

proense®

AUTOMATIONDIRECT.com



SCU - 2200

Universal
Analog to
Frequency (I/f)
Converter

User Manual



Universal I/f converter SCU-2200

Table of contents

Warning	3
Symbol identification	3
Safety instructions	3
How to detach SCU-2200	5
Application	6
Technical characteristics	6
Mounting / installation / programming	6
Applications	7
SCU-PDM1 or SCU-PDM2 display / programming front	8
Mounting / demounting the SCU-PDM1 or SCU-PDM2	8
Electrical specifications	9
Visualization on the SCU-PDM1 or SCU-PDM2 of sensor error detection and input signal outside range	13
Signal conditioning limits	13
Sensor error detection limits	13
Error indications	14
Connections	15
Block diagram	16
Configuration / operating the function keys	17
Routing diagram	20
Routing diagram, advanced settings (ADV.SET)	23
Help text overview	24

Warning



GENERAL

This device is designed for connection to hazardous electric voltages. Ignoring this warning can result in severe personal injury or mechanical damage.

To avoid the risk of electric shock and fire, the safety instructions of this guide must be observed and the guidelines followed. The specifications must not be exceeded, and the device must only be applied as described in the following.

Prior to the commissioning of the device, this installation guide must be examined carefully.

Only qualified personnel (technicians) should install this device. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.



**HAZARD-
OUS
VOLTAGE**

Warning

Until the device is fixed, do not connect hazardous voltages to the device. The following operations should only be carried out on a disconnected device and under ESD safe conditions:

General mounting, connection and disconnection of wires.

Troubleshooting the device.



CAUTION

Warning



**INSTAL-
LATION**

Do not open the front plate of the device as this will cause damage to the connector for the display / programming front SCU-PDM1 or SCU-PDM2.

This device contains no DIP-switches or jumpers.

SCU-2200 must be mounted on a DIN rail according to DIN EN 60715.

Symbol identification



Triangle with an exclamation mark: Warning / demand. Potentially lethal situations. Read the manual before installation and commissioning of the device in order to avoid incidents that could lead to personal injury or mechanical damage.



The CE mark proves the compliance of the device with the essential requirements of the directives.



The double insulation symbol shows that the device is protected by double or reinforced insulation.

Safety instructions

Definitions

Hazardous voltages have been defined as the ranges: 75 to 1500 Volt DC, and 50 to 1000 Volt AC.

Technicians are qualified persons educated or trained to mount, operate, and also trouble-shoot technically correct and in accordance with safety regulations.

Operators, being familiar with the contents of this manual, adjust and operate the knobs or potentiometers during normal operation.

Receipt and unpacking

Unpack the device without damaging it and check whether the device type corresponds to the one ordered. The packing should always follow the device until this has been permanently mounted.

Environment

Avoid direct sun light, dust, high temperatures, mechanical vibrations and shock, and rain and heavy moisture. If necessary, heating in excess of the stated limits for ambient temperatures should be avoided by way of ventilation.

The device must be installed in pollution degree 2 or better.

The device is designed to be safe at least under an altitude up to 2 000 m.

The device is designed for indoor use.

Mounting

Only technicians who are familiar with the technical terms, warnings, and instructions in the manual and who are able to follow these, should connect the device. Should there be any doubt as to the correct handling of the device, please contact

www.automationdirect.com

Mounting and connection of the device should comply with national legislation for mounting of electric materials, i.e. wire cross section, protective fuse, and location.

Stranded wire should be installed with an insulation stripping length of 5 mm or via a suitable insulated terminal such as a bootlace ferrule.

Descriptions of input / output and supply connections are shown in the block diagram and side label.

The following apply to fixed hazardous voltages-connected devices:

The max. size of the protective fuse is 10 A and, together with a power switch, it should be easily accessible and close to the device. The power switch should be marked with a label indicating that it will switch off the voltage to the device.

Year of manufacture can be taken from the first two digits in the serial number.

UL installation requirements

Use 60/75°C copper conductors only

For use only in pollution degree 2 or better

Max. ambient temperature 60°C

Max. wire size. AWG 26-14

UL file number E191072

Calibration and adjustment

During calibration and adjustment, the measuring and connection of external voltages must be carried out according to the specifications of this manual. The technician must use tools and instruments that are safe to use.

Normal operation

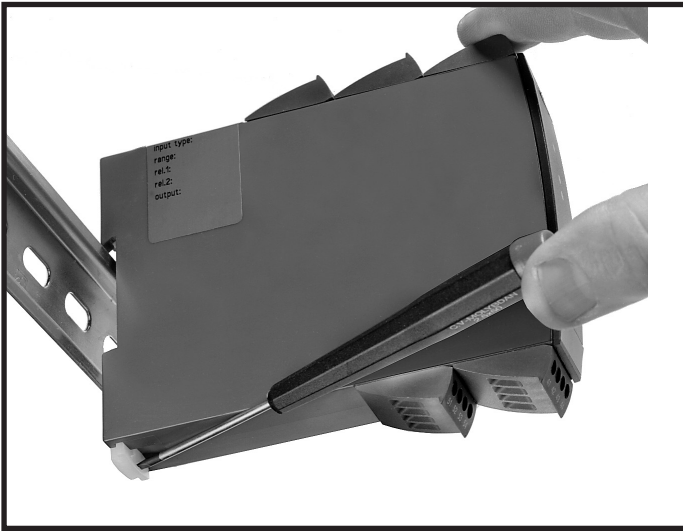
Operators are only allowed to adjust and operate devices that are safely fixed in panels, etc., thus avoiding the danger of personal injury and damage. This means there is no electrical shock hazard, and the device is easily accessible.

Cleaning

When disconnected, the device may be cleaned with a cloth moistened with distilled water.

How to detach SCU-2200

First, remember to demount the connectors with hazardous voltages.



Picture 1:

The device is detached from the DIN rail by moving the bottom lock down.

Universal I/f converter

SCU-2200

- Input for RTD, TC, Ohm, potentiometer, mA and V
- Frequency output NPN, PNP and TTL
- Generates frequencies from 0...25000 Hz
- 2-wire supply > 16 V
- Universal AC or DC supply

Application

- Linearized, electronic temperature measurement with RTD or TC sensor.
- Conversion of linear resistance variation to a frequency signal, e.g. from solenoids and butterfly valves or linear movements with attached potentiometer.
- Power supply and signal isolator for 2-wire transmitters.
- Process control by way of a frequency signal transmitted to e.g. a PLC or a process computer.
- Galvanic separation and conversion of analog signals to frequency signals.

Technical characteristics

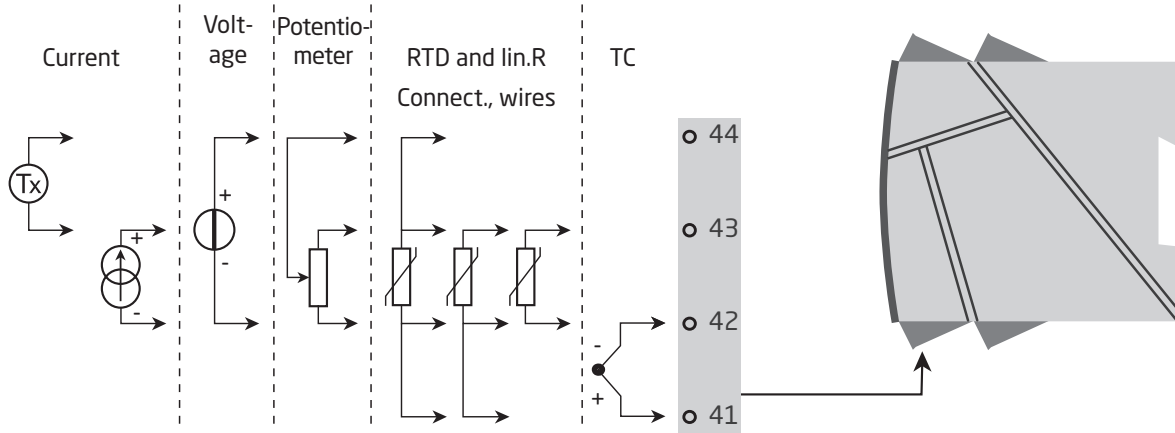
- When SCU-2200 is used in combination with the SCU-PDM1 or SCU-PDM2 display / programming units, all operational parameters can be modified to suit any application. As the SCU-2200 is designed with electronic hardware switches, it is not necessary to open the device for setting of DIP-switches.
- A green front LED indicates normal operation.
- Continuous check of vital stored data for safety reasons.
- 3-port 2.3 kVAC galvanic isolation.

Mounting / installation / programming

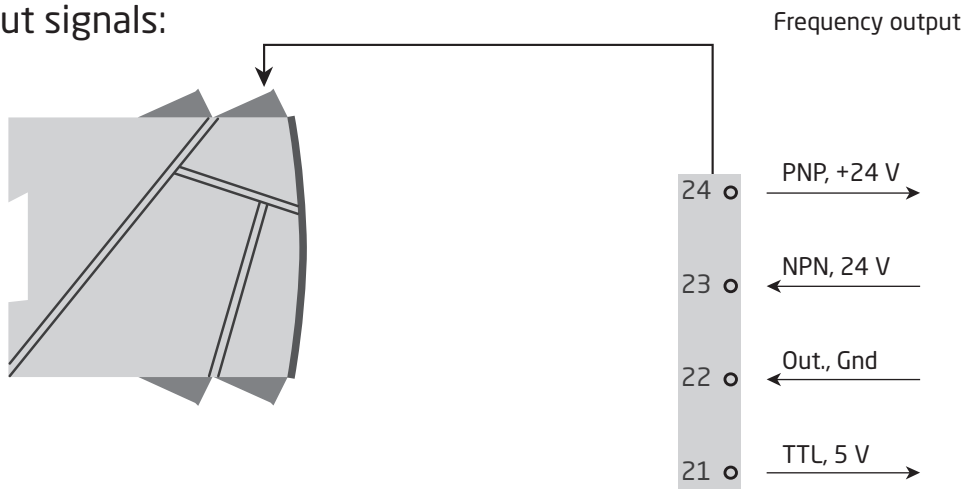
- Very low power consumption means units can be mounted side by side without an air gap - even at 60°C ambient temperature.
- Configuration, monitoring, 2-point process calibration and more are accomplished using the SCU-PDM1 or SCU-PDM2 detachable displays.
- All programming can be password-protected.

Applications

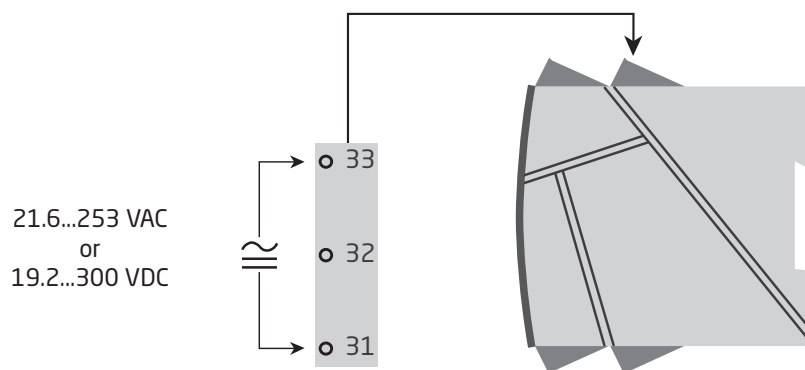
Input signals:



Output signals:



Supply:



SCU-PDM1 or SCU-PDM2 display / programming front

Functionality

The simple and easily understandable menu structure and the explanatory help texts guide you effortlessly and automatically through the configuration steps, thus making the product very easy to use. Functions and configuration options are described in the section "Configuration / operating the function keys".

Application

- Communications interface for modification of operational parameters in SCU-2200.
- Can be moved from one SCU-2200 device to another and download the configuration of the first unit to subsequent units.
- Fixed display for readout of process data and status.

Technical characteristics

- SCU-PDM1 LCD display with 4 lines:
 - Line 1 (H=5.57 mm) shows the input signal.
 - Line 2 (H=3.33 mm) shows the selected engineering unit.
 - Line 3 (H=3.33 mm) alternates between digital output value and scaling (kHz, Hz, mHz, P/m, P/h, P/d) or shows TAG no.
 - Line 4 shows tendency readout for the input signal and communication status.
- SCU-PDM2 LCD display with 4 lines:
 - Line 1 (H=5mm) shows the input signal.
 - Line 2 (H=3.5 mm) shows the selected engineering unit.
 - Line 3 (H=3.5 mm) alternates between digital output value and scaling (kHz, Hz, mHz, P/m, P/h, P/d) or shows TAG no.
 - Line 4 shows tendency readout for the input signal and communication status.
- Programming access can be blocked by assigning a password. The password is saved in the device in order to ensure a high degree of protection against unauthorized modifications to the configuration.



SCU-PDM1



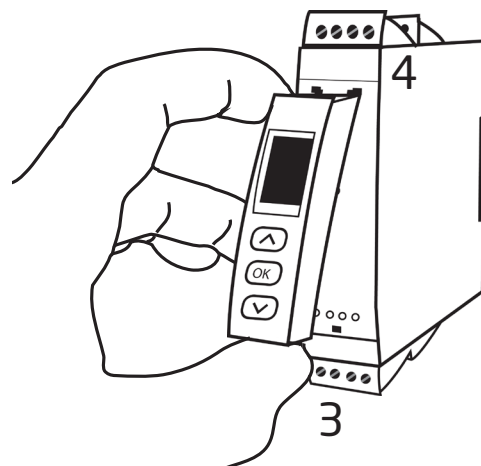
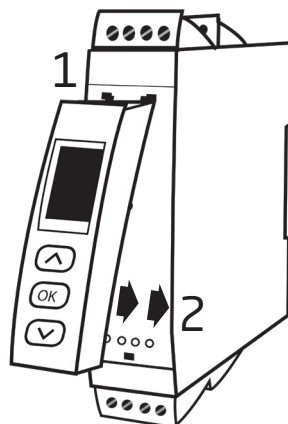
SCU-PDM2

Mounting / demounting the SCU-PDM1 or SCU-PDM2

- 1: Insert the tabs of the SCU-PDM1 or SCU-PDM2 into the holes at the top of the device.
- 2: Hinge the SCU-PDM1 or SCU-PDM2 down until it snaps into place.

Demounting of the SCU-PDM1 or SCU-PDM2

- 3: Push the release button on the bottom of the SCU-PDM1 or SCU-PDM2 and hinge the SCU-PDM1 or SCU-PDM2 out and up.
- 4: With the SCU-PDM1 or SCU-PDM2 hinged up, remove from holes at the top of the device.



Electrical specifications

Environmental conditions

Operating temperature	-20°C to +60°C
Storage temperature	-20°C to +85°C
Calibration temperature.	20...28°C
Relative humidity	< 95% RH (non-cond.)
Protection degree	IP20
Installation in pollution degree 2 & measurement / overvoltage category II.	

Mechanical specifications

Dimensions (HxWxD)	109 x 23.5 x 104 mm (4.3 x 0.9 x 4.1 in)
Dimensions (HxWxD) w/ SCU-PDM1 or SCU-PDM2	109 x 23.5 x 116 / 131 mm (SCU-PDM1) or 144 mm (SCU-PDM2) [4.3 x 0.9 x 4.6 / 5.2 in (SCU-PDM1) or 5.67 in. (SCU-PDM2)]
Weight approx.	155 g
Weight incl. SCU-PDM1 / SCU-PDM2 (approx.).	170 g / 185 g
DIN rail type.	DIN EN 60715 - 35 mm
Wire size.	0.13...2.08 mm ² / AWG 26...14 stranded wire
Screw terminal torque.	0.5 Nm

Common electrical specifications

Supply voltage, universal.	21.6...253 VAC, 50...60 Hz or 19.2...300 VDC
Fuse	400 mA SB / 250 VAC
Max. required power.	≤ 2.5 W
Max. power dissipation	≤ 2.5 W
Isolation voltage - test	2.3 kVAC
Isolation voltage - working	250 VAC (reinforced) / 500 VAC (basic)
Communications Interface	Programming/display module, SCU-PDM2 (sold separately) or SCU-PDM1 (discontinued and replaced by SCU-PDM2)
Signal dynamics, input / output	24 bit / -
Signal / noise ratio.	> 60 dB (0...100 kHz)
Response time (0...90%, 100...10%), programmable:	
Temperature input.	1...60 s
mA / V input	≤ 400 ms

Auxiliary supplies

2-wire supply (terminal 44...43).	25...16 VDC / 0...20 mA
---	-------------------------

Accuracy, the greater of general and basic values:

General values		
Input type	Absolute accuracy	Temperature coefficient
All	$\leq \pm 0.1\%$ of span	$\leq \pm 0.01\%$ of span / °C

Basic values		
Type	Basic accuracy	Temperature coefficient
mA	$\leq \pm 4 \mu\text{A}$	$\leq \pm 0.4 \mu\text{A} / ^\circ\text{C}$
Volt	$\leq \pm 20 \mu\text{V}$	$\leq \pm 2 \mu\text{V} / ^\circ\text{C}$
Pt100	$\leq \pm 0.2^\circ\text{C}$	$\leq \pm 0.01^\circ\text{C} / ^\circ\text{C}$
Linear resistance	$\leq \pm 0.1 \Omega$	$\leq \pm 0.01 \Omega / ^\circ\text{C}$
Potentiometer	$\leq \pm 0.1 \Omega$	$\leq \pm 0.01 \Omega / ^\circ\text{C}$
TC type: E, J, K, L, N, T, U	$\leq \pm 1^\circ\text{C}$	$\leq \pm 0.05^\circ\text{C} / ^\circ\text{C}$
TC type: B, R, S, W3, W5, LR	$\leq \pm 2^\circ\text{C}$	$\leq \pm 0.2^\circ\text{C} / ^\circ\text{C}$

EMC - immunity influence.	$< \pm 0.5\%$ of span
Extended EMC immunity: NAMUR NE Z1, A criterion, burst	$< \pm 1\%$ of span

Input specifications

RTD, linear resistance and potentiometer input

Input for RTD types:

Pt10, Pt20, Pt50, Pt100, Pt200, Pt250, Pt300, Pt400, Pt500, Pt1000

Ni50, Ni100, Ni120, Ni1000

Input type	Min. value	Max. value	Standard
Pt10...Pt1000	-200°C	+850°C	IEC 60751
Ni50...Ni1000	-60°C	+250°C	DIN 43760
Lin. R	0 Ω	10000 Ω	-
Potentiometer	10 Ω	100 kΩ	-

Cable resistance per wire (max.), RTD 50 Ω

Sensor current, RTD Nom. 0.2 mA

Effect of sensor cable resistance (3- / 4-wire), RTD $< 0.002 \Omega / \Omega$

Sensor error detection, RTD Yes

Short circuit detection, RTD $< 15 \Omega$

TC input

Type	Min. value	Max. value	Standard
B	+400°C	+1820°C	IEC 60584-1
E	-100°C	+1000°C	IEC 60584-1
J	-100°C	+1200°C	IEC 60584-1
K	-180°C	+1372°C	IEC 60584-1
L	-200°C	+900°C	DIN 43710
N	-180°C	+1300°C	IEC 60584-1
R	-50°C	+1760°C	IEC 60584-1
S	-50°C	+1760°C	IEC 60584-1
T	-200°C	+400°C	IEC 60584-1
U	-200°C	+600°C	DIN 43710
W3	0°C	+2300°C	ASTM E988-90
W5	0°C	+2300°C	ASTM E988-90
LR	-200°C	+800°C	GOST 3044-84

Cold junction compensation (CJC):

via internally mounted sensor < ±1.0 °C

Sensor error detection, all TC types. Yes

Sensor error current:

when detecting Nom. 2 µA

else. 0 µA

Current input

Measurement range 0...23 mA

Programmable measurement ranges 0...20 and 4...20 mA

Input resistance Nom. 20 Ω + PTC 50 Ω

Sensor error detection:

Loop break 4...20 mA Yes

Voltage input

Measurement range 0...12 VDC

Programmable measurement ranges 0...1 / 0.2...1 / 0...2.5 / 0.5...2.5 /
0...5 / 1...5 / 0...10 and 2...10 VDC

Input resistance, nom. 10 MΩ

Output specifications

Frequency output

Frequency range 0...25000 Hz

Min. frequency (span) 0 Hz

Duty cycle (0...25000 Hz). 50% or

Programmable pulse time ($f \leq 500$ Hz). 1...1000 ms (max. 90% duty cycle)

PNP output

I_{out} max. 30 mA

V_{out} 24 VDC ± 10%

C_{out}. 10 nF

R_{out} typ. 20 Ω

Electromechanical counter 24 V / 135 mA / 20 ms / ≤ 10 Hz

NPN output

I_{sink} max. 150 mA

I_{sink} max. peak 300 mA

External voltage (terminal 23) max. 55 VDC

C_{out}. 10 nF

R_{out} typ. 10 Ω

TTL output

Isink/source max.	15 mA
Isink/source peak	100 mA
Vout	5 V ±5%
Cout.	10 nF
Rout typ.	55 Ω

Sensor error detection

Programmable	0...26250 Hz
------------------------	--------------

of span = of the currently selected measurement range

Observed authority requirements

EMC.	2014/30/EU
LVD.	2014/35/EU
RoHS.	2011/65/EU

Approvals:

c UL us, UL 508.	E191072
--------------------------	---------

Visualization on the SCU-PDM1 or SCU-PDM2 of sensor error detection and input signal outside range

Sensor error check:		
Device	Configuration	Sensor error detection:
SCU-2200	OUT.ERR=NO	OFF
	Else:	ON

Signal conditioning limits

Outside range readout (IN.LO, IN.HI): If the valid range of the A/D converter or the polynomial is exceeded			
Input	Range	Readout	Limit
VOLT	0...1 V / 0.2...1 V	IN.LO	< -25 mV
		IN.HI	> 1.2 V
	0...2.5 / 0.5...2.5 / 0...5 V / 1...5 V / 0...10 V / 2...10 V	IN.LO	< -25 mV
		IN.HI	> 12 V
CURR	0...20 mA / 4...20 mA	IN.LO	< -1.05 mA
		IN.HI	> 25.05 mA
LIN.R	0...800 Ω	IN.LO	< 0 Ω
		IN.HI	> 1075 Ω
	0...10 kΩ	IN.LO	< 0 Ω
		IN.HI	< 110 kΩ
POTM	Min. readout = 0%, Max. readout = 100%	IN.LO	< -0.5 %
		IN.HI	> 100.5 %
TEMP	TC / RTD	IN.LO	< temperature range -2°C
		IN.HI	> temperature range +2°C


Display readout below min. / above max. (-1999, 9999):			
Input	Range	Flashing readout	Limit
All	All	-1999	Display readout < -1999
		9999	Display readout > 9999

Sensor error detection limits

Sensor error detection (SE.BR, SE.SH):			
Input	Range	Readout	Limit
CURR	Loop break (4...20 mA)	SE.BR	<= 3.6 mA; > = 21 mA
POTM	All, SE.BR on all 3-wire	SE.BR	> ca. 126 kΩ
LIN.R	0...800 Ω	SE.BR	> ca. 875 Ω
	0...10 kΩ	SE.BR	> ca. 11 kΩ
TEMP	TC	SE.BR	> ca. 750 kΩ / (1.25 V)
	RTD, 2-, 3-, and 4-wire No SE.SH for Pt10, Pt20 and Pt50	SE.BR	> ca. 15 kΩ
		SE.SH	< ca. 15 Ω

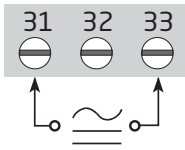
Error indications

Readout at hardware error		
Error search	Readout	Cause
Test of internal CJC sensor	CJ.ER	CJC sensor defect or temperature outside range
Checksum test of the configuration in FLASH	FL.CO	Error in FLASH
Communications test SCU-PDM1 or SCU-PDM2 / SCU-2200	NO.CO	Connection error
Check that input signal matches input configuration	IN.ER	1) Error levels on input
Check that saved configuration in SCU-PDM1 or SCU-PDM2 matches device	TY.ER	Configuration is not SCU-2200

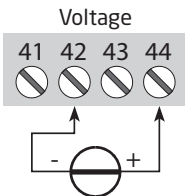
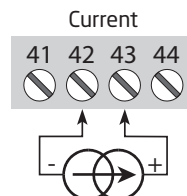
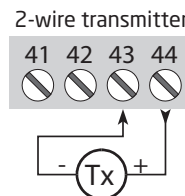
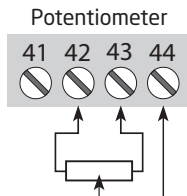
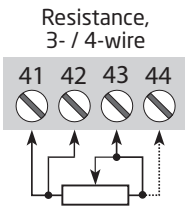
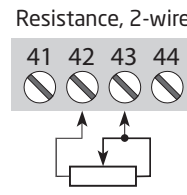
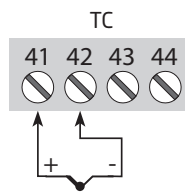
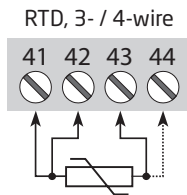
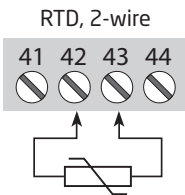
<p>! All error indications in the display flash once per second. The help text explains the error. If the error is a sensor error, the display backlight flashes as well - this is acknowledged (stopped) by pushing the  button.</p>
<p>1) The error is reset by switching off and then switching on the supply voltage to the device.</p>

Connections

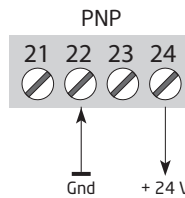
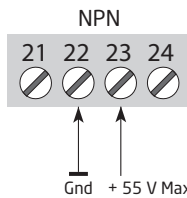
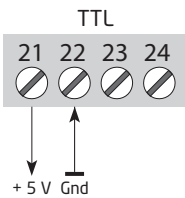
Supply



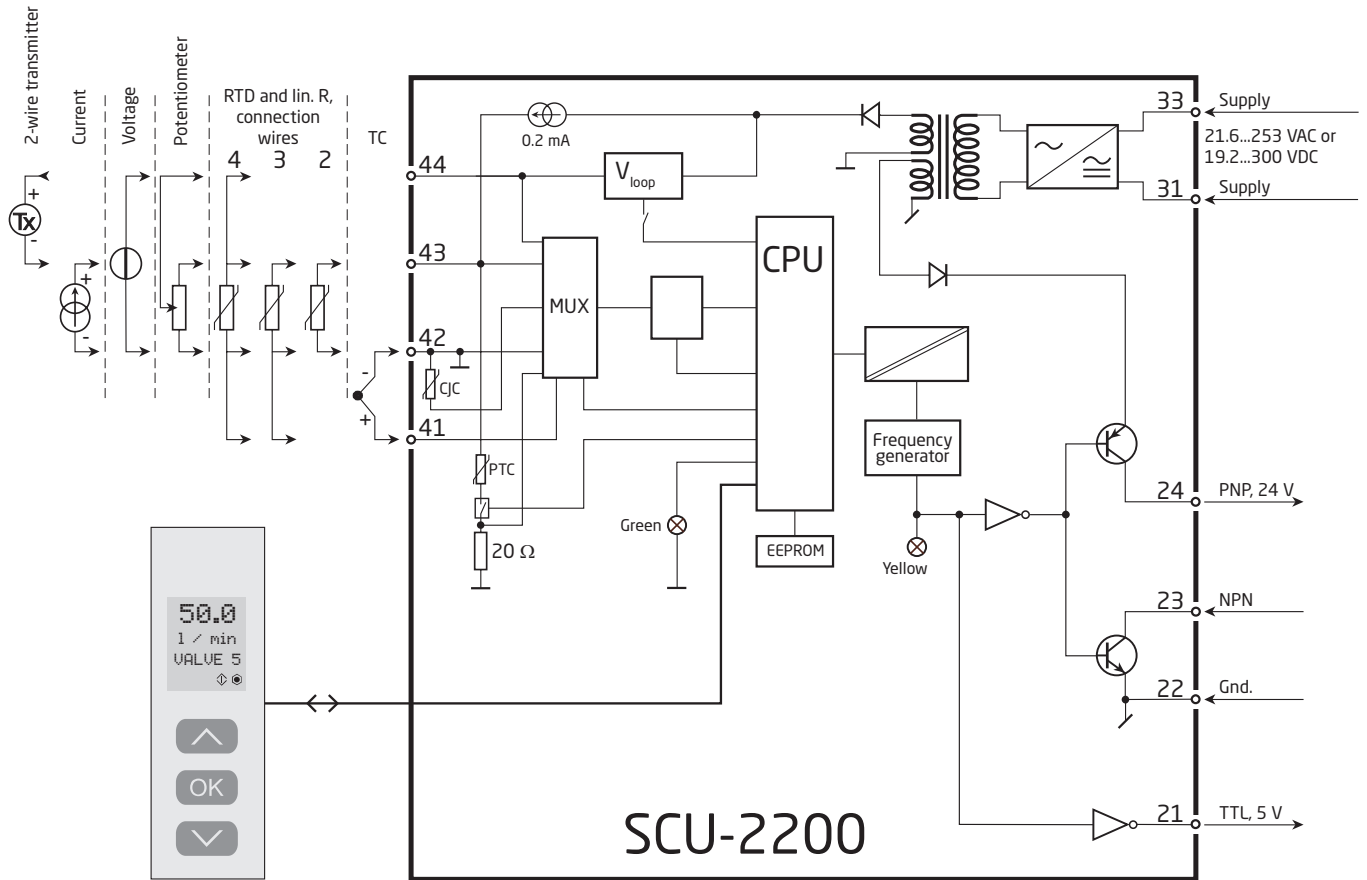
Inputs:



Outputs:



Block diagram



Configuration / operating the function keys

Documentation for routing diagram.

In general

When configuring the SCU-2200, you will be guided through all parameters and you can choose the settings which fit the application. For each menu there is a scrolling help text which is automatically shown in line 3 on the display.

Configuration is carried out by use of the 3 function keys:

- ⏪ will increase the numerical value or choose the next parameter
- ⏩ will decrease the numerical value or choose the previous parameter
- ⏹ will save the chosen value and proceed to the next menu

When configuration is completed, the display will return to the default state 1.0. Pressing and holding ⏹ will return to the previous menu or return to the default state (1.0) without saving the changed values or parameters.

If no key is activated for 1 minute, the display will return to the default state (1.0) without saving the changed values or parameters.

Further explanations

Password protection: Programming access can be blocked by assigning a password. The password is saved in the device in order to ensure a high degree of protection against unauthorized modifications to the configuration.

Signal and sensor error info via display front SCU-PDM1 or SCU-PDM2

Sensor error (see limits in the table) is displayed as SE.BR (sensor break) or SE.SH (sensor short). Signals outside the selected range (not sensor error, see table for limits) are displayed as IN.LO indicating low input signal or IN.HI indicating high input signal. The error indication is displayed in line 3 as text and at the same time the backlight flashes. Line 4 of the display is a status line which displays COM (flashing bullet) indicating correct functioning of SCU-PDM1 or SCU-PDM2 and arrow up/down which indicates tendency readout of the input signal.

Signal and sensor error indication without display front

Status of the unit can also be read from the red / green LED in the front of the device.

- Green flashing LED 13 Hz indicates normal operation.
- Green flashing LED 1 Hz indicates sensor error.
- Steady green LED indicates internal error.

Advanced functions

The unit gives access to a number of advanced functions which can be reached by answering "Yes" to the point "ADV.SET".

Memory (MEM): In the memory menu you can save the configuration of the device in the SCU-PDM1 or SCU-PDM2, and then move the SCU-PDM1 or SCU-PDM2 onto another device of the same type and download the configuration in the new device.

Display setup (DISP): Here you can adjust the brightness contrast and the backlight. Setup of TAG numbers with 6 alphanumeric. Selection of functional readout in line 3 of the display. This line can either show the digital output or the TAG number.

Two-point process calibration (CAL): The device can be process-calibrated in 2 points to fit a given input signal. A low input signal (not necessarily 0%) is applied and the actual value is entered via SCU-PDM1 or SCU-PDM2. Then a high signal (not necessarily 100%) is applied and the actual value is entered via SCU-PDM1 or SCU-PDM2. If you accept to use the calibration, the device will work according to this new adjustment. If you later reject this menu point or choose another type of input signal the device will return to factory calibration.

Process simulation function (SIM): In the menu point "EN.SIM" it is possible to simulate an input signal by means of the arrow keys and thus control the output signal up or down. You must exit the menu by pressing ⏹ (no time-out). The simulation function exits automatically, if the SCU-PDM1 or SCU-PDM2 is detached.

Password (PASS): Here you can choose a password between 0000 and 9999 in order to protect the unit against unauthorized modifications to the configuration. The unit is delivered default without password.

Language (LANG): In the menu "LANG" you can choose between 7 different language versions of help texts that will appear in the menu. You can choose between UK, DE, FR, IT, ES, SE and DK.

Auto diagnosis

The device performs an advanced auto diagnosis of the internal circuits.

The following possible errors can be displayed in the front unit SCU-PDM1 or SCU-PDM2.

CJ.ER - CJC sensor defect or CJC temperature outside range

FL.ER - Flash error

NO.CO - Connection error

IN.ER - Error levels on input

TY.ER - Configuration in SCU-PDM1 or SCU-PDM2 does not match this product type

Selection of units

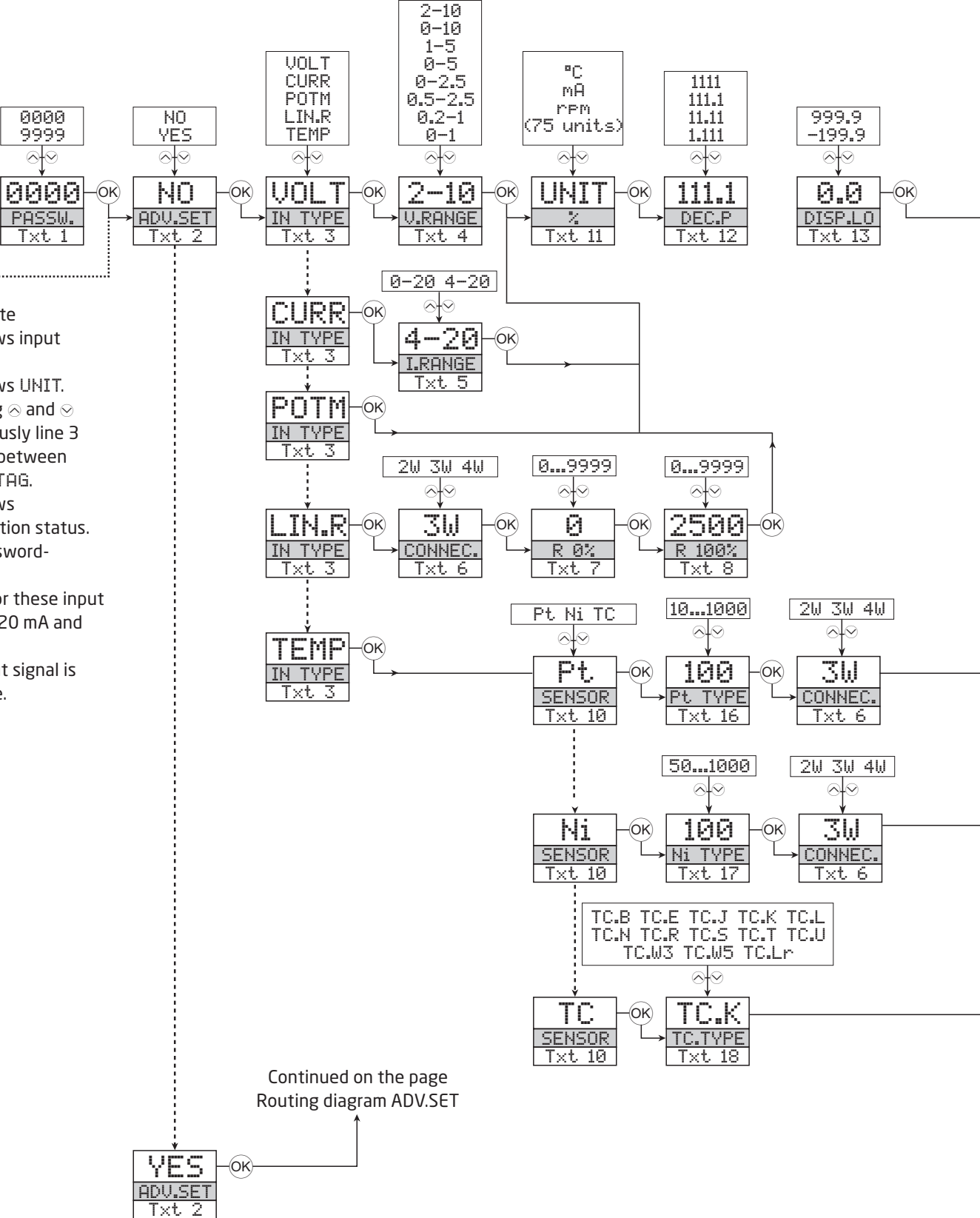
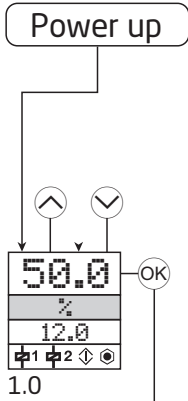
After choosing the input signal type you can choose which process units should be displayed in text line 2 (see table). By selection of temperature input the process value is always displayed in Celsius or Fahrenheit. This is selected in the menu point after selection of temperature input.

This page intentionally blank

Routing diagram

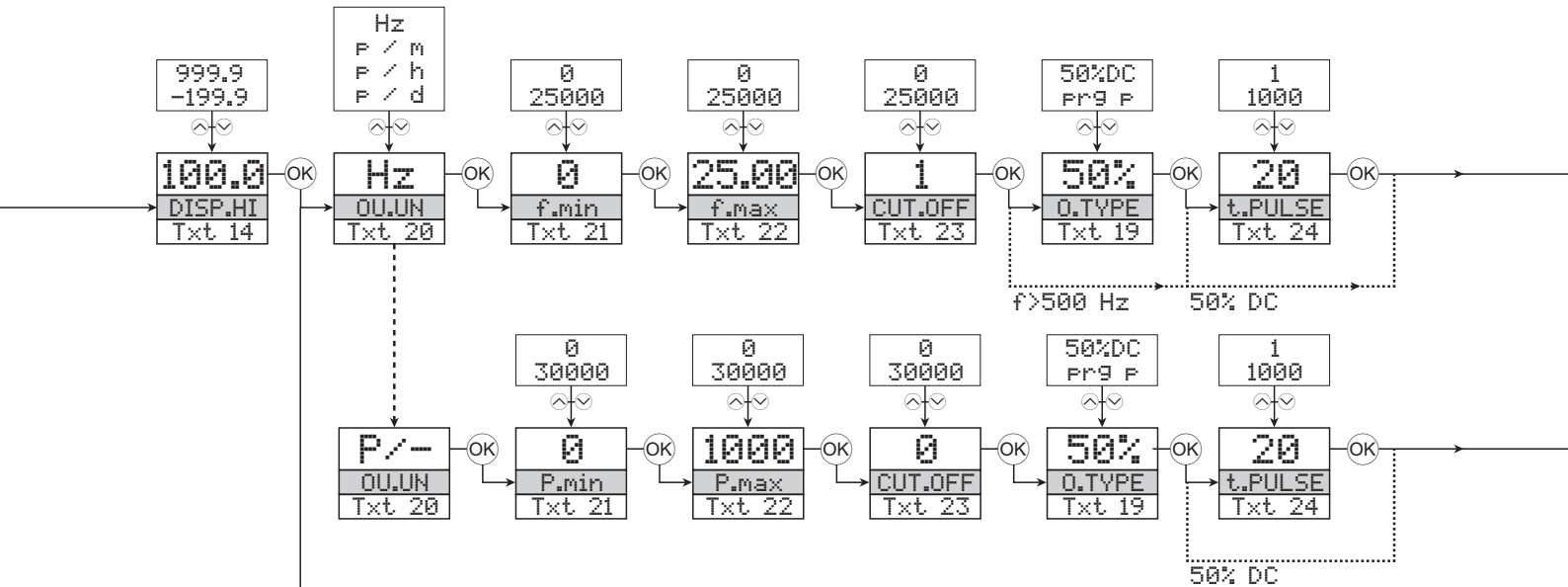
If no key is activated for 1 minute, the display will return to the default state 1.0 without saving configuration changes.

- ⬆ Increase value / choose next parameter
- ⬇ Decrease value / choose previous parameter
- ⊗ Save the chosen value and proceed to the next menu
- Hold ⊗ Back to previous menu / return to menu 1.0 without saving.

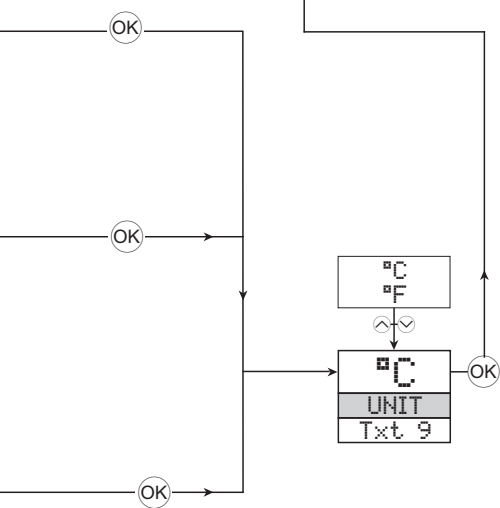


- 1.0 = Default state
Line 1 shows input signal.
Line 2 shows UNIT.
By pressing ⬆ and ⬇ simultaneously line 3 alternates between f.Out and TAG.
Line 4 shows communication status.
- 1.1 = Only if password-protected.
- 1.2 = Not valid for these input signals: 0...20 mA and voltage.
- 1.3 = Only if input signal is temperature.

Continued on the page
Routing diagram ADV.SET

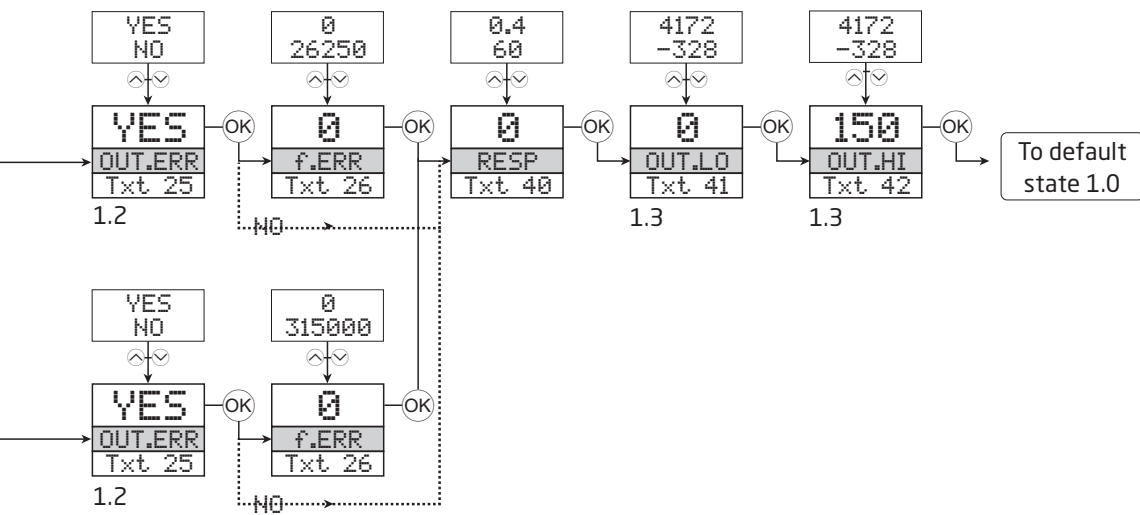


Continued on the next page



Selectable UNITS:

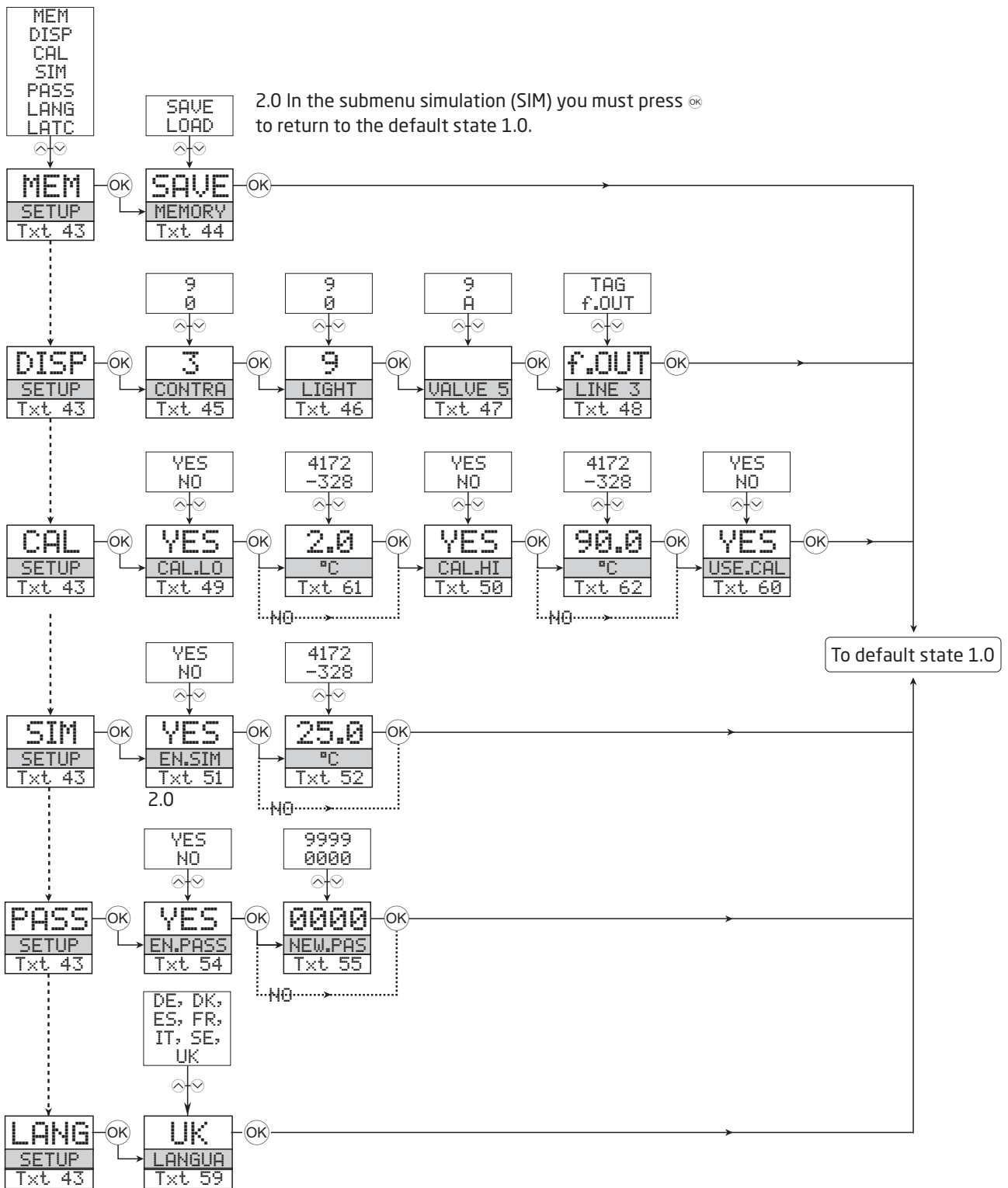
%	hPa	kWh	mils	Pa
°C	Hz	l	min	PH
°F	in	l/h	mm	rPM
A	in/h	l/min	mm/s	s
bar	in/min	l/s	mm/s^2	S
cm	in/s	m	mol	t
ft	l/s	m/h	MPa	t/h
ft/h	K	m/min	mV	uA
ft/min	kA	m/s	MW	um
ft/s	kG	m/s^2	MWh	uS
g	kHz	m3	N	V
gal/h	kJ	m3/h	Ohm	W
gal/min	kPa	m3/min	P/day	Wh
GW	kV	mbar	P/h	yd
hp	kW		P/min	[blank]



1.2 = Not valid for these input signals: 0...20 mA and voltage.

1.3 = Only if input signal is temperature.

Routing diagram, advanced settings (ADV.SET)



Help text overview

- [01] Set correct password
- [02] Enter advanced setup menu?
- [03] Select temperature input
 - Select potentiometer input
 - Select linear resistance input
 - Select current input
 - Select voltage input
- [04] Select 0.0-1 V input range
 - Select 0.2-1 V input range
 - Select 0-2.5 V input range
 - Select 0.5-2.5 V input range
 - Select 0-5 V input range
 - Select 1-5 V input range
 - Select 0-10 V input range
 - Select 2-10 V input range
- [05] Select 0-20 mA input range
 - Select 4-20 mA input range
- [06] Select 2-wire sensor connection
 - Select 3-wire sensor connection
 - Select 4-wire sensor connection
- [07] Set 0% resistance value
- [08] Set 100% resistance value
- [09] Select Celsius as temperature unit
 - Select Fahrenheit as temperature unit
- [10] Select TC sensor type
 - Select Ni sensor type
 - Select Pt sensor type
- [11] Select display unit
- [12] Select decimal point position
- [13] Set display readout low
- [14] Set display readout high
- [16] Select Pt10 as sensor type
 - Select Pt20 as sensor type
 - Select Pt50 as sensor type
 - Select Pt100 as sensor type
 - Select Pt200 as sensor type
 - Select Pt250 as sensor type
 - Select Pt300 as sensor type
 - Select Pt400 as sensor type
 - Select Pt500 as sensor type
 - Select Pt1000 as sensor type
- [17] Select Ni50 as sensor type
 - Select Ni100 as sensor type
 - Select Ni120 as sensor type
 - Select Ni1000 as sensor type
- [18] Select TC-B as sensor type
 - Select TC-E as sensor type
 - Select TC-J as sensor type
 - Select TC-K as sensor type
 - Select TC-L as sensor type
 - Select TC-N as sensor type
 - Select TC-R as sensor type
 - Select TC-S as sensor type
 - Select TC-T as sensor type
 - Select TC-U as sensor type
 - Select TC-W3 as sensor type
 - Select TC-W5 as sensor type
 - Select TC-Lr as sensor type
- [19] Select 50% duty cycle output
 - Select programmable pulse time
- [20] Select Hz as output unit
 - Select pulses/minute as output unit
 - Select pulses/hour as output unit
 - Select pulses/day as output unit
- [21] Set output frequency for 0% input
- [22] Set output frequency for 100% input
- [23] Set low cut-off frequency
- [24] Set pulse time in milliseconds
- [25] Select no error action - output undefined at error
 - Select output at specific frequency on input error
- [26] Set output frequency on input error
- [40] Set response time in seconds
- [41] Set temperature for frequency output low
- [42] Set temperature for frequency output high
- [43] Enter language setup
 - Enter password setup
 - Enter simulation mode
 - Perform process calibration
 - Enter display setup
 - Perform memory operations
- [44] Load saved configuration into module
 - Save configuration in display front
- [45] Adjust LCD contrast
- [46] Adjust LCD backlight
- [47] Write a 6-character device TAG
- [48] Output frequency is shown in display line 3
 - Device TAG is shown in display line 3
- [49] Calibrate input low to process value?
- [50] Calibrate input high to process value?
- [51] Enter simulation mode?
- [52] Simulate input value
- [54] Enable password protection?
- [55] Set new password
- [59] Select language
- [60] Use process calibration values?
- [61] Set value for low calibration point
- [62] Set value for high calibration point