



## Transmitter/Controller

for pH-Value, Redox, Standard signals  
and Temperature



measuring  
•  
monitoring  
•  
analysing

# DISAI

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T. 962 448 450 [www.disai.net](http://www.disai.net)



## APM-1

Compact-Line

- Measuring range:
  - pH: -2 ... 16
  - Redox: -1500 ... +1500 mV
  - Temperature: Pt100/Pt1000: -50 ... +250 °C
  - NTC/PTC: 0.1 ... 30 kΩ
  - Standard signal: 0(4) ... 20 mA, 0-10V
  - Resistance: min. 100 Ω, max. 3 kΩ
- Input (standard)
  - 1 x pH or redox and
  - 1 x temperature/resistance or standard signal and
  - 2 x binary inputs
- Output (standard)
  - 2 x relay (changeover contact)
  - 1 x power supply for 2-wire sensor 17V<sub>DC</sub>
- 3 plug-in boards (optional retrofit)
  - relay (changeover contact)
  - double relay (2 x NO, common pin)
  - 1 x analogue output 0(4) ... 20 mA, 0(2) ... 10V
  - 1 x semiconductor relay TRIAC, 1 A
  - 2 x semiconductor switch (Photo-Mos)
  - supply voltage for sensor ± 5V<sub>DC</sub>
  - supply voltage for sensor + 12V<sub>DC</sub>
  - interface RS 485
  - datalogger with RS 485 and real time clock
  - Profibus DP
- Freely programmable via keys or by optional software
- Programmable backlight graphic display (1, 2 or 3 display values, trend display, bargraph, trend curve)
- Calibration routines, wash timer
- Math and logic module
- 13 operator languages integrated



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KOBOLD Messring GmbH  
Nordring 22-24  
D-65719 Hofheim/Ts.  
Head Office:  
+49(0)6192 299-0  
+49(0)6192 23398  
[info.de@kobold.com](mailto:info.de@kobold.com)  
[www.kobold.com](http://www.kobold.com)



### Description

The compact transmitter /controller APM-1.. measures and controls the pH value or redox potential in aqueous solutions. It is available as panel-mounted device according to DIN/EN 61554 or as field housing.

Measured values and parameters are displayed on a high-contrast graphic display in plain text.

Easy configuration via buttons or PC with optional software provide a simple and user friendly operation.

An integrated math and logic module enables the integration of the measured values in mathematical formulas so that the measured variables can be displayed.

The transmitter has two analogue and two binary inputs.

- Analogue input:  
For pH- or redox sensor  
Conventional glass sensors, combined electrode or ISFET sensors can be attached.
- Compensation input:  
For connection of a  
resistance thermometer Pt 100/Pt1000/NTC/PTC  
a standard signal 0(4) ... 20 mA, 0(2) ... 10 V) or  
resistance transmitter (min 100 Ω, max. 3 kΩ)
- 2 binary inputs  
As initiators for actions (keyboard inhibit, Hold,  
Alarm suppression, reset partial or total quantity,  
parameter set changeover) or connecting a pulse  
encoder e. g. for flow measurement (instantaneous value,  
partial quantity, total quantity)

The two control relays can be used as limit value or two position, three position, three position controller or continuous controller with P-, PI-, PD- or PID action.

The modular units can be retrofitted with 3 plug-in boards and so be upgraded flexibly for different measuring and control tasks

The followings boards are available:

- input standard signal 0(4) ... 20 mA, 0(2) ... 10V
- supply for ISFET sensor 5V
- supply for proximity switch
- analogue output 0(4) ... 20 mA, 0(2) ... 10 V
- 1 relay (changeover contact)
- 2 relay (NO with common pin)
- semiconductor relay TRIAC 1A
- semiconductor switch Photo-Mos
- interface RS 485 (max. 1)
- interface Profibus DP (max. 1)
- datalogger (max. 1)

### A complete measuring device comprises:

- the pH transmitter model APM-1
- a pH combined electrode model APS-Z with integrated or separate temperature sensor Pt 100 model AZT-Z
- a suitable pH measuring cable model APK-Z

### Application examples for pH measurements

#### Drinking water

- Monitoring parameters

#### Industrial waste-water treatment

- Neutralization
- Detoxication
- Precipitation station
- Final inspection

#### Communal waste-water treatment plants

- Inflow /sand-trap
- Activation tanks (for nitrification)
- Run-off
- Digestion tower

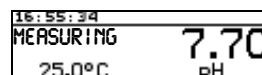
### Functional description

The parameters of the units can be easily configured via keyboard or optional software via PC. The operation is protected by a password. Up to 8 user data that must be changed frequently, can be unblocked in one user file.

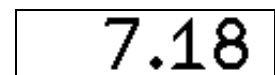
### Display

The display is a graphic display in plain text. Different displays can be configured by customer. Large display, double display, bargraph, trend curve with various status indicators and alarms.

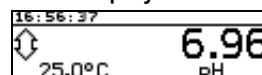
#### Normal display



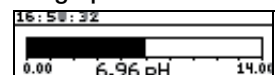
#### Large display



#### Trend display



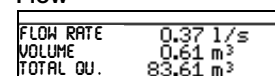
#### Bargraph



#### Trend curve (Data monitor)



#### Flow





### Calibration

For units with additional plug-in boards the following calibration options are possible:

Zero point, limit value, zero point and limit value, cell constant, temperature coefficient.

### Linear scaling

With function "linear scaling" the input signal can be displayed linearly. The following units are available:  $\mu\text{S}/\text{cm}$ ,  $\text{mS}/\text{cm}$ , %, mV, pH, ppm, customised up to 5 characters.

### Customised with table

Nonlinear relationships between input and output size can be processed. E. g. Content of horizontal cylinders in level measurement. The values can be stored in a table via software.

### Calibration

1, 2 or 3-point calibration for pH and 1-point calibration for Redox (for display mV) or 2-point calibration for Redox (%-display, free scaling).

The last 5 successful calibrations can be stored in a log-book.

### Wash timer

Cyclically recurring actions can be triggered by activation of a relay.

### Technical Data

#### General

Housing:	Plastic, for panel mounting according to DIN IEC 61554 or aluminum field housing, orange
Ambient temperature:	-5 ... +55 °C (panel mounting) -5 ... +50 °C (field housing)
Storage temperature:	-30 ... +70 °C
Climatic rating:	rel. humidity $\leq$ 90 % annual mean, no condensation
Mounting position:	horizontal
Weight:	Installation housing: approx. 380 g (fully fitted with 3 optional boards) Field housing: approx. 1780 g
Protection:	Installation housing: IP 65 (front), IP 20 (rear) Field housing: IP 65
Display:	LC graphic display, 122 x 32 Pixel blue with backlight
Power supply:	110 ... 240 V <sub>AC</sub> , -15/+10%, 48 ... 63 Hz (standard) 20 ... 30 V <sub>AC/DC</sub> , 48 ... 63 Hz (special)
Power consumption :	max. 13 VA
Data backup:	EEPROM
Electrician connection:	screw terminals (rear) max. cable cross-section 2.5 mm <sup>2</sup>
Menu languages:	German (factory set), English, French, Spanish, Dutch, Russian, Hungarian, Italian, Czech, Swedish, Portuguese, Polish, Rumanian

### Input 1 (standard)

(pH or Redox)

#### pH-value

Measuring and control range:	-2 ... 16 pH
Accuracy:	$\leq$ 0.3 % of measuring range
Temperature effect:	0.2 % /10 K
Ambient temperature effect:	-10 ... +150 °C (note values of the sensor)

#### Redox potential

Measuring and control range:	-1500 ... 1500 mV
Accuracy:	$\leq$ 0.3 % of measuring range
Ambient temperature effect:	0.2 % /10 K

### Input 2 (standard)

(Temperature, standard signal or resistance)

#### Temperature Pt100/Pt1000

Measuring and control range:	-50 ... +250 °C (switchable to °F)
Accuracy:	$\leq$ 0.25 % of measuring range
Ambient temperature effect:	0.2 % /10 K

#### Temperature NTC/PTC

Measuring and control range:	0.1 ... 30 k $\Omega$ (entry via table with 20 value pairs)
Accuracy:	$\leq$ 1.5 % of measuring range
Ambient temperature effect:	0.2 % /10 K

#### Standard signal

Measuring and control range:	0(4) ... 20 mA or 0 ... 10 V
Accuracy:	0.25 % of measuring range
Ambient temperature effect:	0.2 % /10 K

#### Resistance transmitter

Measuring and control range:	minimal: 100 $\Omega$ , maximal 3 k $\Omega$
Accuracy:	$\pm$ 5 $\Omega$
Ambient temperature effect:	0.1 % /10 K

### Binary inputs (standard)

Activation:	Floating contact is open: function is not active Floating contact is closed: function is active
Function:	Key lock, manual mode, HOLD, HOLD inverse, alarm suppression, freeze measured value, level lock, reset partial quantity, reset total quantity, parameter set changeover



**Technical Data** (suite)

**Outputs (standard)**

**2 relay (changeover contact)**

Contact rating: 5 A at 240 V<sub>AC</sub> resistive load  
Contact service life: 350 000 operations at nominal load  
750 000 operations at 1 A

**Sensor supply for 2-wire transmitter**

17 V<sub>DC</sub> at 20 mA, open-circuit voltage approx. 25 V<sub>DC</sub>

**Controller (standard)**

(see manual for configuration examples)

Controller type: Limit comparators, limit controllers,  
pulse length controllers, pulse  
frequency controllers, modulating  
controllers, continuous controllers

Controller structure: P / PI / PD / PID

**Optional boards**

To extend functionality the units can be retrofitted with up to 3 optional boards.

**Inputs (optional max. 3)**

**Optional board standard signal**

Measuring range: 0(2) ... 10V, 0 ... 1V  
(input resistance R<sub>E</sub> > 100 kΩ)  
0(4) ... 20 mA  
(Voltage drop ≤ 1.5 V)  
resistance sensor, min. 100 Ω,  
max. 4kΩ

Measuring accuracy: ≤ 0.05 % (resistance ± 4 Ω)

Ambient

temperature effect: 100 ppm/K

**Power supply external sensors (optional max. 3)**

**Optional boards supply ISFET**

Output voltage: ± 5 V<sub>DC</sub>, 5 mA

**Optional boards supply proximity switch**

Output voltage: 12 V<sub>DC</sub>, 10 mA

**Outputs (optional max. 3)**

**Optional board 1 relay**

Switching function: changeover contact  
Contact rating: 8 A at 240 V<sub>AC</sub> resistive load  
Contact service life: 100 000 operations at nominal load  
350 000 operations at 3 A

**Optional board double relay**

Switching function: NO with common pin  
Contact rating: 3 A bei 240 V<sub>AC</sub> resistive load  
Contact service life: 350 000 operations at nominal load  
900 000 operations at 1 A

**Optional board semiconductor relay TRIAC**

Contact rating: 1 A at 240 V<sub>AC</sub>  
Protective circuit: Varistor

**Optional board 2 semiconductor relay Photo-MOS**

Contact rating: U ≤ 50 V<sub>AC/DC</sub>  
Protective circuit: I ≤ 200 mA

**Optional board analogue output**

Measuring range: 0(2) ... 10V, 0 (4) ... 20 mA  
Load resistance: R<sub>load</sub> ≤ 500 Ω  
Accuracy: ≤ 0,5 %

**Interfaces / data logger (optional max. 1)**

**Optional board RS 422/ 485**

Protocol: Modbus, Modbus Integer  
Baud rate: 9600, 19200, 38400  
Device address: 0 ... 255  
Max. number of participants: 32

**Optional board Profibus DP**

Device address: 0 ... 255

**Optional board RS 485 with data logger**

The readout of data is only possible with the PC setup software! Further processing is possible with "Office" products.

Data sets: up to 43 500 data sets  
(rings buffer)

Readout: depending on the resolution  
10 hours up to 150 days



Order Details (Example: APM-1 E 1 0 0 0 Y)

Model	Version	Housing	Power supply	Option 1 (Optional board)	Option 2 (Optional board)	Option 3 (Optional board)	Special
APM Evaluation electronics pH/redox	1 = Compact-Line (new) Input: 1x pH/redox, 1x temperature/ standard signal, 2x binary input sensor supply: 2-wire transmitter, 2 relays	E = for panel mounting F = Field housing S = Field housing with wall mounting bracket R = Field housing with pipe mounting bracket	1 = 110...240 V <sub>AC</sub> -15%/+10%, 48...63 Hz 2 = 20...30 V <sub>AC/DC</sub> , 48...63 Hz	4 = analogue output 0(4)-20 mA, 0(2)-10V <b>(Standard)</b> 0 = without 1 = universal input (resistance, current, voltage) 2 = 1 relay (changeover contact) 3 = 2 relays (NO with common pin) 5 = 2 Photo-Mos relay switch (0.2A) 6 = 1 semiconductor relay TRIAC (1A) 7 = 1 power supply 4.85V (e. g. for ISFET sensor) 8 = 1 power supply 12V <sub>DC</sub> (e. g. for inductive proximity switch)	0 = without 1 = universal input (resistance, current, voltage) 2 = 1 relay (changeover contact) 4 = analogue output 0(4)-20 mA, 0(2)-10V 5 = 2 Photo-Mos relay switch (0.2 A) 6 = 1 semiconductor relay TRIAC (1A) 7 = 1 power supply 4.85V (e. g. for ISFET sensor) 8 = 1 power supply 12 V <sub>DC</sub> (e. g. for inductive proximity switch)	0 = without 1 = universal input (resistance, current, voltage) 2 = 1 relay (changeover contact) 3 = 2 Relais (NO with common pin) 4 = analogue output 0(4)-20 mA, 0(2)-10 V 5 = 2 Photo-Mos relay switch (0.2 A) 6 = 1 semiconductor relay TRIAC (1A) 7 = 1 power supply 4.85 V (e. g. for ISFET sensor) 8 = 1 power supply 12 V <sub>DC</sub> (e. g. for inductive proximity switch) S = Interface RS 422/485 D = Data logger with interface RS 485 <sup>1)</sup> P = Interface Profibus DP	0 = without (factory set) Y = adjusted according to customer specification

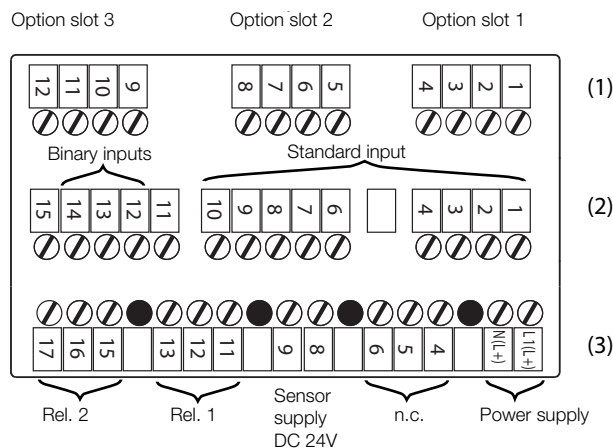
<sup>1)</sup> The readout of data is only possible with the PC setup software! Note: All languages are available in the device menu and can be changed by the customer at any time. The factory default setting of a language (except for "German") entail additional costs.

Accessories for transmitter APM-1 and ACM-1

Version	Code
Setup-Software	ACM-Soft
PC-Interface with transducer USB/TTL with adapter (pins/connector)	ACM-Int
Mounting bracket for top hat rail, front size (96 x 48 mm)	ACM-Halt

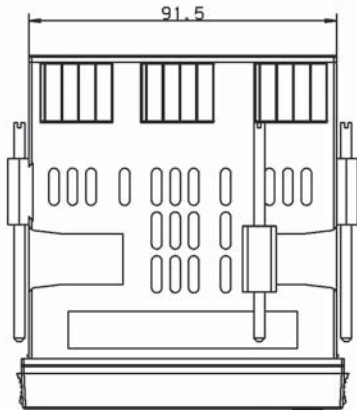
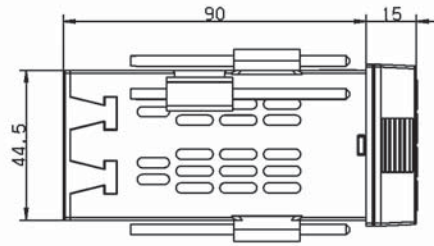
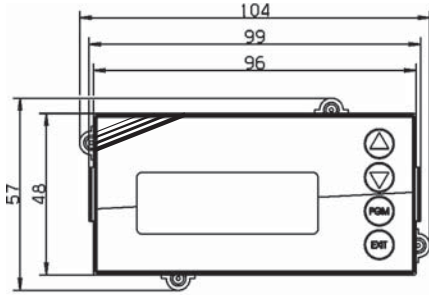
Electrical connection

(For details see manual or configuration sheet)

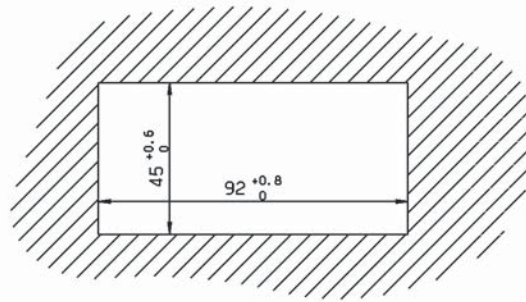




**Dimensions**  
Panel Mounting



**Panel cut-out**



**Field Housing**

