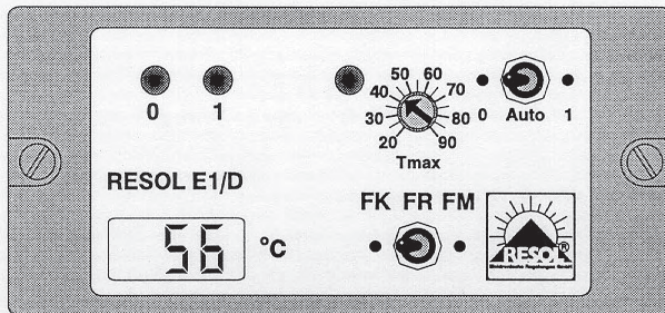
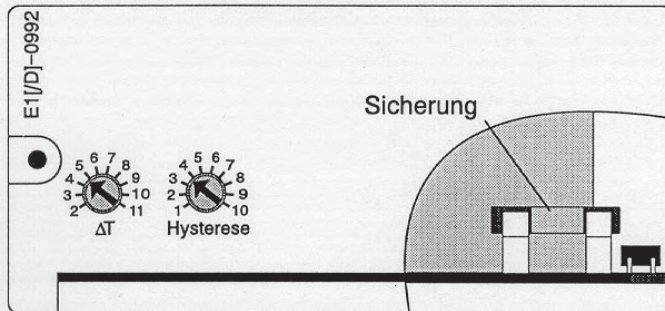


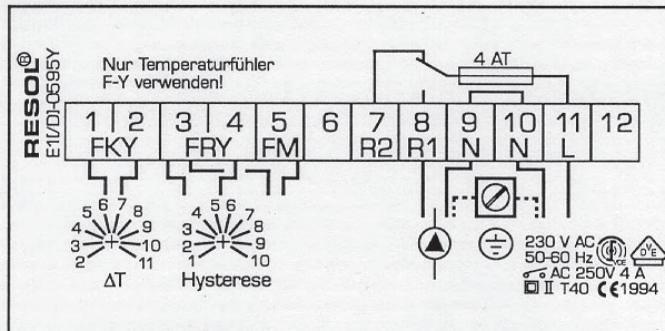
1. Short Instruction



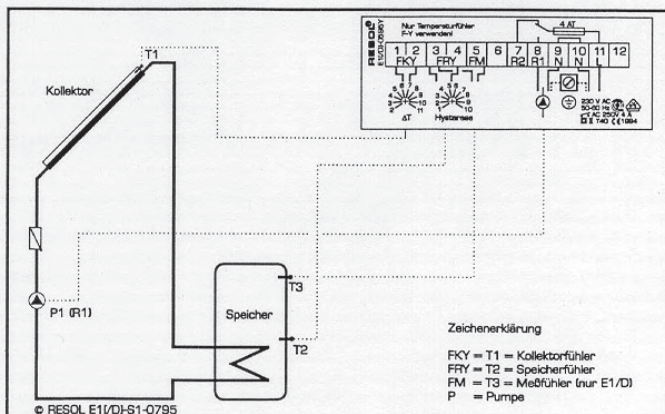
Housing - front view



Housing - back view



Electrical connections



Example

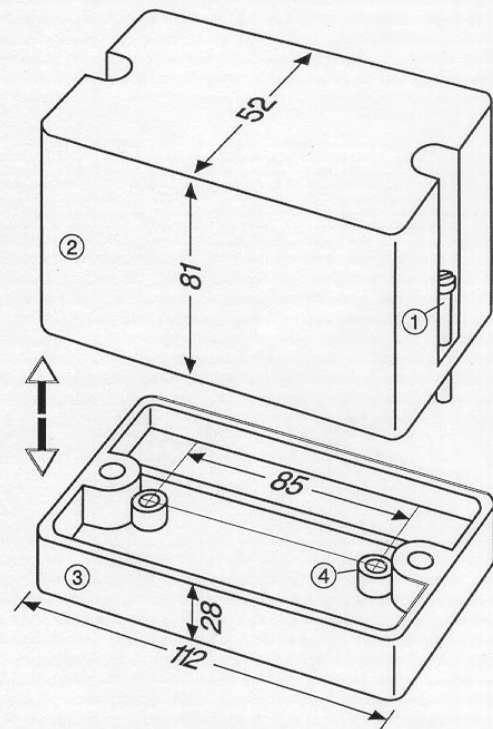
mains control lamp	0	red
operation lamp	1	green
limitation lamp		yellow

operation switch:

1	=	permanent operation
auto	=	automatic
0	=	off

temperature display switch:

FK	collector
FR	store
FM	third sensor



Open housing by removing the two cover screws (1) and pulling the cover (2) carefully away from the base (3).

WARNING: Switch off power supply before opening housing!
Fix base (3) in a switch box or to the wall of a dry room by using the provided fixing holes (4).

RESOL sensor cables carry low voltages. Do not lay up sensor cables with cables carrying voltages higher than 50 V a.c.. Use screened cable if this is unavoidable (e.g. in cable ducts).



6. Adjustment and putting into operation

Before plugging cover into base adjust temperature differential with the adjuster (ΔT) at the backplate (scale indication: 2 ... 11 deg.C) according to the respective instrument type.

(Δ = delta, this symbol normally stands for various of differentials, in this context it is used for the indication of temperature differentials.)

Attention: Switch off power supply before fixing / removing cover to / from base!

Having switched off the power supply, plug cover (2) into base (3) and tighten the two fixing screws (see page 1). In case that the instrument has a temperature control, its maximum value has to be adjusted (T_{MAX}) within the temperature range from 20 to 90deg.C. The operation series switch must be adjusted to position "0".

As soon as the external power is switched on, terminal 7 will be live (indicated by the red pilot light). If subsequently operation mode "1" is selected, terminal 8 will be live (indicated by the green pilot light).

Having thus checked the proper functioning of the instrument, adjust the operation series switch to position "auto".

Once adjusted to "auto", the instrument will only switch on (green pilot light) when the temperatures measured by sensor FKY and sensor FRY constitute a temperature differential which is higher than the preset temperature differential ΔT .

The respective temperatures measured by each sensor are displayed by means of the display switch (FK / FR / FM).

7. Error Indications

Switch off power supply before removing cover from base!

The relay output is protected by a precision fuse 4A (inert). This precision fuse becomes visible beside the transformer after removing cover from base (see page 1). The base-plate of the cover is clicked into the cover at three points and can be levered up with a screw-driver.

The temperature regulator does not switch off, if either connection terminals 3 and 4 are bridged or the contact between terminals 1 and 2 and the respective sensor (FKY) is interrupted. Conversely, the regulator does not switch on, if either terminals 1 and 2 are bridged or the contact between terminals 3 and 4 and the other sensor (FRY) is interrupted. In case of such defective functioning check sensor connections and sensor extensions. Temperature sensors which are not connected to the temperature regulator have, at a temperature of 25 deg.C, a resistance value of about 2000 Ω . The resistance increases with increase of temperature (PTC).

8. Technical Data of RESOL E1/D:

Housing: Plug-in plastic housing
Protection type: IP40 / DIN 40050
Power consumption: 2,5 VA
Dimensions: 112 x 52 x 106 mm
Switch-on differential:
 ΔT : 2 ... 11 deg.C (manually adjustable)
Switch-off differential: 1,6 deg.C below switch-on differential
Temperature limitation T_{MAX} : adjustable within range of 20 to 90deg.C
custom-made regulator with range of 20 to 40 deg.C available
Effective measurement range: -20 ... 150 deg.C
Relay: 1 relay output, changeover contact
Permissible maximum load: 750 VA with $\cos \phi = 0,7$
Operating voltage: 230 V a.c. $\pm 10\%$, 50-60 Hz, other voltages available
Radio screened: according to DIN 57875 / IEC 80
RESOL temperature sensors (PTC) type FKY and FRY

Technical changes reserved! The given example does not claim to contain any detail.



3. Functions and Equipment

Temperature sensors (semiconductors) measure the respective temperatures of the heat source and the store. The regulator compares the temperature differential measured by these two sensors with a preset value (manually adjustable, temperature range: 2 ... 11 deg.C). If the measured temperature differential is higher than the preset value ΔT , the circulation pump is switched on. The pump is switched off as soon as the measured temperature differential falls below the preset value by 1,6 deg.C. RESOL E1/D is regulated by a changeover contact (relay), it is possible to connect several motors (pumps) or electrical valves to this changeover contact.

The temperature control reacts according to the temperatures measured by the sensor connected to terminal 3 and 4 within a maximum temperature range of 20 to 90 deg.C (adjustable). If the temperature in the store is higher than the preset value, the yellow pilot light besides the preset value adjuster is switched on.

Mode switch (upper right) selections:

AUTO: automatic temperature regulation

0 : temperature regulation off (output via terminal 7 only)

1: override position, permanent output via terminal 8

A red and a green pilot light indicate the respective operation mode (0 and 1).

Use lower operation series switch to display the different temperatures measured by the respective RESOL sensor. Display adjustment:

FK = collector temperature

FR = reference temperature, measured in the store

FM = temperature measured by optional sensor

Polarity of sensor connection is not important.

Optional Extras:

Temperature control, maximum temperature range 20 ... 90 deg.C

Anti-freeze function

Adjustable hysteresis

Switch-off delay

Anti-freeze function:

The anti-freeze function is controlled by the sensor connected to connection terminals 1 / 2. With the mode switch set to "AUTO" the circulation pump is switched on as soon as the collector temperature falls below +4 deg.C (independent of temperature differential) and the green pilot light is switched on and off. With the mode switch set to "0" the red pilot light is switched on and off.

Hysteresis:

The hysteresis can be adjusted at the back of the housing cover (temperature range: 1 to 10 deg.C).

Switch-off delay:

A switch-off delay of two minutes can be preset at factory.

4. Mounting

Mounting of RESOL E1/D as shown on page 1:

Open housing by removing the two screws (1) and pulling the cover (2) carefully away from the base (3).

There are two mounting holes on the inner surface of the base (85 mm apart). Drill through or pierce the knockouts before mounting base to the wall of a dry room or in a switch box. Afterwards electrical connection of the instrument is possible

5. Electrical Connections (see page 1)

Make sure that all electrical works are carried out according to international safety standards and by specialists only.

Main connection (230 V a.c. ± 10 %, 50-60 Hz) by an external switch only.

10 = zero conductor N

11 = conductor L

Earth connections are made at the 4 way brass terminal in the wall mounting base.

It is possible to connect several motors (pumps), valves etc. to the consumer putputs:

8 = conductor L (relay operation contact)

9 = zero conductor N

Earth connections are made at the 4 way brass terminal in the wall mounting base.

In the inoperative position of the relay, terminal 7 is live. The consumer can either be connected to terminals 7 and 8 plus N for valves that are powered both ways or to terminal 8 plus N for spring return valves. The relay has a switch capacity of 750 VA with $\cos \phi = 0,7$. For higher switch capacities a contactor must be interposed.

Sensor connections:

- temperature sensor type FKY, responsible for the measurement of the heat source temperature, at terminals 1 and 2
- temperature sensor type FRY, responsible for the measurement of the reference temperature (e.g. of the store), at terminals 3 and 4
- an optional sensor without regulative function, that is suitable for the temperature measurement only, at terminals 3 and 5. If such a sensor is not needed, terminals 3 and 5 can be bridged. When selecting operation mode FM the display indicates "200 deg.C" if the terminals are not bridged. When the terminals are bridged the display will show "---".

See page 2 for further information.



2. Temperature Sensors

Optimum control of the heating system goes hand in hand with correct temperature measurement, which can be ensured by accurate mounting of the RESOL sensors. The collector temperature should be measured in the upper part of the collector. For temperature measurement of stores with heat exchanger the sensor is at best mounted on a level with the upper edge of the heat exchanger (see example on page 1). If the heat exchanger is external, the sensor should be fitted at the bottom of the store.

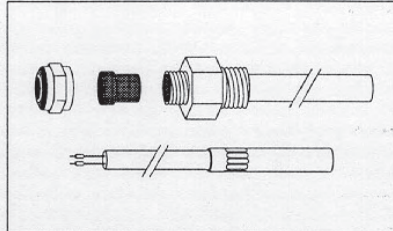
The collector sensor is supplied with a temperature resistant, 1m silicone cable, RESOL type FKY (range: -50 ... +180 deg.C). The store sensor is supplied with a 2,5 m PVC cable, RESOL type FRY (range: -5 ... +80 deg.C). The sensor hou-

sings of both types are temperature resistant up to +180 deg.C.

Make sure that all electrical works are carried out according to international safety standards and by specialists only. RESOL sensor cables carry low voltages. Do not lay up sensor cables with cables carrying voltages higher than 50 V a.c.. Use screened cable if this is unavoidable (e.g. in cable ducts).

The sensor cables can be lengthened up to 100m on condition that the cable cross-section has 1,5 mm² (up to a length of 50 m a cross-section of 0,75 mm²).

Temperature sensors which are not connected to the temperature regulator have, at a temperature of 25 deg.C, a resistance value of about 2000 Ω . The resistance increases with increase of temperature (PTC), see Table 1.



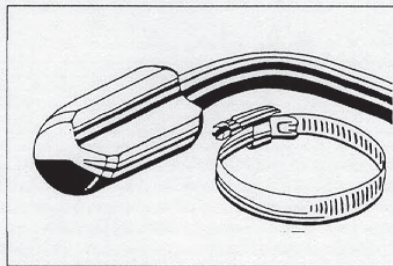
Immersion sensors:

available with different immersion depths, for example:

FKY60: depth = 60 mm

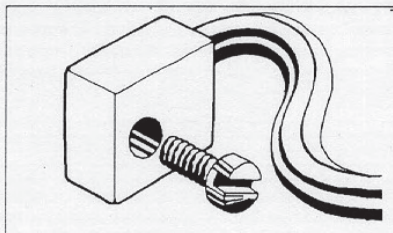
FKY150: ddepth = 150 mm

Attention: Insert sensor properly into sensor housing and tighten screw jo-



Pipe sensors:

FKY20 or FRY20, supplied complete with clamp. Ensured good thermal contact of the sensor to the pipework by cleaning contact area and by applying heat conduction paste between sensor and pipe. For protection against any outer temperature factors it is recommended to wind the sensor cable around the pipe before insulating overall.



Contact sensor:

FKY8 or FRY8. Ensure good thermal contact. Use heat conduction paste. good isolation is important.

The table shows the resistance values of sensors at various temperatures:

Table 1

T [deg.C]	R [W]
-30	1254
-20	1373
-10	1499
0	1633
10	1774
20	1923
30	2079
40	2243
50	2414
60	2592
70	2778
80	2972
90	3173
100	3380