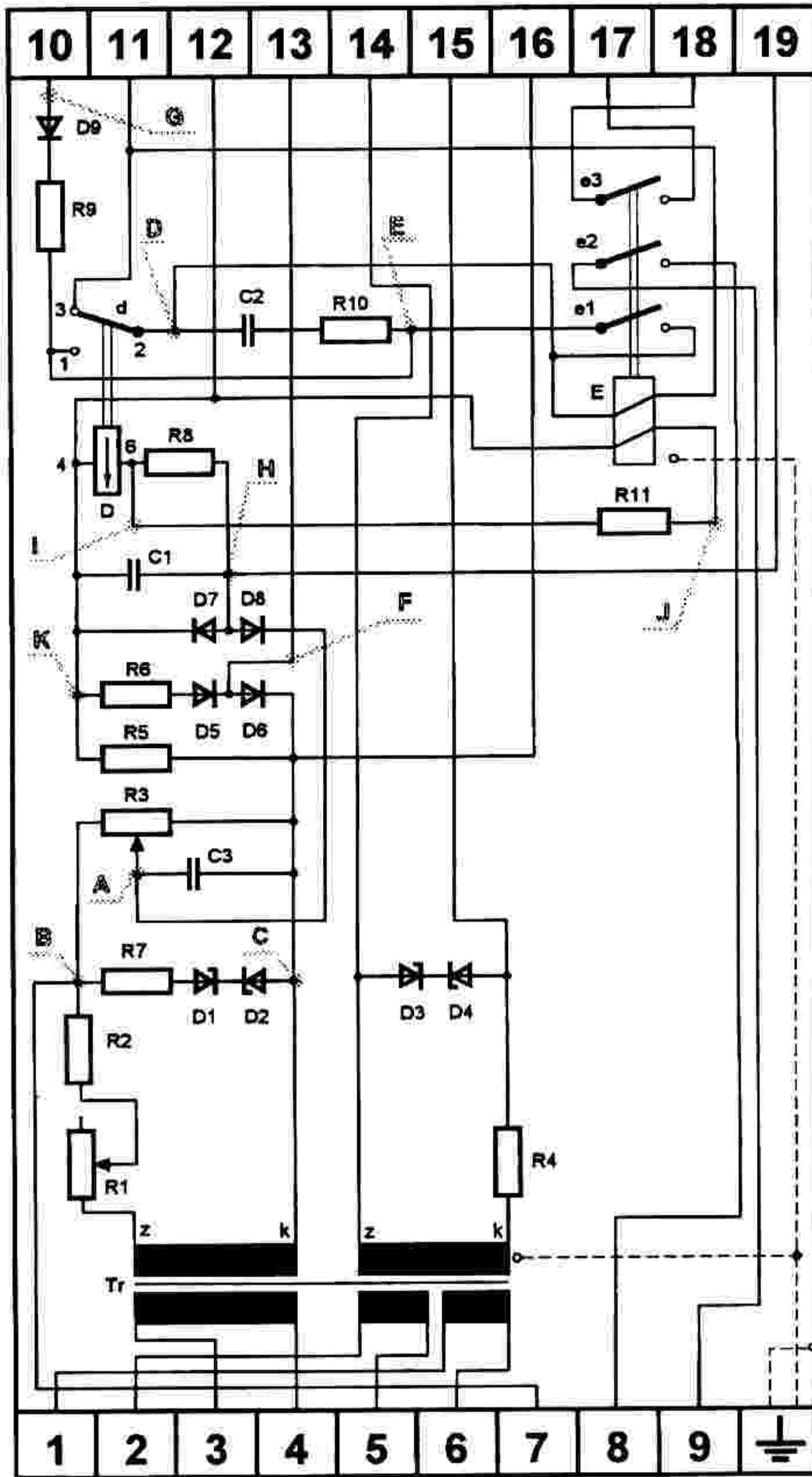


S 103 B1 Phase-Comparison Protection  
 S 105 U Translators  
 S 105 F Blocking Relay

Dimensional drawing of the case K II for S 103 B1 and S 105 U

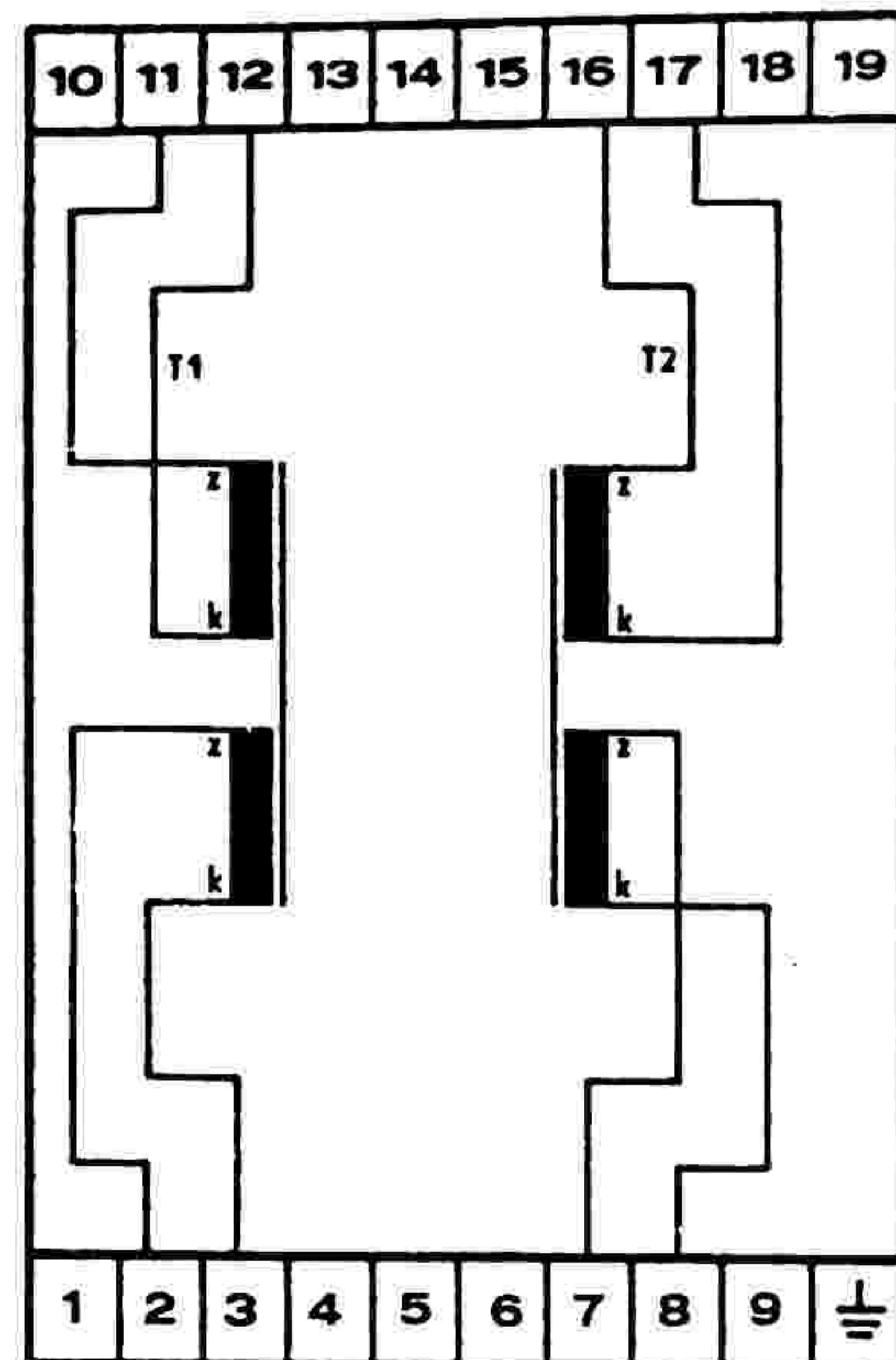


Circuit diagram S 103 B1



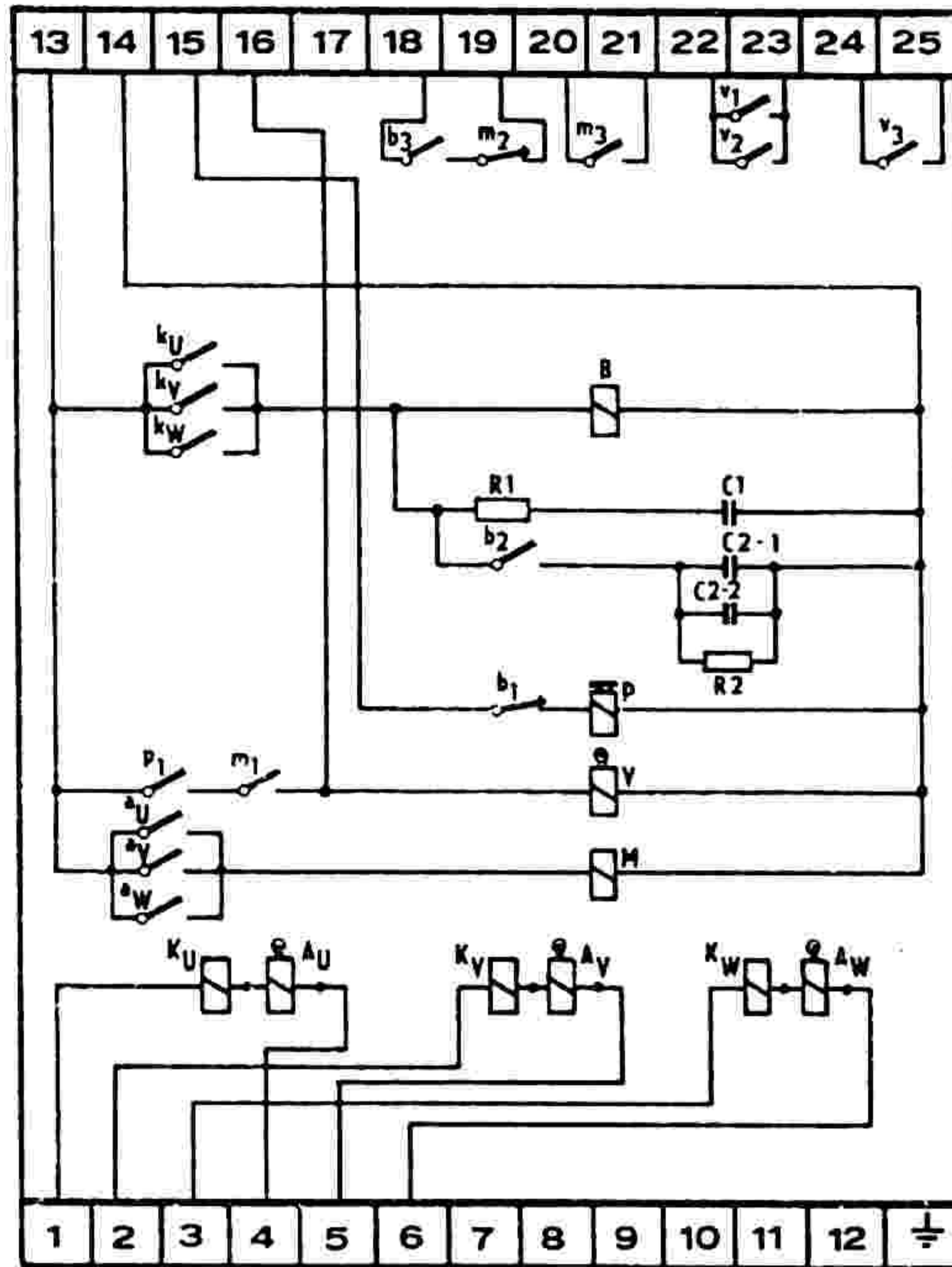
D – UCR  
 d – UCR contact  
 E – RP 102  
 e1, e2, e3 – RP 102 contacts  
 Tr – summation transformer

Internal circuit diagram of translators S 105 U

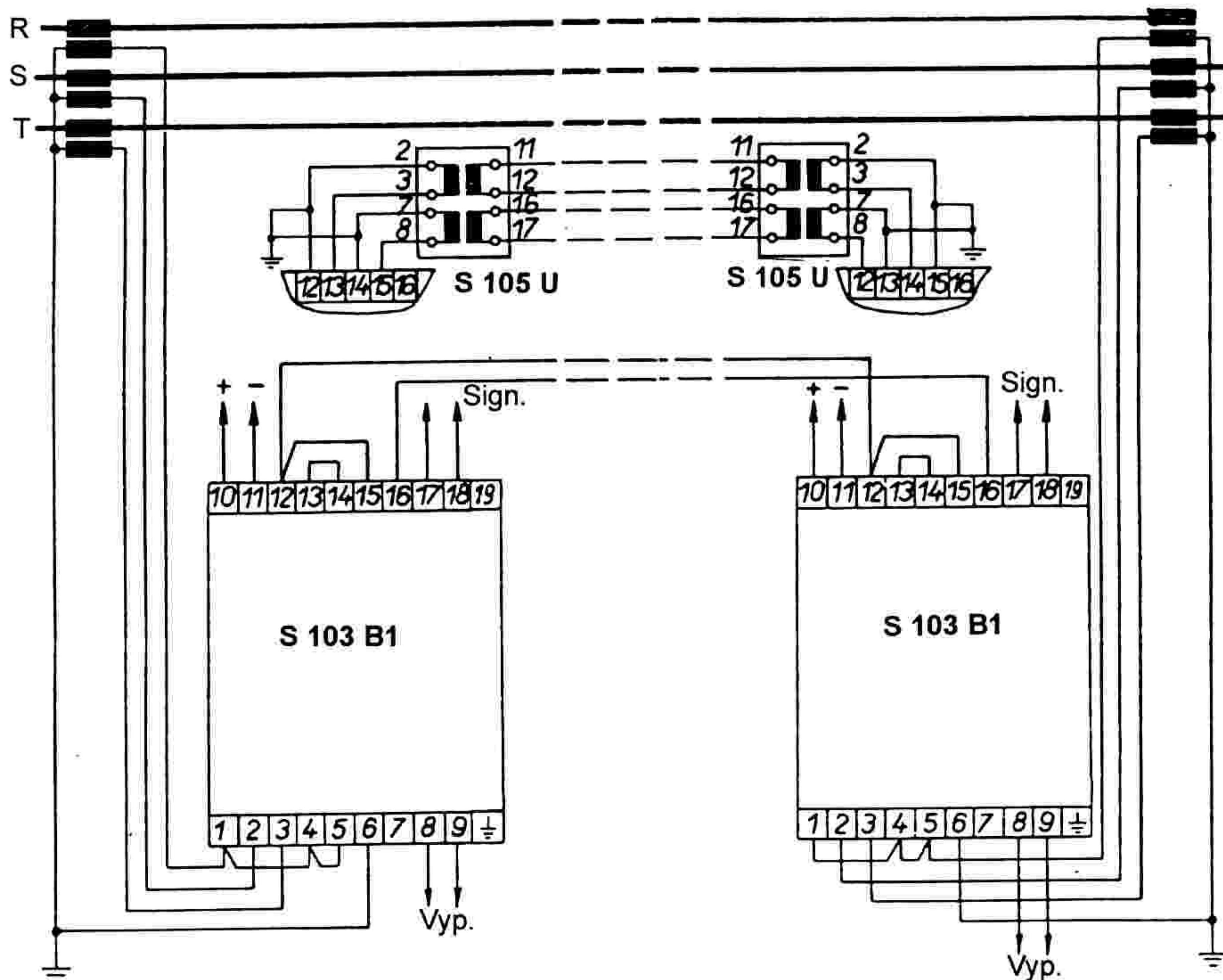


S 103 B1 Phase-Comparison Protection  
 S 105 U Translators  
 S 105 F Blocking Relay

Circuit diagram of the blocking relay S 105 F

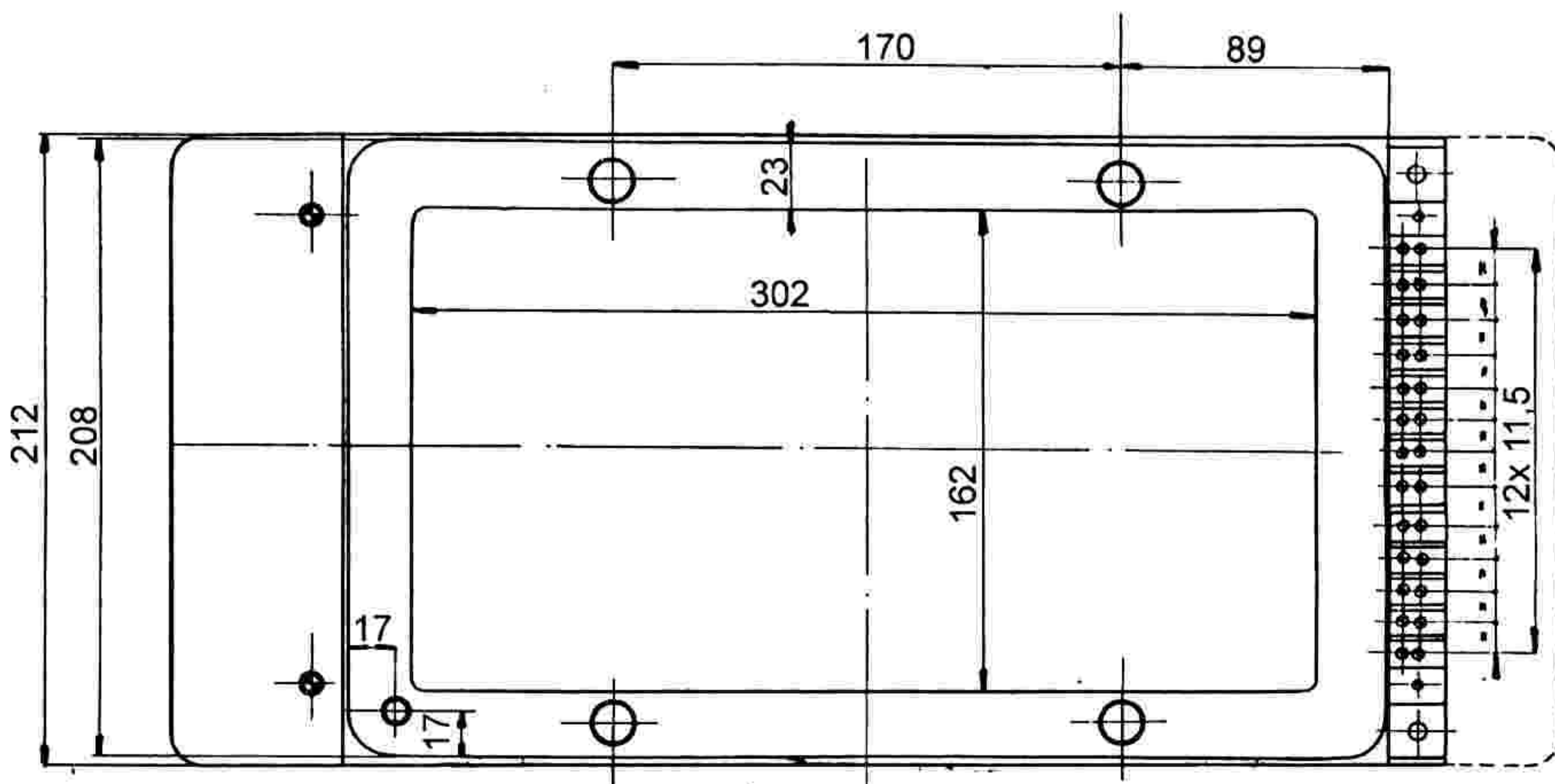
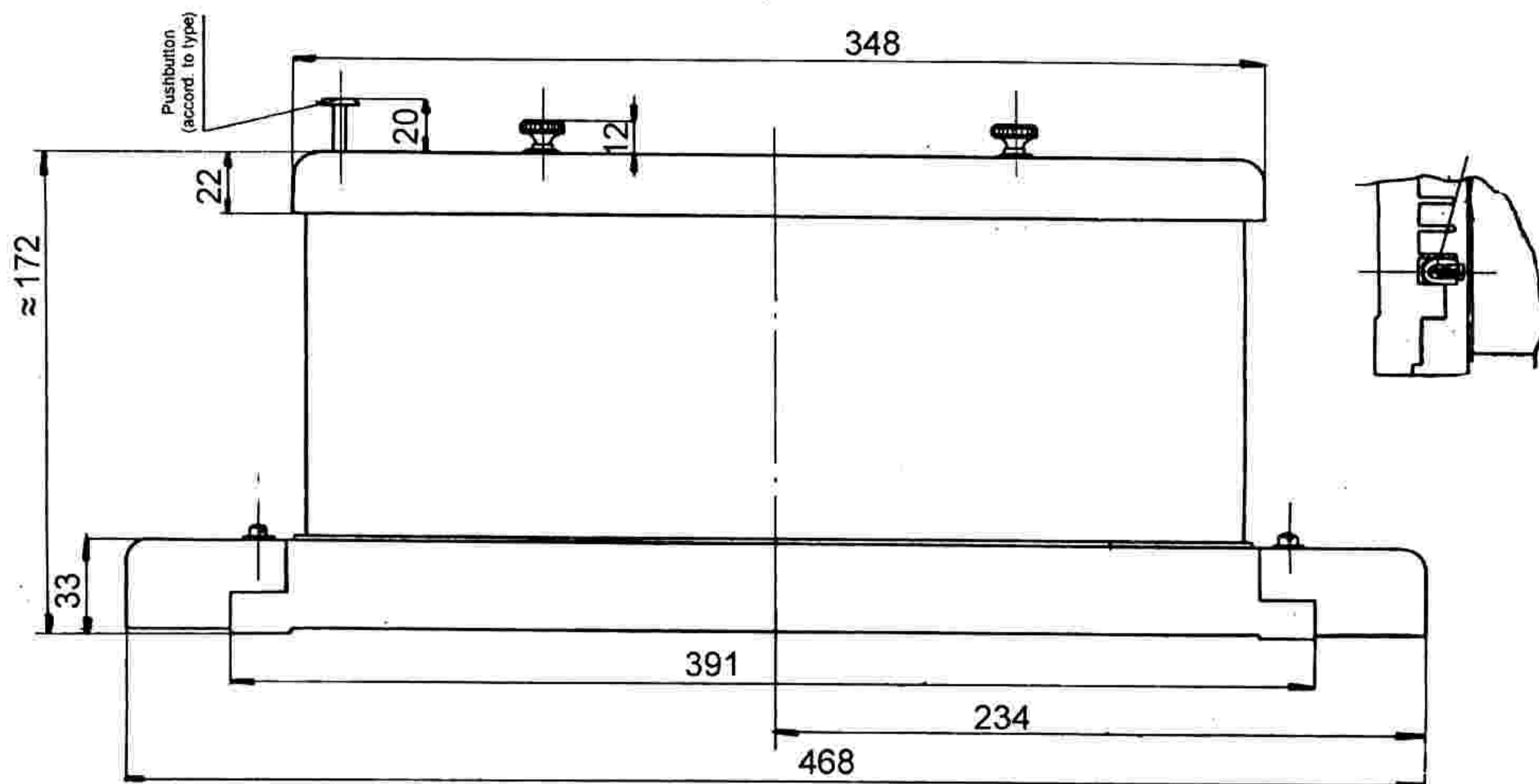
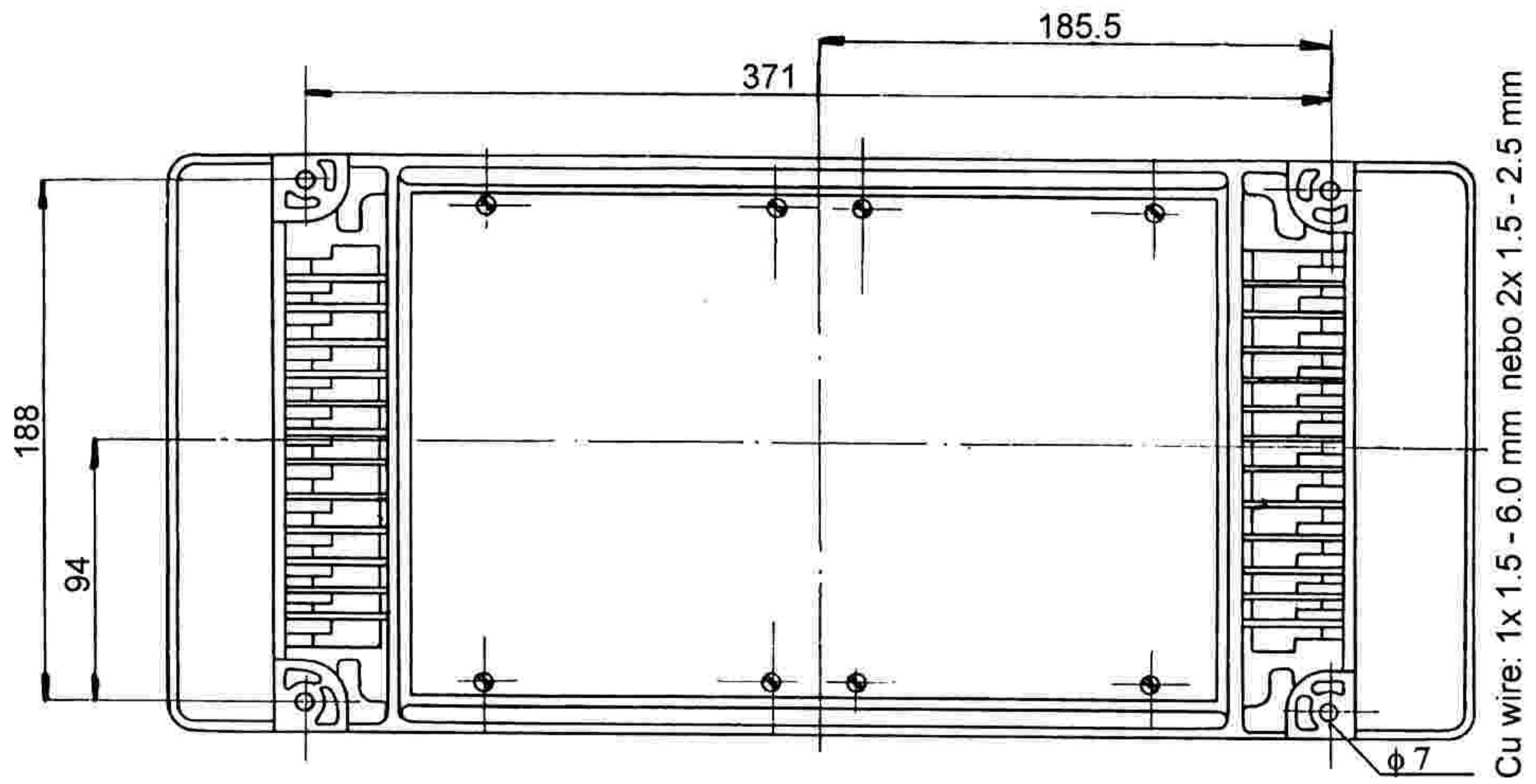


Interconnection of two S 103 B1 protections



S 103 B1 Phase-Comparison Protection  
 S 105 U Translators  
 S 105 F Blocking Relay

Dimensional drawing of the case K III for S 105 F





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