



OMEGATM User's Guide



**Shop online at
*omega.com***

e-mail: *info@omega.com*
**For latest product manuals:
*www.omegamanual.info***

DRST-DC Universal Uni-/Bipolar Signal Transmitter



omega.com info@omega.com

Servicing North America:

**U.S.A.
Headquarters:**

Omega Engineering, Inc.
800 Connecticut Ave. Suite 5N01 Norwalk, CT 06854
Toll-Free: 1-800-826-6342 (USA & Canada only) Customer
Service: 1-800-622-2378 (USA & Canada only) Engineering
Service: 1-800-872-9436 (USA & Canada only)

Tel: (203) 359-1660
e-mail: info@omega.com

Fax: (203) 359-7700

For Other Locations Visit omega.com/worldwide

Universal Uni-/bipolar signal transmitter DRST-DC

Table of contents

Warning	4
Symbol identification	4
Safety instructions	5
How to demount system DRST-DC.	6
When front LED flashes red or DRSL-DISPLAY shows AO.ER.	6
Advanced features	7
Application	7
Mounting / installation / programming	7
Applications	8
DRSL-DISPLAY / programming front.	9
Mounting / demounting the DRSL-DISPLAY	9
Order	10
Accessories	10
Electrical specifications	10
Configurable input error indication and input limits	14
Square root function.	17
DRSL-DISPLAY readout of input error detection and signal "outside range".	19
Connections	20
Block diagram	21
Configuration / operating the function keys	22
Routing diagram	24
Routing diagram, advanced settings (ADV.SET)	28
Help text overview	30
Document history	32

Warning



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.

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.

Repair of the device and replacement of circuit breakers must be done by Omega Engineering only.

Warning



Do not open the front plate of the device as this will cause damage to the connector for the display / programming front DRSL-DISPLAY.

This device contains no DIP-switches or jumpers.

SYSTEM DRST-DC 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.

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 your local distributor or, alternatively,

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.

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 E248256

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.

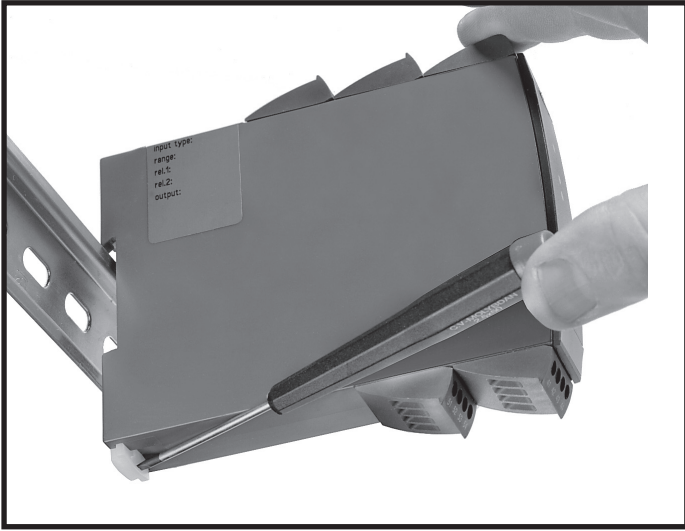
Liability

To the extent the instructions in this manual are not strictly observed, the customer cannot advance a demand against Omega Engineering that would otherwise exist according to the concluded sales agreement.

How to demount system DRST-DC

Picture 1:

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



When front LED flashes red or DRSL-DISPLAY shows A0.ER

The DRST-DC is designed with a high safety level. Therefore, the device continuously measures the output current. If "S4-20" is selected during configuration, and output current drops to 0 mA, the DRSL-DISPLAY will indicate "A0.ER" and the front LED will turn red. (A 0 mA output can be caused by an open output loop). The error mode can be reset by power cycling the device or stepping through the menu.

Universal uni-/bipolar signal transmitter

DRST-DC

- Measures uni-/bipolar DC current and voltage signals
- Passive/active current output and buffered voltage output
- Extremely good signal dynamics for spans from 25 mV to 300 VDC
- Programming, process monitoring and diagnostics via DRSL-DISPLAY
- Fast < 20 ms response time and excellent < 0.05% accuracy
- Configurable input limits
- Universally powered by 21.6...253 VAC / 19.2...300 VDC

Application

- Fast < 20 ms response time for measuring signals produced by torque, position, current & acceleration sensors.
- User configurable bipolar or unipolar I/O means DRST-DC is suitable for nearly any DC voltage or current conversion.
- Freely programmable between ± 300 VDC and ± 100 mA.
- The excitation source allows measurement of a 2-wire or 3-wire transmitter, or a potentiometer.
- The active or passive I/O makes the DRST-DC perfect for power matching current loops.
- Converts narrow bipolar inputs to wide bipolar or unipolar outputs, e.g., ± 1 volt input = ± 10 volt or 4...20 mA output.
- Selectable direct or inverse I/O makes the DRST-DC suitable for proportional control applications.
- Configurable input limits control the output value for increased safety.
- ± 20 VDC buffered voltage output for controlling devices like the PVG 32 valve (6...18 VDC).
- Connection for both passive and active inputs and outputs.
- The detachable DRSL-DISPLAY provides enhanced diagnostics.

Technical characteristics

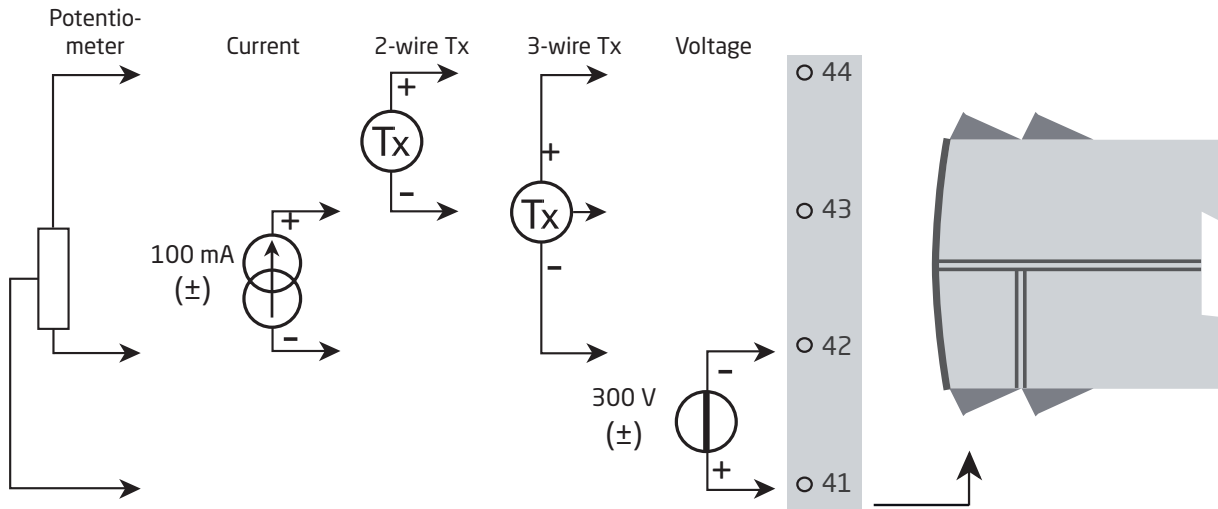
- The latest analog and digital techniques are used to obtain maximum accuracy and immunity to interference.
- Possibility of output safety readback by selecting S4...20 mA output.
- The current output can drive up to 1000 Ohms, with an adjustable response time of 0.0...60.0 seconds.
- Exceptional mA output load stability of < 0.001% of span / 100 Ohm.
- Meets the NAMUR NE21 recommendations, ensuring high accuracy in harsh EMC environments.
- Meets the NAMUR NE43 recommendations, allowing the control system to easily detect a sensor error.
- Each unit is tested to a high 2.3 kVAC, 3-port galvanic isolation level.
- Excellent signal to noise ratio of > 60 dB.

Mounting / installation / programming

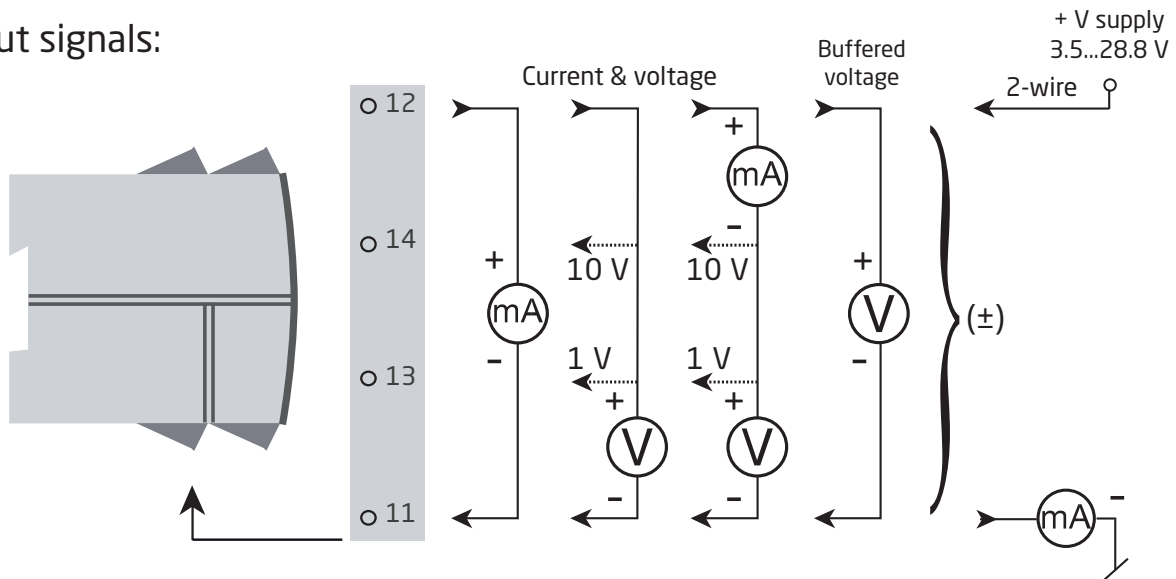
- Very low power consumption means units can be mounted side by side without an air gap - even at 60°C ambient temperature.
- Configuration, monitoring, 2-point process calibration and more are accomplished using either the DRSL- detachable display or the DRST-CM detachable digital communication enabler.
- All programming can be password-protected.

Applications

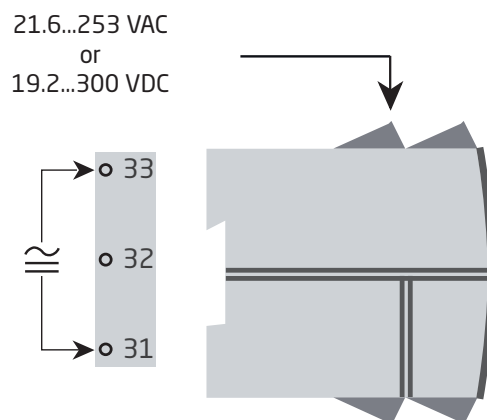
Input signals:



Output signals:



Power connection:



DRSL-DISPLAY & DRST-CM / 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 DRST-DC.
- Can be moved from one DRST-DC device to another and download the configuration of the first unit to subsequent units.
- When mounted in the process, the display shows process values and device status.



Technical characteristics

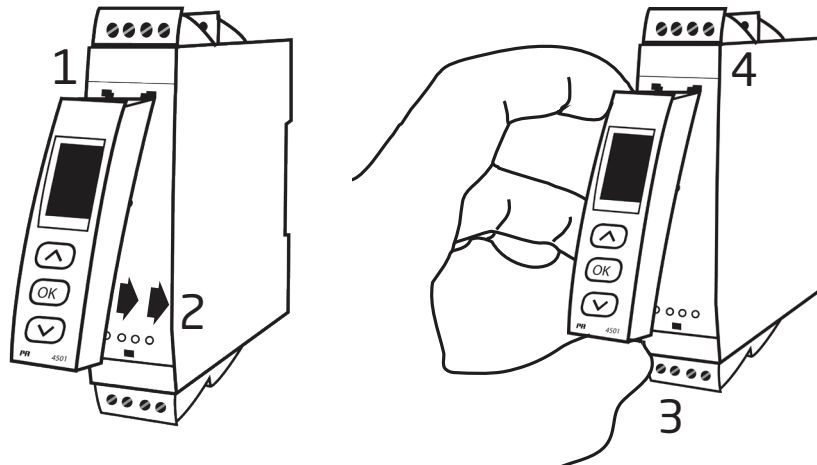
- LCD display with 4 lines:
 - Line 1 (H=5.57 mm) shows the scaled process value - OK or error.
 - Line 2 (H=3.33 mm) shows the selected engineering unit.
 - Line 3 (H=3.33 mm) shows analog output or TAG no.
 - Line 4 shows status for communication and signal trending.
- Programming access can be blocked 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.

Mounting / demounting the DRSL-DISPLAY & DRST-CM

- 1: Insert the tabs of the DRSL-DISPLAY & DRST-CM the holes at the top of the device.
- 2: Hinge the DRSL-DISPLAY & DRST-CM down until it snaps into place.

Demounting of the DRSL-DISPLAY & DRST-CM

- 3: Push the release button on the bottom of the DRSL-DISPLAY & DRST-CM and hinge the the DRSL-DISPLAY & DRST-CM out and up.
- 4: With the DRSL-DISPLAY & DRST-CM hinged up, remove from holes at the top of the device.



Order

DRST-DC = Universal uni-/bipolar signal

transmitter Accessories

DRSL-DISPLAY = Display / programming front

DRST-CM = Communication enabler

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
Dimensions (HxWxD) w/DRSL-DISPLAY.	109 x 23.5 x 116 / 131 mm
Weight approx.	250 g
Weight incl. DRSL-DISPLAY(approx.)	285 g / 350 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
Max. required power.	≤ 2.5 W
Max. power dissipation	≤ 2.0 W
Isolation voltage - test	2.3 kVAC
Isolation voltage - working.	250 VAC (reinforced) / 500 VAC (basic)
Programming	Communication enabler DRST-CM / Programming front DRSL-DISPLAY
Signal dynamics, input / output	24 bit / 18 bit
Signal / noise ratio.	> 60 dB
Bandwidth (3 dB)	> 40 Hz
Response time (0...90%, 100...10%)	< 20 ms

Auxiliary supplies:

2-wire loop supply (terminal 43, 44).	> 16 V @ 20 mA
3-wire loop supply (terminal 42, 44)	> 18...< 28 V @ 23...0 mA
Loop supply limitation (terminal 42, 44).	27...35 mA avg., < 80 mA peak
Reference voltage	2,5V ±0.5%
Reference voltage, load.	0...15 mA
Current limit, reference voltage	< 60 mA

Accuracy, the greater of general and basic values:

General values*		
Input type	Absolute accuracy	Temperature coefficient
All	$\leq \pm 0.05\%$ of span	$\leq \pm 0.01\%$ of span / °C

Basic values		
Type	Basic accuracy	Temperature coefficient
Current input	$\pm 0.334 \mu\text{A}$	$\pm 0.067 \mu\text{A} / ^\circ\text{C}$
Voltage input	$\pm 8.33 \mu\text{V}$	$\pm 1.67 \mu\text{V} / ^\circ\text{C}$
Current output	$\pm 1.33 \mu\text{A}$	$\pm 0.266 \mu\text{A} / ^\circ\text{C}$
Buffered voltage output	$\pm 267 \mu\text{V}$	$\pm 53.4 \mu\text{V} / ^\circ\text{C}$
Shunted voltage output ($\pm 1 \text{ V}$)	$\pm 267 \mu\text{V}$	$\pm 53.4 \mu\text{V} / ^\circ\text{C}$
Shunted voltage output ($\pm 10 \text{ V}$)	$\pm 1333 \mu\text{V}$	$\pm 0.267 \mu\text{V} / ^\circ\text{C}$

EMC - immunity influence.	$< \pm 0.5\%$ of span
Extended EMC immunity:	
NAMUR NE 21, A criterion, burst	$< \pm 1\%$ of span
Conducted emission, class A	150 kHz...10 MHz

of span = of selected standard range

* For custom input and output ranges, values for accuracy, temperature coefficient and EMC performance are valid with a maximum input offset of 50% and a maximum output offset of 20%.

Input specifications:

Current input:

Signal range.	$\pm 100 \text{ mA}$
Programmable measurement ranges	0...1, 0...5, 1...5, 0...20, 4...20, $\pm 1, \pm 5, \pm 10, \pm 20, \pm 50, \pm 100 \text{ mA}$
Custom configurable signal range.	$\pm 100 \text{ mA}$
Min. span	0.5 mA
Input resistance	Nom. 20 Ω + PTC 10 Ω
Input voltage drop, nom.	0.6 V @ 20 mA

Voltage input:

Signal range.	$\pm 300 \text{ VDC}$
Programmable measurement ranges	0...0.1, 0...1, 0.2...1, 0...2.5, 0...5, 1...5, 0...10, 2...10, 0...100, 0...300, $\pm 0.1, \pm 1, \pm 2.5, \pm 5, \pm 10, \pm 100, \pm 300 \text{ V}$
Custom configurable signal range.	$\pm 300 \text{ V}$
Min. span	25 mV
Input resistance, nom.	
> 2.5 V input	3 M Ω nom.
$\leq 2.5 \text{ V}$ input	> 10 M Ω

Potentiometer input:

3-wire potentiometer input (terminal 41, 42 & 44)	0...100%
Reference voltage (terminal 42, 44)	2.5 V
Calibration resistance	5 k Ω
Min. potentiometer resistance	200 Ω

Configurable input limits:

Error detection	Enable / disable
Configurable input limits, low:	
VOLT	'Minimum selected input' to -300 V
CURR.	'Minimum selected input' to -100 mA
POTM	'Minimum selected input' to 0%
Configurable input limits, high:	
VOLT	'Maximum selected input' to 300 V
CURR.	'Maximum selected input' to 100 mA
POTM	'Maximum selected input' to 100%
Input limit low/high, error indication levels:	
UP	See tables on pages 15-16
DOWN	See tables on pages 15-16
ZERO.	See tables on pages 15-16
NONE	See tables on pages 15-16
Hysteresis.	0.5% of 'Max. input'
Error detection release delay	0.7...0.8 s

Output specifications**Common specifications current output:**

All standard and custom ranges can be selected as Direct or Inverted action or V-Function.

Active / passive output range	± 23 mA / 0...23 mA
Programmable standard ranges	0...5, 1...5, 0...10, 2...10, 0...20, 4...20, 54-20 mA ± 5 , ± 10 , ± 20 mA
Custom configurable output range	± 20 mA
Min. span	4 mA
Load, max.	$\leq 1000 \Omega$ / ± 20 V @ ± 20 mA
Current limit.	≤ 28 mA (unipolar) / ± 28 mA (bipolar)
Load stability	0.001% of span / 100 Ω
Response time, programmable.	0.0...60.0 s
Output limitation at outside range	See tables on pages 15-16

Passive 2-wire mA:

Programmable ranges	0...20 and 4...20 mA Direct or Inverted action
External 2-wire loop supply	3.5...28.8 V

Voltage output specifications:

All standard and custom ranges can be selected as Direct or Inverted action or V-Function.

Programmable ranges	0/0.2...1, 0/1...5, 0/2...10, ± 1 , ± 5 and ± 10 V Direct or Inverted action
Load, min	> 500 k Ω
Response time, programmable.	0.0...60.0 s
Output limitation at outside range	See tables on pages 15-16

Shunted voltage output:

Signal range.	± 1.2 V / ± 12 V
Programmable standard ranges	0...1, 0...2.5, 0...5, 1...5, 0...10, 2...10 V ± 1 , ± 2.5 , ± 5 , ± 10 V
Custom configurable output range	± 10 V
Min. span	0.8 V
Load, min.	> 500 k Ω

Buffered voltage output:

Signal range.	$\pm 23 \text{ V}$
Programmable standard ranges	0...1, 0.2...1, 0...2.5, 0...5, 1...5, 0...10, 2...10, 0...20, 4...20 V $\pm 1, \pm 2.5, \pm 5, \pm 10, \pm 20 \text{ V}$
Custom configurable output range	$\pm 20 \text{ V}$
Min. span	0.8 V
Current limit.	< 50 mA
Load, min.	> 2 k Ω

Observed authority requirements:

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

Approvals:

c UL us, Standard for Safety	UL 508 / C22.2 No. 14
--	-----------------------

Configurable input error indication and input limits

Configurable input error detection

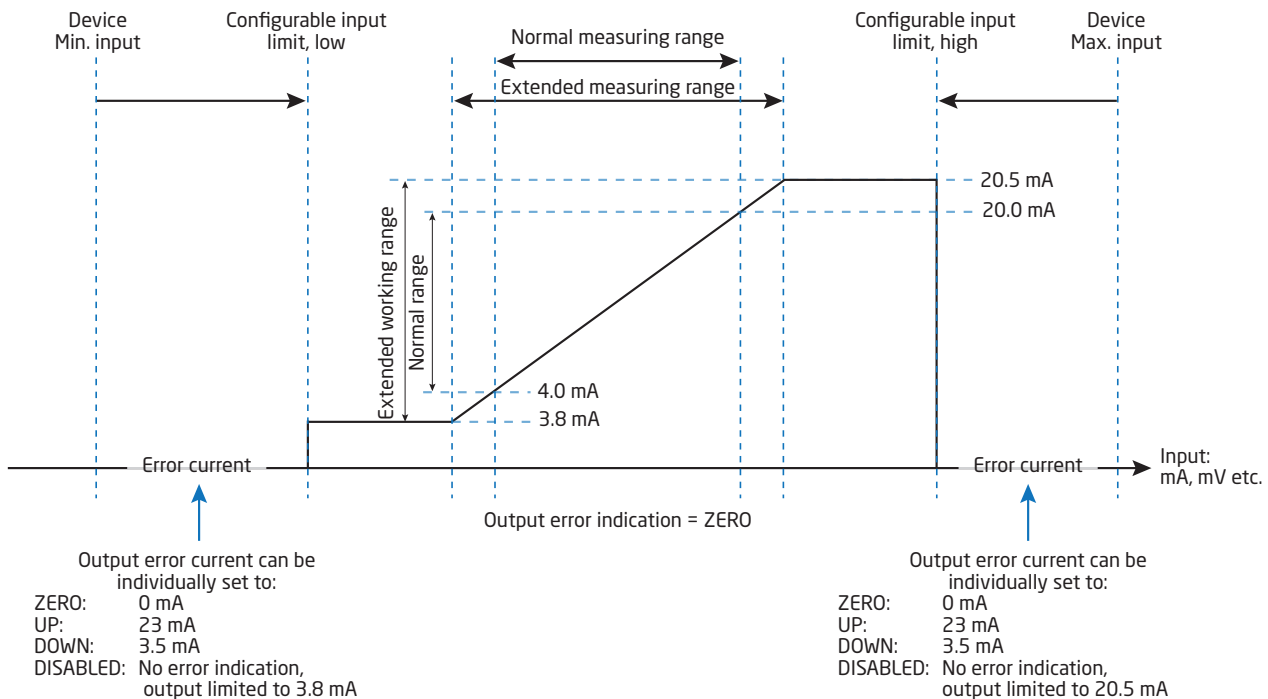
To increase system safety and integrity, users can program a high and low input error detection level. Input signals outside the selected error indication levels will cause the output of the device to go to the programmed error state. The error is indicated in display line 1 as IN.ER and at the same time the backlight flashes.

The two configurable input error detection levels can be set and enabled individually, just as it is possible to individually set the output error indication for each of the two detection levels. This allows users to differentiate process faults, broken input wires, etc.

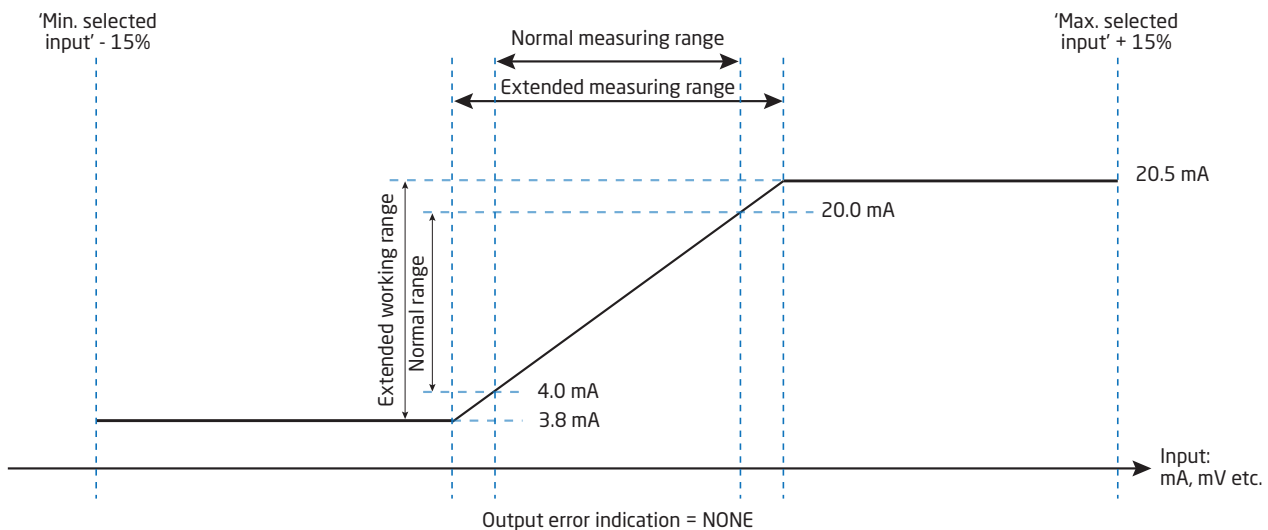
Available output error states for each of the two detection levels are: UP, DOWN, ZERO and NONE.

Output error indication uses the error states defined by NAMUR NE43 for 4...20 mA output span, and for all other output spans equivalent output error indications are used (see tables on pages 15-16).

Example - 4..20 mA output span and both high and low configurable input error limit enabled with output error indication set to ZERO:



Example - Error indication set to NONE:



Output limits and error indications - current output:

	Input error indication disabled		Configurable input limits low or high enabled					
Output span	Output limit low	Output limit high	Output limit low	Output limit high	Output error indication, UP	Output error indication, DOWN	Output error indication, ZERO	Output error indication, NONE
4...20 mA	0 mA	23 mA	3.8 mA	20.5 mA	23 mA	3.5 mA	0 mA	No error indication
0...20 mA	0 mA	23 mA	0 mA	20.5 mA	23 mA	0 mA	0 mA	No error indication
2...10 mA	0 mA	11.5 mA	0.195 mA	10.25 mA	11.5 mA	0 mA	0 mA	No error indication
0...10 mA	0 mA	11.5 mA	0 mA	10.25 mA	11.5 mA	0 mA	0 mA	No error indication
0...5 mA	0 mA	5.75 mA	0 mA	5.125 mA	5.75 mA	0 mA	0 mA	No error indication
1...5 mA	0 mA	5.75 mA	0.975 mA	5.125 mA	5.75 mA	0.875 mA	0 mA	No error indication
±5 mA	-5.75 mA	5.75 mA	-5.125 mA	5.125 mA	5.75 mA	5.75 mA	0 mA	No error indication
±10 mA	-11.5 mA	11.5 mA	-10.25 mA	10.25 mA	11.5 mA	-11.5 mA	0 mA	No error indication
±20 mA	-23 mA	23 mA	-20.5 mA	20.5 mA	23 mA	-23 mA	0 mA	No error indication

Output limits and error indications - shunted voltage output:

	Input error indication disabled		Configurable input limits low or high enabled					
Output span	Output limit low	Output limit high	Output limit low	Output limit high	Output error indication, UP	Output error indication, DOWN	Output error indication, ZERO	Output error indication, NONE
0...1 V	0 V	1.15 V	0 V	1.025 V	1.15 V	0 V	0 V	No error indication
0.2...1 V	0 V	1.15 V	0.195 V	1.025 V	1.15 V	0.175 V	0 V	No error indication
0...5 V	0 V	5.75 V	0 V	5.125 V	5.75 V	0 V	0 V	No error indication
1...5 V	0 V	5.75 V	0.975 V	5.125 V	5.75 V	0.875 V	0 V	No error indication
0...10 V	0 V	11.5 V	0 V	10.25 V	11.5 V	0 V	0 V	No error indication
2...10 V	0 V	11.5 V	1.95 V	10.25 V	11.5 V	1.75 V	0 V	No error indication
±1 V	-1.15 V	1.15 V	-1.025 V	1.025 V	1.15 V	-1.15 V	0 V	No error indication
±5 V	-5.75 V	5.75 V	-5.125 V	5.125 V	5.75 V	-5.75 V	0 V	No error indication
±10 V	-11.5 V	11.5 V	-10.25 V	10.25 V	11.5 V	-11.5 V	0 V	No error indication

Output limits and error indications - buffered voltage output:

	Input error indication disabled		Configurable input limits low or high enabled					
Output span	Output limit low	Output limit high	Output limit low	Output limit high	Output error indication, UP	Output error indication, DOWN	Output error indication, ZERO	Output error indication, NONE
0...1 V	0 V	1.15 V	0 V	1.025 V	1.15 V	0 V	0 V	No error indication
0.2...1 V	0 V	1.15 V	0.195 V	1.025 V	1.15 V	0.175 V	0 V	No error indication
0...2.5 V	0 V	2.875 V	0 V	2.5625 V	2.875 V	0 V	0 V	No error indication
0...5 V	0 V	5.75 V	0 V	5.125 V	5.75 V	0 V	0 V	No error indication
1...5 V	0 V	5.75 V	0.975 V	5.125 V	5.75 V	0.875 V	0 V	No error indication
0...10 V	0 V	11.5 V	0 V	10.25 V	11.5 V	0 V	0 V	No error indication
2...10 V	0 V	11.5 V	1.95 V	10.25 V	11.5 V	1.75 V	0 V	No error indication
0...20 V	0 V	> 21 V	0 V	20.5 V	> 21 V	0 V	0 V	No error indication
4... 20 V	0 V	> 21 V	3.8 V	20.5 V	> 21 V	3.5 V	0 V	No error indication
±1 V	-1.15 V	1.15 V	-1.025 V	1.025 V	1.15 V	-1.15 V	0 V	No error indication
±2.5 V	-2.875 V	2.875 V	-2.5625 V	2.5625 V	2.875 V	-2.875 V	0 V	No error indication
±5 V	-5.75 V	5.75 V	-5.125 V	5.125 V	5.75 V	-5.75 V	0 V	No error indication
±10 V	-11.5 V	11.5 V	-10.25 V	10.25 V	11.5 V	-11.5 V	0 V	No error indication
±20 V	< -21 V	> 21 V	-20.5 V	20.5 V	> 21 V	< -21 V	0 V	No error indication

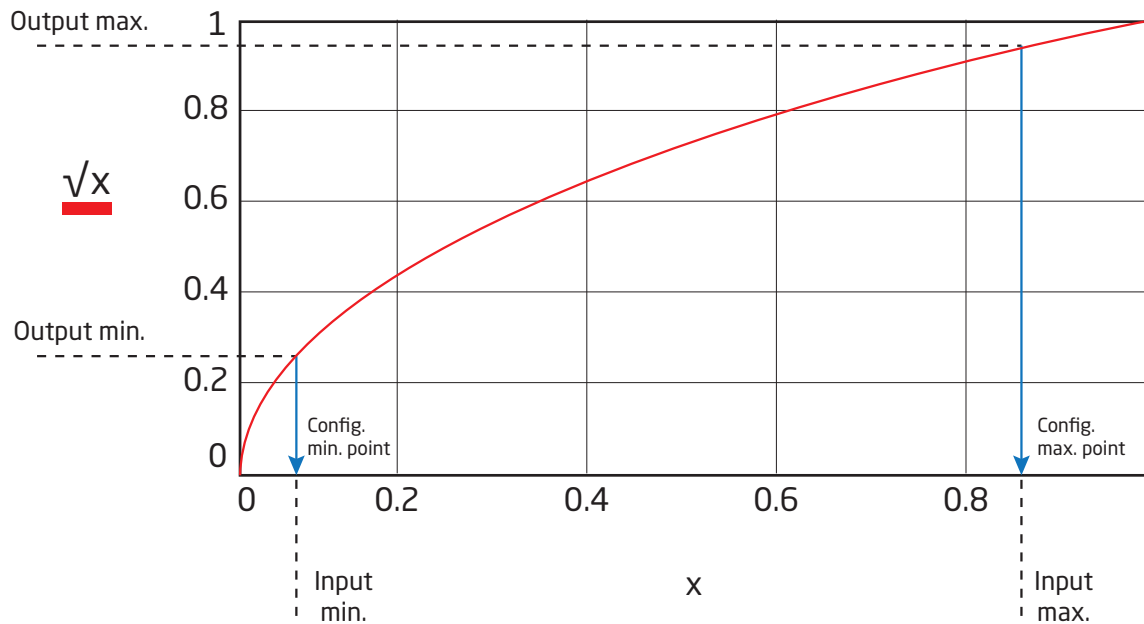
Output limits and error indications - custom outputs (applies to both voltage and current outputs):

	Input error indication disabled		Configurable input limits low or high enabled					
Output span	Output limit low	Output limit high	Output limit low	Output limit high	Output error indication, UP	Output error indication, DOWN	Output error indication, ZERO	Output error indication, NONE
Outputs starting at zero	0 V / 0 mA	'Max. output'* 115%	0 V / 0 mA	'Max. output'* 102.5%	'Max. output'* 115%	0 V / 0 mA	0 V / 0 mA	No error indication
Offset output span *)	0 V / 0 mA	'Max. output'* 115%	'Min. output'* 95%	'Max. output'* 102.5%	'Max. output'* 115%	'Min. output'* 87.5%	0 V / 0 mA	No error indication
Bipolar output span	'Min. output'* 115%	'Max. output'* 115%	'Min. output'* 102.5%	'Max. output'* 102.5%	'Max. output'* 115%	'Min. output'* 115%	0 V / 0 mA	No error indication

*) An output is considered offset if the span does not include zero or a zero crossing.

Square root function

The DRST-DC features the possibility of configuring a square root relationship between the input and output. It is possible to use the full square root relationship, or to select a fraction of the square root function, by manually choosing 'Input min.' and 'input max.' of the square root function, as shown in the figure below:

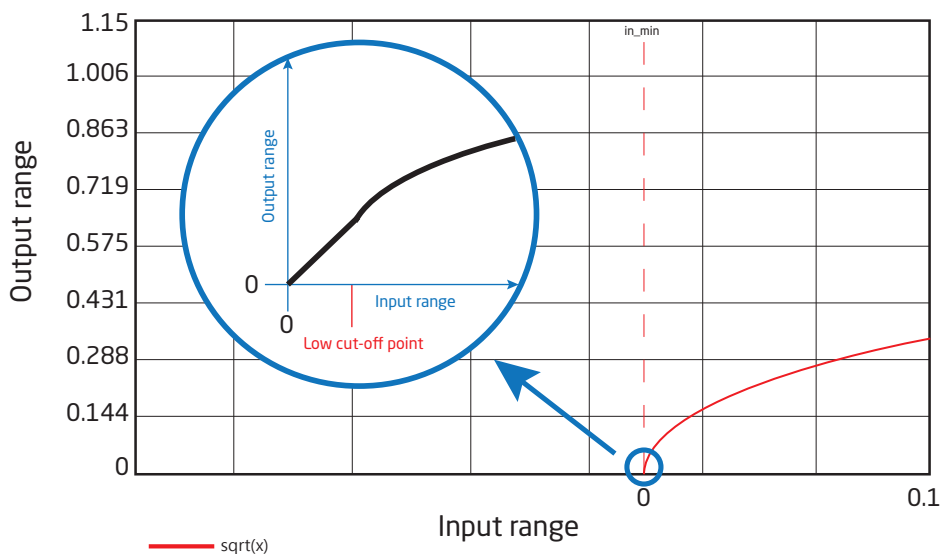


Low cut-off function:

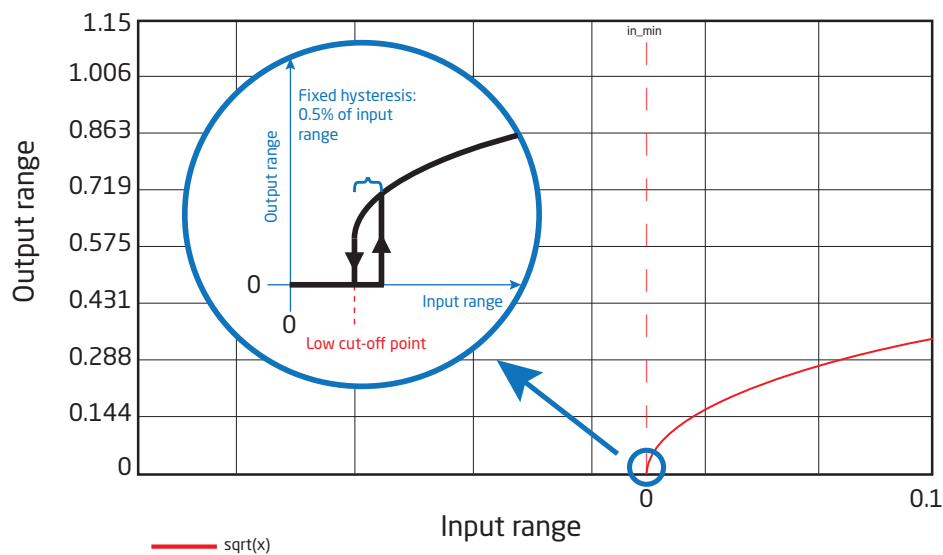
As a part of the square root function of the DRST-DC it is possible to manually configure a low cut-off point. The feature is often used to suppress noise in the system.

The low cut off point defines a point where the input/output relationship either changes to a linear relationship or the output is truncated to zero. The two principles are illustrated below:

Linear cut-off:



Truncation to zero:



Configuration	Parameter	Specification	Condition
Low cut-off point	Linear cut-off	0.0 to 50.0% of selected input range	Independent of square root settings
	Truncation to zero	0.0 to 50.0% of selected input range Fixed hysteresis of 0.5% of the selected input range	

Over range / under range operation:

Configuration	Parameter	Specification	Condition
Normal square root action	Input low limit	'Minimum of selected input range'	'Square root point max.' > 'Square root point min.'
	Input high limit	'Maximum of selected input range' + 20%	
Inverted square root operation	Input low limit	'Minimum of selected input range' - 20%	'Square root point max.' < 'Square root point min.'
	Input high limit	'Maximum of selected input range'	

DRSL-DISPLAY & DRST-CM readout of input error detection and signal "outside range"

Configurable input error detection - readout (IN.ER):			
Input	Range	Readout	Limit
CURR	All	IN.ER	See tables on pages 15-16
VOLT	All	IN.ER	See tables on pages 15-16
POTM	All	IN.ER	See tables on pages 15-16

Display readout at "outside range" limits			
Input	Range	Readout	Limit
All	All	IN.LO	Depending on input type
		IN.HI	Depending on input type

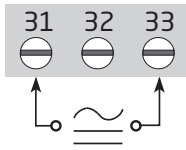
Display readout below min. / above max. (-1999, 9999):			
Input	Range	Readout	Limit
All	All	-1999	Display readout <-1999
		9999	Display readout >9999

Readout at hardware error		
Error search	Readout	Cause
Check measurement of analog output	AO.ER	No load on the current output (only S4...20 mA)*
Communications test between DRSL-DISPLAY and DRST-DC	NO.CO	Connection error
Configuration error	CO.ER	Default configuration is loaded
Configuration error	CO.ER	Invalid configuration**
Check that saved configuration in DRSL-DISPLAY matches device	TY.ER	Invalid type or rev. no.
Hardware error	RA.ER	RAM error*
Hardware error	AD.ER	A/D converter error*
Hardware error	AO.SU	Analog output supply error*
Hardware error	EF.ER	External flash error*
Hardware error	IF.ER	Internal flash error*

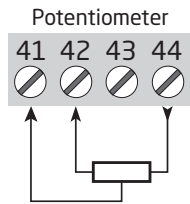
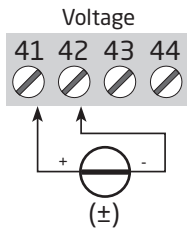
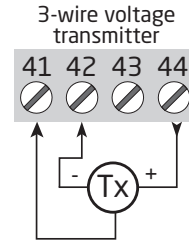
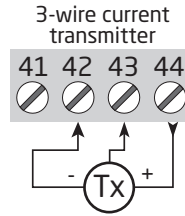
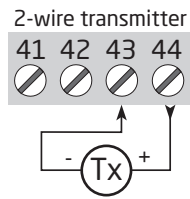
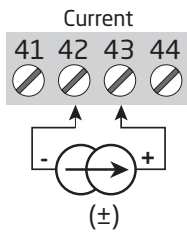
!	All error indications in the display flash once per second. The help text explains the error. If the error is an input loop error, the display backlight flashes as well - this is acknowledged (stopped) by pushing the  button.
*	Error is acknowledged by either stepping through the basic setup, or by resetting the device power. Some types of errors can only be acknowledged by resetting the device power.
**	Error is acknowledged by stepping through the basic setup.

Connections

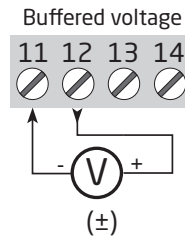
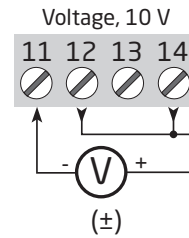
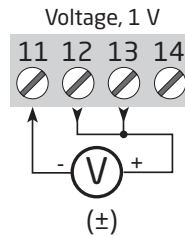
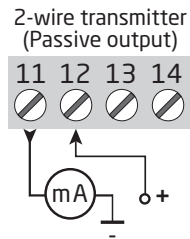
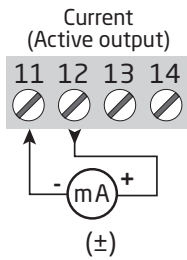
Supply



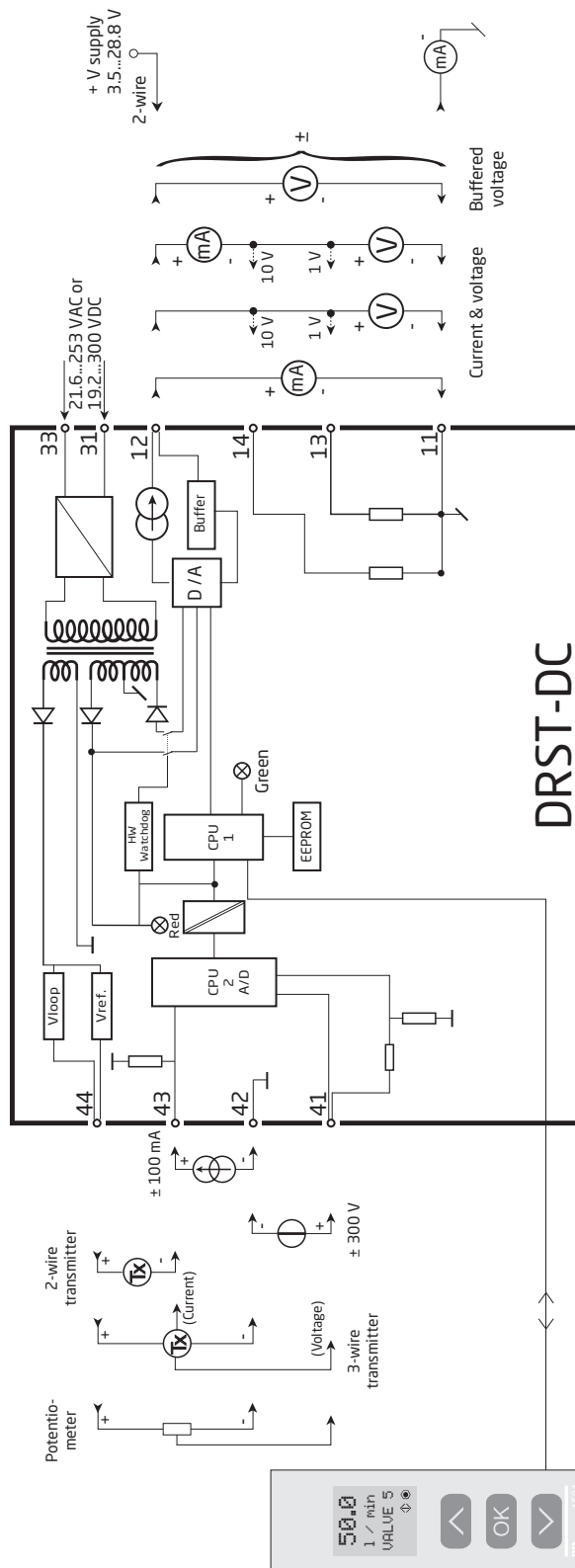
Inputs:



Outputs:



Block diagram



Configuration / operating the function keys

Documentation for routing diagram.

In general

When configuring the DRST-DC, 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
- OK 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 OK 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 unauthorised modifications to the configuration. Default password 2008 allows access to all configuration menus.

Signal error indication via display front DRSL-DISPLAY & DRST-CM

Signal error is displayed as LO.ER (see table page 19). Input signals outside the selected range are displayed as IN.LO indicating low input signal or IN.HI indicating high input signal (see table page 19). Error indication is displayed in line 1 as text and at the same time the backlight flashes. A flashing bullet in line 4 is indicating correct functioning of DRSL-DISPLAY & DRST-CM.

Signal 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 configurable input limit error.
- Steady green LED indicates internal error.
- Steady red LED indicates fatal 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 DRSL-DISPLAY & DRST-CM, and then move the DRSL-DISPLAY & DRST-CM 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 alphanumerics. Selection of functional readout in line 3 of the display - choose between readout of analogue output or tag no.

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 DRSL-DISPLAY & DRST-CM. Then a high signal (not necessarily 100%) is applied and the actual value is entered via DRSL-DISPLAY & DRST-CM. 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 OK (no time-out). The simulation function exits automatically, if the DRSL-DISPLAY & DRST-CM 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.

Output function (OFUN): Here the output characteristics can be set to either Direct (DIR) or Inverted (INV) function. Output type and range are set in the normal programming menu. If the selected output range is starting at zero, V-curved output function (VFUN) can also be selected. The output characteristics will then be 100-0-100% on the basis of a linear 0-100% input signal.

Square root and low cut-off function (IFUN): Here it is possible to choose a square root relationship between input and output and decide which section of the square root function that has to be used. The function includes a low cut-off point for limiting "small" input signals. Cut-off type and cut-off value are also selected in this menu point.

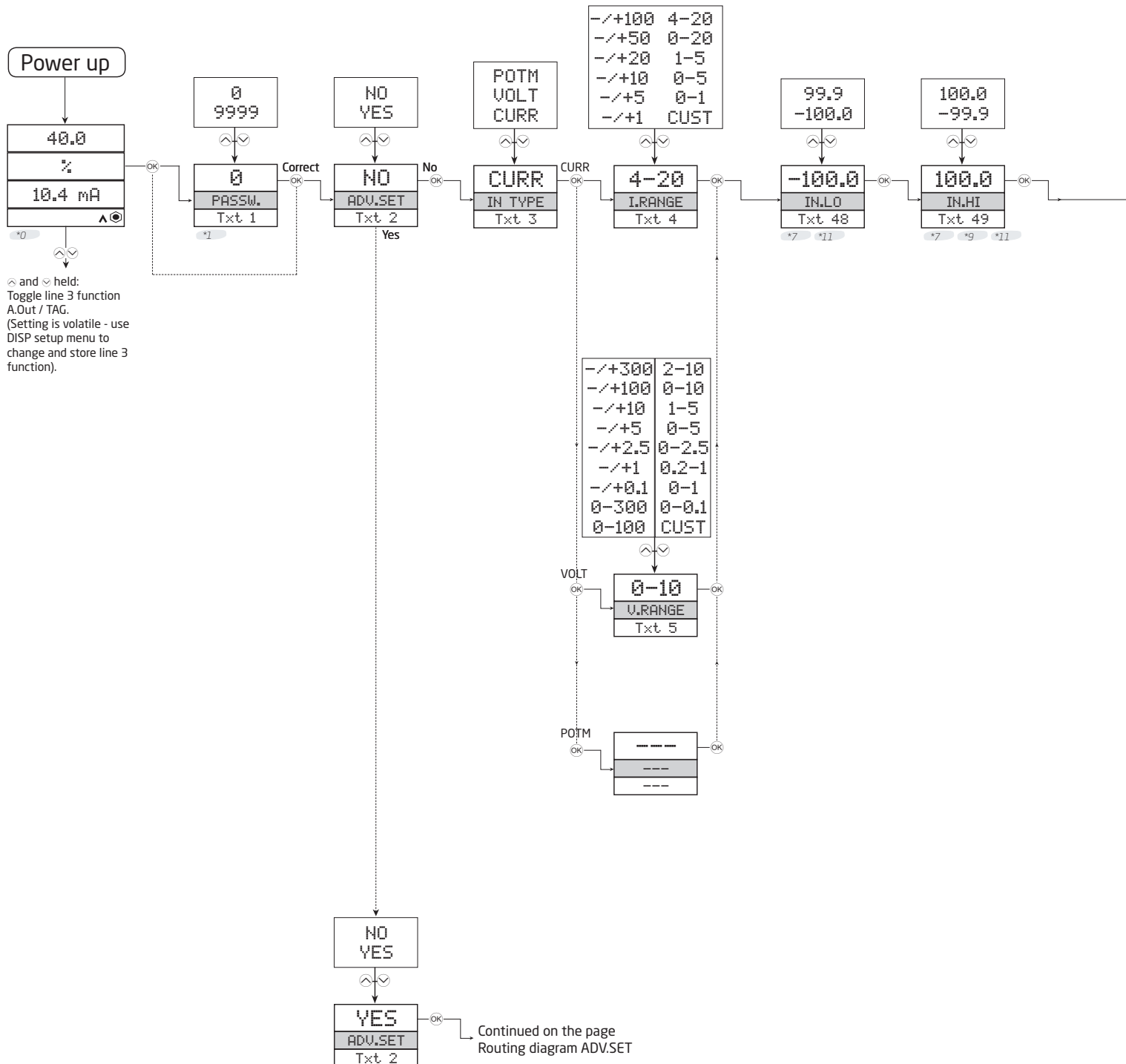
Auto diagnostics

The device performs an advanced auto diagnosis of the internal circuits - check tables on page 19.

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.



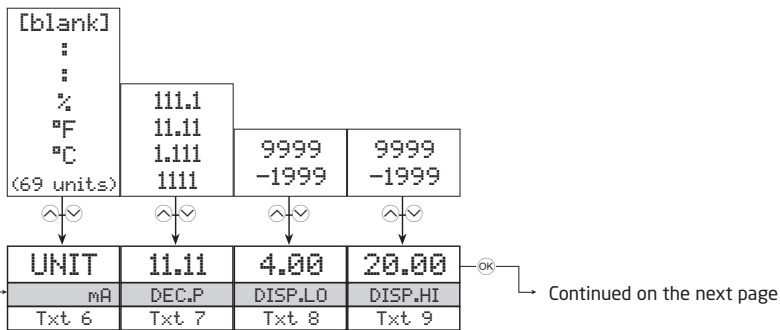
- *0 Default state.
 - Line 1 shows the scaled process value - OK or error.
 - Line 2 shows the selected engineering unit.
 - Line 3 shows analogue output or TAG no.
 - Line 4 shows status for communication and signal trending.

*7 Only displayed if CUST input range or POTM is selected.
This menu will change range automatically.

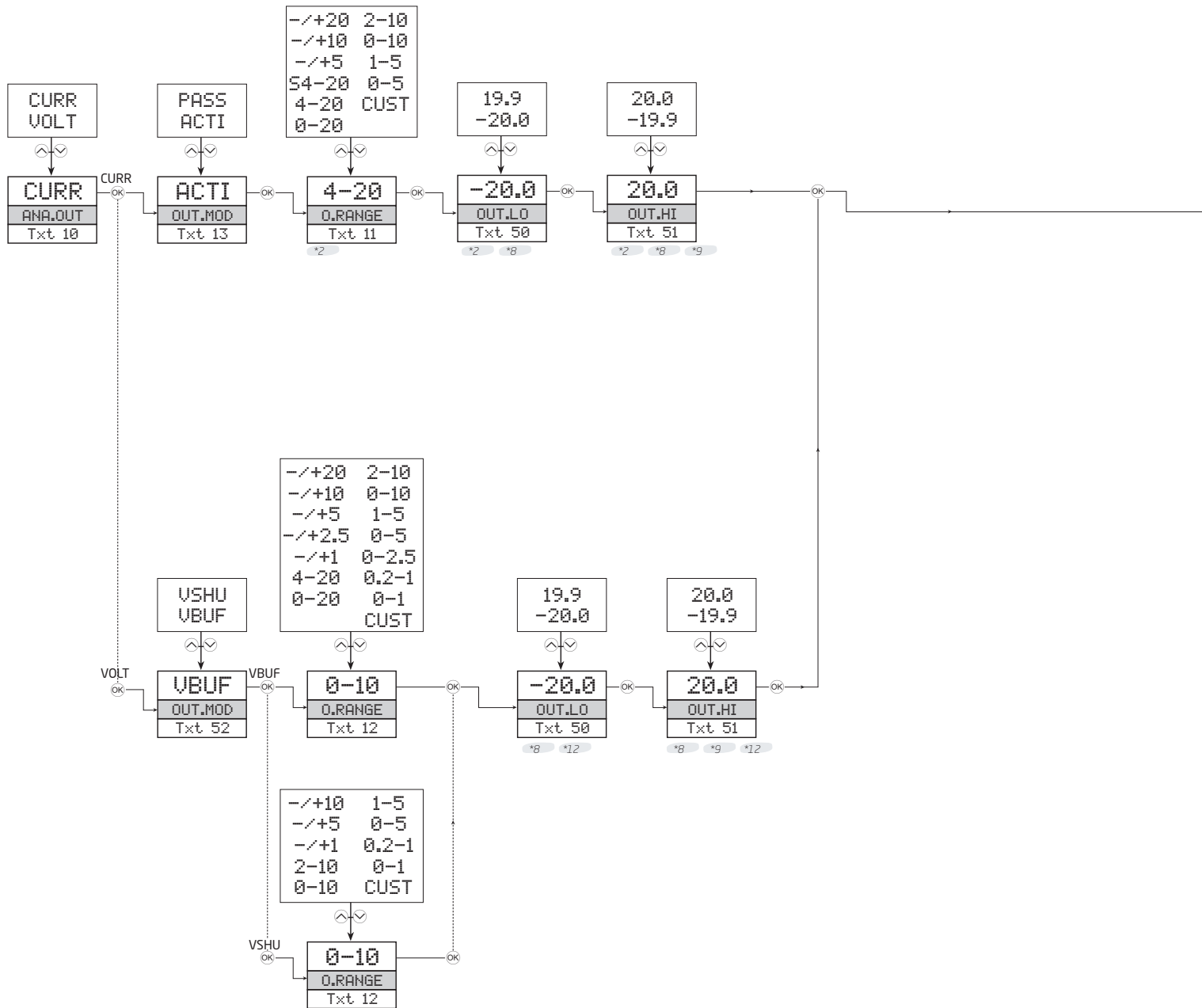
*11 Limits are dependent on input type:
CURR limits are: ± 100.0
VOLT limits are: ± 300
POTM limits are: 0 and 100.0

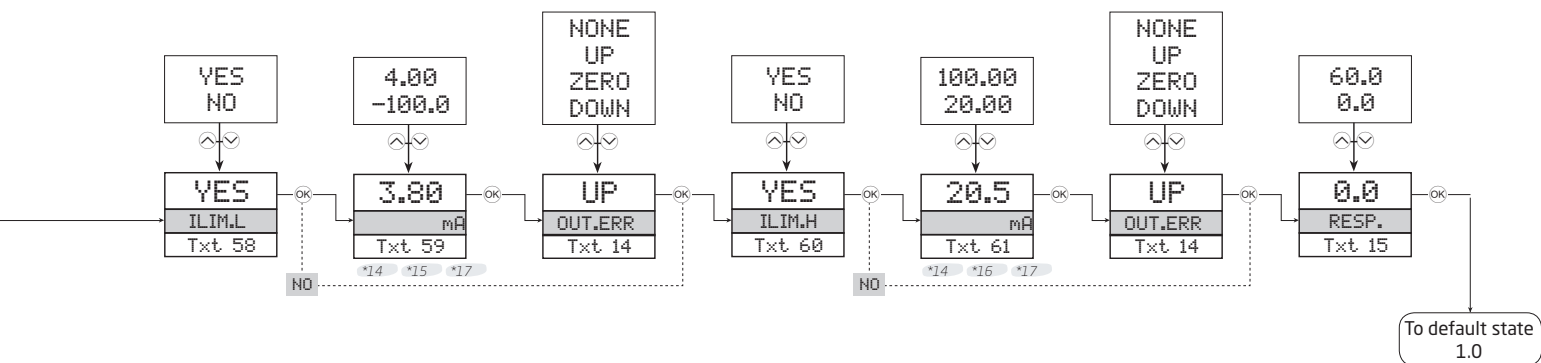
*1 Only displayed if password is enabled.

*9 Value will be forced to be greater than xx.L0.



Selectable UNITS:				
°C	hp	kW	mA	pH
°F	hPa	kWh	mbar	rpm
%	Hz	l	mils	s
A	in	l/h	min	S
bar	in/h	l/min	mm	t
cm	in/min	l/s	mm/s	t/h
ft	in/s	m	mol	uA
ft/h	ips	m/h	Mpa	um
ft/min	K	m/min	mV	uS
ft/s	kA	m/s	MW	U
g	kg	m/s2	MWh	W
gal/h	kJ	m3	N	Wh
gal/min	kPa	m3/h	Ohm	yd
GW	kV	m3/min	Pa	[blank]





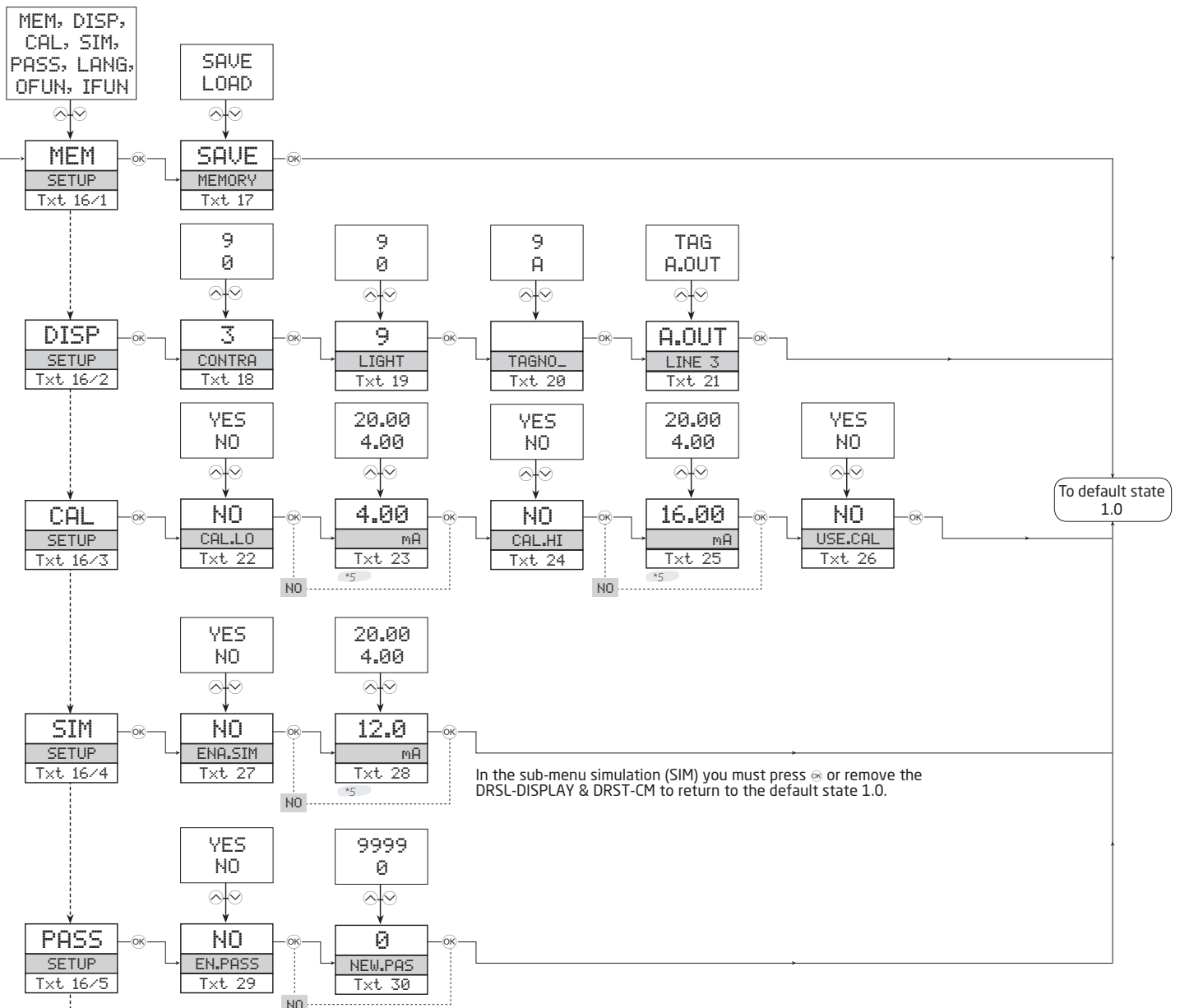
*14 Selectable in engineering units, i.e. Volt (V), Current (mA) or Potentiometer (%).

*15 Limits are dependent on input type and the selected input range:
 High Limit: 'Minimum input'
 Low limit, CURR: -100.0 mA
 Low limit, VOLT: -300 V
 Low limit, POTM: 0 %

*16 Limits are dependent on input type and the selected input range:
 Low Limit: Maximum input'
 High limit, CURR: 100.0 mA
 High limit, VOLT: 300 V
 High limit, POTM: 100.0 %

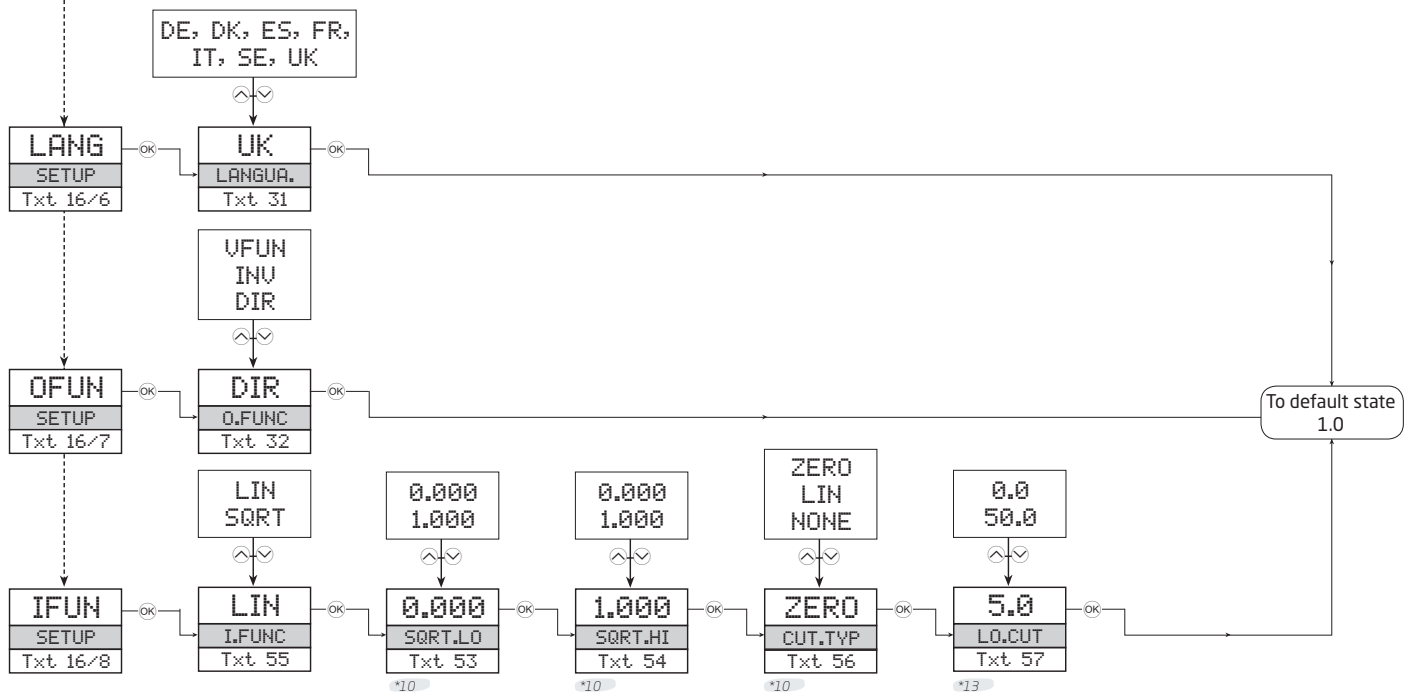
*17 If the selected input range is changed to 4...20 mA the configurable limits are initially set to the following:
 Range limit, Low 3.6 mA
 Range limit, High 21 mA

Routing diagram, advanced settings (ADV.SET)



Continued on
the next page

*5 Selectable range as defined by DEC.P, DISP.LO and DISP.HI.



*10 Only displayed if SQRT is selected!
SQRT.LO and SQRT.HI must not be equal.

*13 Only shown if CUT.TYP is NOT set to NONE.

Help text overview

- [1] Set correct password
- [2] Enter advanced setup menu?
- [3] Select current input
Select voltage input
Select potmeter input
- [4] Select -100...100 mA input range
Select -50...50 mA input range
Select -20...20 mA input range
Select -10...10 mA input range
Select -5...5 mA input range
Select -1...1 mA input range
Select 4...20 mA input range
Select 0...20 mA input range
Select 1...5 mA input range
Select 0...5 mA input range
Select 0...1 mA input range
Select custom current input range
- [5] Select -300...300 V input range
Select -100...100 V input range
Select -10...10 V input range
Select -5...5 V input range
Select -2.5...2.5 V input range
Select -1...1 V input range
Select -100...100 mV input range
Select 0...300 V input range
Select 0...100 V input range
Select 2...10 V input range
Select 0...10 V input range
Select 1...5 V input range
Select 0...5 V input range
Select 0...2.5 V input range
Select 0.2...1 V input range
Select 0...1 V input range
Select 0...100 mV input range
Select custom voltage input range
- [6] Select display unit
- [7] Select decimal point position
- [8] Set display range low
- [9] Set display range high
- [10] Select current as analog output type
Select voltage as analog output type
- [11] Select -20...20 mA output range
Select -10...10 mA output range
Select -5...5 mA output range
Select 4...20 mA output range with safety readback
Select 4...20 mA output range
Select 0...20 mA output range
Select 2...10 mA output range
Select 0...10 mA output range
Select 1...5 mA output range
Select 0...5 mA output range
Select custom current output range
- [12] Select -20...20 V output range
Select -10...10 V output range
Select -5...5 V output range
Select -2.5...2.5 V output range
- Select -1...1 V output range
Select 4...20 V output range
Select 0...20 V output range
Select 2...10 V output range
Select 0...10 V output range
Select 1...5 V output range
Select 0...5 V output range
Select 0...2.5 V output range
Select 0.2...1 V output range
Select 0...1 V output range
Select custom voltage output range
- [13] Select active output mode
Select passive output mode
- [14] Select downscale at error
Select zero output at error
Select upscale at error
Select no error action - output undefined at error
- [15] Set analog output response time in seconds
- [16] Select analog output function
Enter Language setup
Enter Password setup
Enter Simulation mode
Perform Process calibration
Enter Display setup
Perform Memory operations
Select analog input function
- [17] Load saved configuration into module
Save configuration in display front
- [18] Adjust LCD contrast
- [19] Adjust LCD backlight
- [20] Write a 6-character device TAG
- [21] Analog output value is shown in display line 3
Device TAG is shown in display line 3
- [22] Calibrate Input low to process value?
- [23] Set value for low calibration point
- [24] Calibrate Input high to process value?
- [25] Set value for high calibration point
- [26] Use process calibration values?
- [27] Enable simulation mode?
- [28] Set the input simulation value
- [29] Enable password protection?
- [30] Set new password
- [31] Select language
- [32] Select direct output mode
Select inverted output mode
Select V-function output mode
- [33] Display underrange
- [34] Display overrange
- [35] Input underrange
- [36] Input overrange
- [37] Analog output supply error
- [38] Analog output error - check output connections and reset power
- [39] Configuration error - default configuration is loaded
- [40] RAM memory error
- [41] Invalid configuration

- [42] A/D converter error
- [43] No communication
- [44] Input range limit error - Input outside
configurable input range limit
- [45] Invalid configuration type or version
- [46] External flash error
- [47] Internal flash error
- [48] Set input range low
- [49] Set input range high
- [50] Set output range low
- [51] Set output range high
- [52] Select buffered voltage output
Select shunted voltage output
- [53] Select low value of square root
- [54] Select high value of square root
- [55] Select linear input function
Select square root input function
- [56] Set low cut-off type to zero
Set low cut-off type to linear
Disable low cut-off
- [57] Select low cut-off point in % of input range
- [58] Enable configurable input error limit, low
- [59] Set configurable input limit, low
- [60] Enable configurable input error limit, high
- [61] Set configurable input limit, high

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by the company will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a "Basic Component" under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

OMEGA is a trademark of OMEGA ENGINEERING, INC.

© Copyright 2018 OMEGA ENGINEERING, INC. All rights reserved. This document may not be copied, photocopied, reproduced, translated, or reduced to any electronic medium or machine-readable form, in whole or in part, without the prior written consent of OMEGA ENGINEERING, INC.

Where Do I Find Everything I Need for Process Measurement and Control? OMEGA...Of Course!

Shop online at omega.com

TEMPERATURE

- ☑ Thermocouple, RTD & Thermistor Probes, Connectors, Panels & Assemblies
- ☑ Wire: Thermocouple, RTD & Thermistor
- ☑ Calibrators & Ice Point References
- ☑ Recorders, Controllers & Process Monitors
- ☑ Infrared Pyrometers

PRESSURE, STRAIN AND FORCE

- ☑ Transducers & Strain Gages
- ☑ Load Cells & Pressure Gages
- ☑ Displacement Transducers
- ☑ Instrumentation & Accessories

FLOW/LEVEL

- ☑ Rotameters, Gas Mass Flowmeters & Flow Computers
- ☑ Air Velocity Indicators
- ☑ Turbine/Paddlewheel Systems
- ☑ Totalizers & Batch Controllers

pH/CONDUCTIVITY

- ☑ pH Electrodes, Testers & Accessories
- ☑ Benchtop/Laboratory Meters
- ☑ Controllers, Calibrators, Simulators & Pumps
- ☑ Industrial pH & Conductivity Equipment

DATA ACQUISITION

- ☑ Communications-Based Acquisition Systems
- ☑ Data Logging Systems
- ☑ Wireless Sensors, Transmitters, & Receivers
- ☑ Signal Conditioners
- ☑ Data Acquisition Software

HEATERS

- ☑ Heating Cable
- ☑ Cartridge & Strip Heaters
- ☑ Immersion & Band Heaters
- ☑ Flexible Heaters
- ☑ Laboratory Heaters

ENVIRONMENTAL MONITORING AND CONTROL

- ☑ Metering & Control Instrumentation
- ☑ Refractometers
- ☑ Pumps & Tubing
- ☑ Air, Soil & Water Monitors
- ☑ Industrial Water & Wastewater Treatment
- ☑ pH, Conductivity & Dissolved Oxygen Instruments