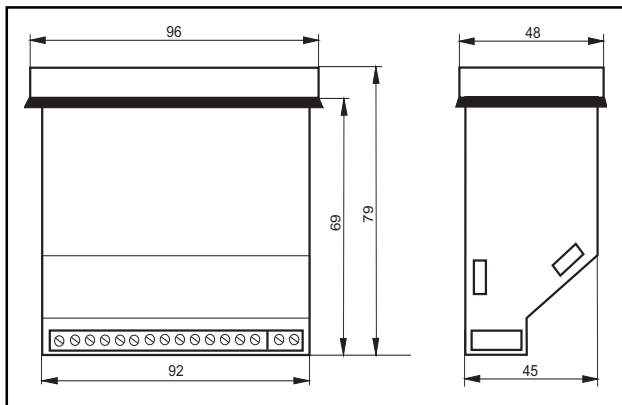


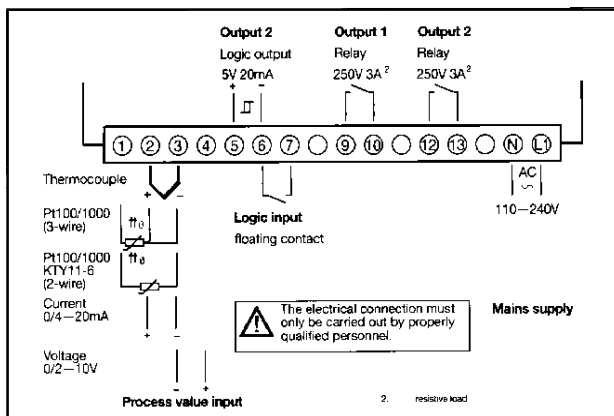
**Compact microprocessor controller TFR2  
 for humidity, temperature and pressure  
 for sensors with resistance-, current-, and  
 voltage output**



**Dimensions**



**Electrical connection**



**Description**

The universal double-set point controller type TFR2 does not only regulate humidity, temperature and pressure but also flow and speed of the wind. It is a digital microprocessor-controller allowing configuration with many standardized input signals Pt100, Pt1000, KTY-11-6, 0(2)...10VDC, 0(4)...20mA and thermocouple.

The TFR2 can be used as display, single set and double set point, with ON/OFF or PID-function. The self-optimisation function determines the optimum controller parameters for PID or PI controllers.

The controller disposes of two NO-relays, one logic output which can be freely configured and a binary input for various functions. The TFR2 has also a programmable output function on faults.

The process value is shown on the display with 4 green figures. The relay position is displayed on the LED. All parameters and the measuring range are to be programmed with the three keys.

**Technical details**

- input ..... Pt100, Pt1000, KTY11-6  
 ..... thermocouple, 0(2)...10V, 0(4)...20mA
- measuring range ..... programmable (-1999...+9999)
- output ..... 2 NO-contacts  
 ..... 1 logic output 5V/20mA
- breaking capacity ..... max. 3A ohmic load at 250VAC
- sampling time ..... 210ms
- control characteristics ..... programmable
- switching hysteresis ..... programmable
- mains supply ..... 110...240V
- frequency ..... 48...63 Hz
- power consumption ..... max 5 VA
- ambient temperature ..... 0...55°C
- climatic conditions ..... max. 75%r.F. no condensation
- housing type ..... plastic für panel mounting to DIN 43700
- housing dimensions ..... 96 x 48 x 70 mm
- operating position ..... any
- electromagnetic compatibility  
 resistance to interference..... EN50082-2  
 interference emission..... EN50081-2
- protective system  
 front..... IP65 to EN 60 529  
 rear..... IP20
- weight ..... 0,2 kg



This information is based on current knowledge and is intended to provide details of our products and their possible applications. It does not, therefore, act as a guarantee of specific properties of the products described or of their suitability for a particular application. It is our experience that the equipment may be used across a broad spectrum of applications under the most varied conditions and loads. We cannot appraise every individual case. Purchasers and/or users are responsible for checking the equipment for suitability for any particular application. Any existing industrial rights of protection must be observed. The perfect quality of our products is guaranteed under our General Conditions of Sale. Issue : February 2003 TFR2\_E. Subject to modifications.

## Operation of the Controller



### Setting of the basic functions of the controller (configuration level):

In order to make the settings, it is necessary to change from the process value display to the configuration level, where the basic functions are set.

Press the **P** button for approx. 3 sec. until the parameter **Pb .1** appears, press **P** several times until the parameter **Y .0** appears, then press **P** again for another 3 sec. approx. The first parameter will appear on the configuration level (**C111**)



Now the display will show in change the parameter symbol and the parameter value. The parameters can be changed dynamically with the keys  and . The setting will be automatically saved after 2 sec. approx.

On the display appears the parameter **C111** (process value input)

Choose the desired transducer by pressing  or . It will be automatically saved after approx. 2 sec.



parameter	transducer
001	Pt100 (3-wire)
006	Pt1000 (3-wire)
601	KTY11-6
003	Pt100 (2-wire)
005	Pt1000 (2-wire)
039	Cu-CuNi „T“
040	Fe-CuNi „J“
041	Cu-CuNi „U“
042	Fe-CuNi „L“
043	NiCr-Ni „K“
044	Pt10Rh-Pt „S“
045	Pt13Rh-Pt „R“
046	Pt30Rh-Pt „B“
048	NiCrSi-NiSi „N“
052	standard signal 0...20mA
053	standard signal 4...20mA
063	standard signal 0...10V
071	standard signal 2...10V

By pressing **P** the parameter **C112** (decimal places/unit of process value) will appear

Choose the desired unit or number of decimal places by pressing  or . They will be automatically saved after 2 sec.

parameter	decimal places/ unit
0	9999/°C
1	999.9/°C
2	99.99/°C
3	9999/°F
4	999.9/°F
5	99.99/°F

By pressing **P** the parameter **C113** (controller type / output 1 / output 2) will appear.

Choose the desired controller type by pressing  or . It will be saved after about 2 sec.

parameter	controller type	output 1	output 2
10	single setpoint (reversed)	controller	limit comparator
11	single setpoint (direct)	controller	limit comparator
30	double setpoint	controller reversed	controller direct
20	single setpoint (reversed)	limit comparator	controller
21	single setpoint (direct)	limit comparator	controller
33	double setpoint	controller direct	controller reversed

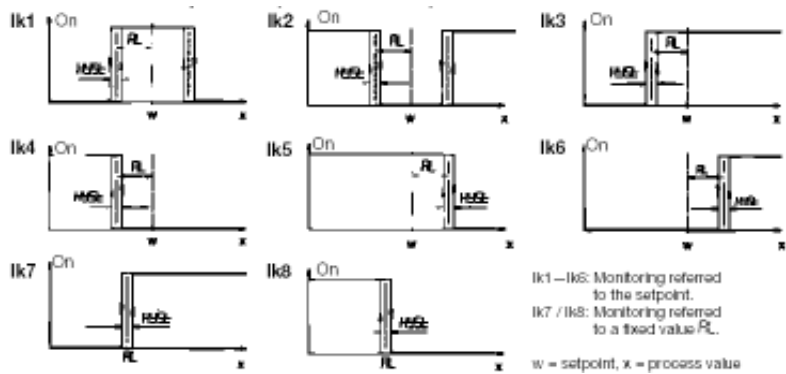
reversed = heating (output is active when process value is below setpoint)  
direct = cooling (output is active when process value is above setpoint)

By pressing **P** the parameter **C114** (limit comparators LK) appears

parameter	limit comparator
0	no function
1	lk 1
2	lk 2
3	lk 3
4	lk 4
5	lk 5
6	lk 6
7	lk 7
8	lk 8

Choose the required limit comparator by pressing **▲** or **▼**. It will be automatically saved after about 2 sec.

**Limit comparator (alarm contact)**

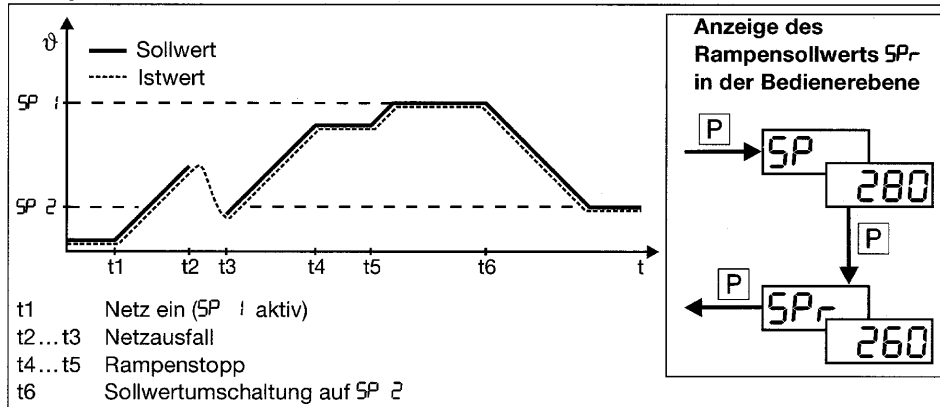


Press **P** again to get the parameter **C115** (ramp function)

Choose the required ramp function by pressing **▲** or **▼**. It will be automatically saved after about 2 sec.

Parameter	Ramp function
0	ramp function off
1	ramp function (K/min)
2	ramp function (K/h)

**Rampenfunktion**





Press **P** again to get the parameter **C116** (outputs on fault)

Choose the required function by pressing **▲** or **▼**. It will be automatically saved after about 2 sec.



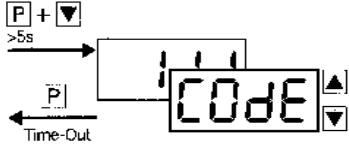
Parameter	Outputs on fault
0	0% output / lk off
1	100% output / lk off
2	-100% output / lk off
3	0% output / lk on
4	100% output / lk on



Press **P** again to get to parameter **C117** (Binary input)

Choose the required function by pressing  or . It will be automatically saved after about 2 sec.

Parameter	Function of binary input
0	no function
1	key inhibit
2	level inhibit
3	ramp stop
4	setpoint switching

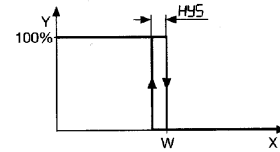
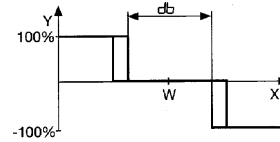
## Binäreingang

																						
<b>Tastaturverriegelung</b>	Bedienen über Tasten ist möglich.	Bedienen über Tasten ist <b>nicht</b> möglich.																				
<b>Ebenenverriegelung</b>	Zugang zu den Ebenen ist möglich. Das Starten der Selbstoptimierung ist möglich.	Zugang zu den Ebenen <b>nicht</b> möglich. Das Starten der Selbstoptimierung ist <b>nicht</b> möglich.																				
Alternativ zum Binäreingang kann eine Ebenenverriegelung über einen Code eingestellt werden (Binäreingang hat Priorität)	<table border="1"> <thead> <tr> <th>Code</th> <th>Bediener-ebene</th> <th>Parameter-ebene</th> <th>Konfigurations-ebene</th> </tr> </thead> <tbody> <tr> <td>000</td> <td>frei</td> <td>frei</td> <td>frei</td> </tr> <tr> <td>001</td> <td>frei</td> <td>frei</td> <td>verriegelt</td> </tr> <tr> <td>0*1</td> <td>frei</td> <td>verriegelt</td> <td>verriegelt</td> </tr> <tr> <td>1*1</td> <td>verriegelt</td> <td>verriegelt</td> <td>verriegelt</td> </tr> </tbody> </table> 		Code	Bediener-ebene	Parameter-ebene	Konfigurations-ebene	000	frei	frei	frei	001	frei	frei	verriegelt	0*1	frei	verriegelt	verriegelt	1*1	verriegelt	verriegelt	verriegelt
Code	Bediener-ebene	Parameter-ebene	Konfigurations-ebene																			
000	frei	frei	frei																			
001	frei	frei	verriegelt																			
0*1	frei	verriegelt	verriegelt																			
1*1	verriegelt	verriegelt	verriegelt																			
<b>Rampenstopp</b>	Rampe läuft.	Rampe gestoppt.																				
<b>Sollwertumschaltung</b>	Sollwert $SP_1$ ist aktiv	Sollwert $SP_2$ ist aktiv																				
	Darstellung der entsprechenden Symbole $SP_1$ und $SP_2$ in der Bediener-ebene.																					

Continue to press **P** to get to the **parameter level** that offers according to the previous configuration the following parameters. Here again, select the required value by pressing  or . The values will be automatically saved after 2 seconds. To select the next parameter press **P** again.

Parameter	Explanation	Value range	Factory set
SCL	start value of the standard signal	-1999... 9999 Digit	0
SCH	en value of the standard signal	-1999... 9999 Digit	100
SPL	lower setpoint limiting	-1999... 9999 Digit	-200
SPH	upper setpoint limiting	-1999... 9999 Digit	850
OFFS	process value correction	-1999... 9999 Digit	0
HYS1	switching differential of the limit comparator	0... 9999 Digit	1
SP 1	setpoint 1	SPL... SPH	0
SP2	setpoint 2	SPL... SPH	0
	(only with activated ramp function)		
AL	limit value of limit comparator	-1999... 9999 Digit	0
Pb .1	proportional band 1 (controller output 1) (influences P action of the controller, at Pb=0 the controller shows ON/OFF action)	0... 9999 Digit	0
Pb .2	proportional band 2 (controller output 2)	0... 9999 Digit	0
dt	derivative time (influences D action of controller, at dt=0 controller shows no D action)	0... 9999 Sekunden	80s
rt	reset time (influences I action of controller, at rt=0 controller shows no I action)	0... 9999 Sekunden	350s
CY 1	cycle time 1 (controller output 1)	1,0... 999,9 Sekunden	20,0s
CY 2	cycle time 2 (controller output 2)	1,0... 999,9 Sekunden	20,0s
db	contact spacing with double setpoint control	0... 1000 Digit	0
HYS.1	differential 1 (controller output 1)	0... 9999 Digit	1
HYS.2	differential 2 (controller output 2)	0... 9999 Digit	1
Y .0	working point (output process value = set point)	-100... 100%	0%
Y .1	maximum output (has to be 100 % at Pb=0)	0... 100%	100%
Y .2	minimum output (has to be 100 % at Pb=0)	-100... +100%	-100%
dF	filter time constant	0,0... 100,0 Sekunden	0,6s
rASd	ramp slope	0... 999 Digit/h oder Digit/min	0

Symbol	Bemerkungen
db	<b>Kontaktabstand</b> Bei Dreipunktregler
HYS. 1 HYS. 2	<b>Schaltdifferenz 1</b> (1.Reglerausgang) <b>Schaltdifferenz 2</b> (2.Reglerausgang) Für Regler mit $P_b=0$



### Parameter level

It is also possible to change directly from the **parameter level** to the process value indication. Press therefore **P** for 3 seconds until **Pb.1** appears. The parameter can now be called and changed as described.

### Setpoint adjustment and indication of ramp setpoint

To change the setpoint directly from the process value indication press **P**. **SP** or **SPr** will appear. Adjust these parameter again by pressing ▲ or ▼ to the required value. It will be automatically saved after about 2 seconds. Change back to the process value indication by pressing **P** again.

**Alarm messages:** The display for the process value flashes **1999**

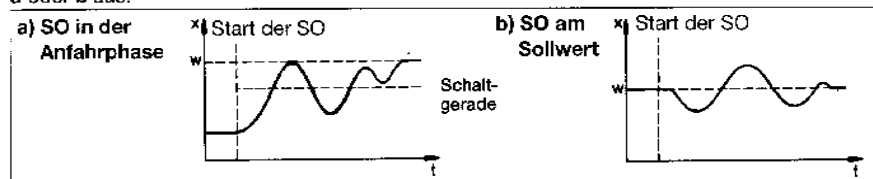
The causes may be: over/underrange of process value e. g. by sensor break/short circuit  
the measurement is outside the control range of the connected sensor,  
display overflow;  
Controller and limit comparators referred to the process value input behave in accordance with the configuration of the outputs.

### **Selbstoptimierung**

Die Selbstoptimierung SO ermittelt die optimalen Reglerparameter für einen PID- oder PI-Regler.

Folgende Reglerparameter werden bestimmt:  $rE$ ,  $dE$ ,  $P_b 1$ ,  $P_b 2$ ,  $CS 1$ ,  $CS 2$ ,  $dF$

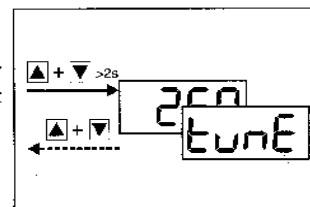
In Abhängigkeit von der Größe der Regelabweichung wählt der Regler zwischen zwei Verfahren **a** oder **b** aus:



#### **Start der Selbstoptimierung**

Ein Start der Selbstoptimierung ist bei aktiver Ebenenverriegelung und Rampenfunktion nicht möglich.

Die Selbstoptimierung wird automatisch beendet oder kann abgebrochen werden.



**Example of a configuration**

**problem:** In a climatic chamber humidity has to be measured by a air humidity sensro (output 0... 10 V). By steering a humidifier with the **TFR2 controller** a relative humidity of 80 % rh with PID action has to be controlled. At a deviation of more than +/- 10 % of the setpoint value an alarm signal has to be issued.

**course of controller configuration:**

1. set basic controller functions on configuration level

In order to effect the necessary adjustments change from the process value indication to the configuration level. Therefore press **P** for about 3 seconds until the Parameter **Pb.1** appears. Go on pressing **P** until the parameter **Y .0** appears, then press **P** again for about 3 seconds. The first parameter will appear on configuration level (**C111**).

Now the display will show in change the parameter symbol and the parameter value. The parameters can be changed dynamically with the keys **▲** and **▼**. The setting will be automatically saved after 2 sec. approx. Change to the next parameter by pressing **P**.

**2. Input of parameters**

parameter	setting	description
C111	063	sensor signal 0... 10V
C112	1	values will be displayed with one decimal place
C113	10	output 1 (K1) is the controller output for humidification
C114	2	output 2 (K2) is the alarm output (limit comparator) alarm has to be activated when a preset tolerance (+ or -) of the setpoint has been reached.
C115	0	no ramp function necessary
C116	3	on sensor breakage the humidification has to be switched off and the alarm has to be activated
C117	0	binary input without function
SCL	0	inital value of the standard signal 0%rh
SCH	100	final value of the standard signal 100%rh
SPL	75	lower setpoint limit 75%rh
SPH	85	upper setpoint limit 85%rh - the setpoint can only be changed between 75 and 85 % rh
OFFS	0	process value correction not necessary
HYS <sub>t</sub>	0	differential for alarm not activated
AL	10	at a deviation of the setpoint of +/-10%rh an alarm has to be activated
Pb .1	10	the proportional band has to be 10%
dt	20	derivative time has to be 20 seconds
rt	50	reset time has to be 50 seconds
CY 1	20	cycle time of output 1 has to be 20 seconds
HYS.1	1	differential at output 1 has to be 1 digit (0,1%rh)
Y .0	0	if the setpoint is reached humidification will be stopped
Y .1	100	maximum output (power) can be 100%
Y .2	-100	minimum output (power) can be reduced to 0%
dF	0.6	the filter time constant is set optimally to 0,6 seconds approx.
SP	80.0	the setpoint has to be 80%rh