



USER MANUAL DCR



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TILLQUIST DCR is a programmable universal transducer for fast and high accuracy measurements of low DC voltage or current, resistance, RTD, potentiometer, thermocouple or tap changers. Advanced filter functions and characteristic setting points, that can be set individually for the analog- and relays outputs. Auxiliary supply with wide input voltage range and free configuration software, ConfigLQT.

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1 Instructions

1.1 Purpose of this document


This document describes how to use the DCR multi transducer. The user manual is intended to be used by:

- installation personnel and commissioning engineers
- service and maintenance personnel
- planners

1.2 Intended use

The transducer is programmable to measure and monitoring low DC voltage and DC current, resistance, RTD, potentiometer, thermocouple or tap changers. The measured value is then available via analog outputs and relays. Advanced filter functions and characteristic set points can be added individual for all outputs of analog signals and relays.



1.3 Mounting

	The transducer shall be installed into a protecting cabinet on a 35 mm top hat rail (DIN rail) according IEC 60715. The enclosure shall not be accessible without tools.
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1.4 Installation and maintenance

The installation, operation and maintenance shall only be made by qualified electrical engineering personnel and in accordance with applicable regulations. Before the installation, please check that the transducer is the correct type and complies with the installation needs.

1.4.1 Safety notes

	Attention: Danger to life! Ensure that all leads are free of potential when connection them!
	AUX-supply need to have an external circuit breaker and it must be installed and located easily reached close to the device. The OFF-position shall be clearly marked.

1.5 Operation

The transducer is intended for operation at an altitude not exceeding 2000 m and in an environment that is not considered as wet location.

Operation temperature: -10...24...+55°C

Proper function is only guaranteed if the USB is not connected to the transducer and all the instructions in this manual are followed for safety reasons.


If the equipment is used in a manner not specified by this instruction, the protection provided by the equipment may be impaired.

1.6 Safety

All inputs and outputs are galvanically isolated from each other.

Protection class:	II, protective insulation, voltage inputs via protective impedance.
Protection:	IP40 (housing), IP20 (terminals)

1.7 Warning!

	Connection must comply with current regulations for systems with rated voltage up to 1000 V. Before switching on or off and if the housing is removed, all voltages to the equipment must be switched off and external currents circuit shorted before disconnected.
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1.8 Maintenance

The transducer requires no maintenance. Any repairs shall be performed by trained personnel, or the equipment shall be returned to the supplier for repair.

Wipe the device using a clean, dry and soft cloth if necessary. Do not use solvents.

1.9 Symbols



Warning for life-threatening or hazardous for properties situations. Indicates situations where careful reading of this manual is required to avoid potential HAZARD situations.



Caution, possibility of electric shock



Read the manual before use



The device must be discarded in a professional way



CE conformity mark

1.10 Disclaimer of liability

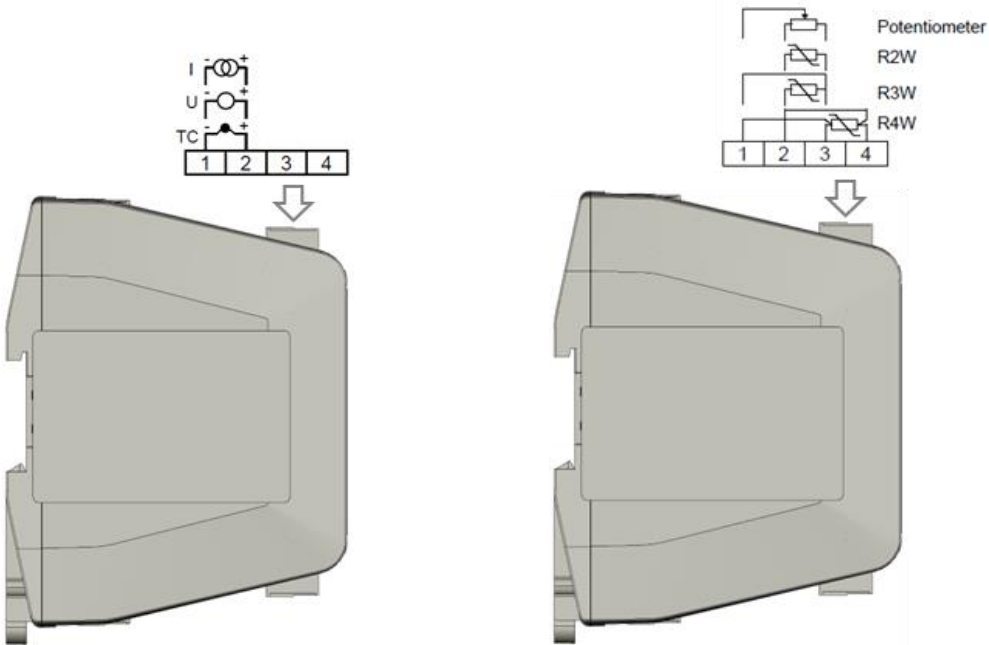
The content of this document has been reviewed to ensure correctness. Nevertheless it may contain errors or inconsistencies and we cannot guarantee completeness and correctness. This is especially true for different language versions of this document. This document is regularly reviewed and updated. Necessary corrections will be included in subsequent version and are available via our webpage <http://www.tillquist.com>.

2 Connections

2.1 Terminal connection

Plug-in terminals	
Wire section:	2.5 mm ² / 14 AWG solid and stranded Copper
Clamp opening size:	2.8 × 3.1 mm
Wire stripping:	max 8 mm
Recommended torque:	0.5 - 0.55 Nm / 4.5 - 4.9 in.lbs

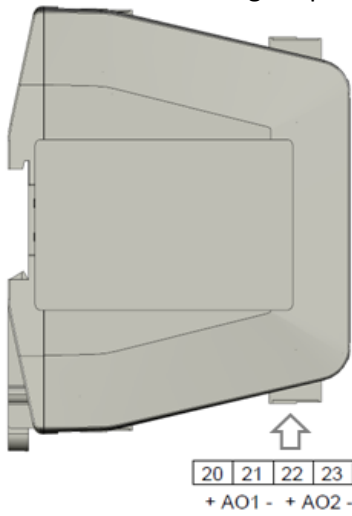
2.2 Connections inputs signals



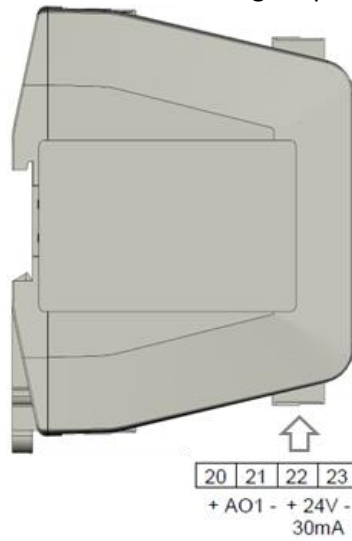
For measuring ranges, see *Technical Data*.

2.3 Connections outputs signals

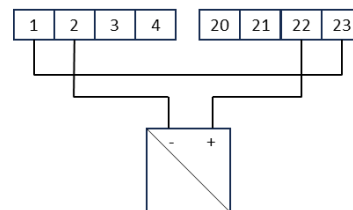
Version with 2 analog outputs



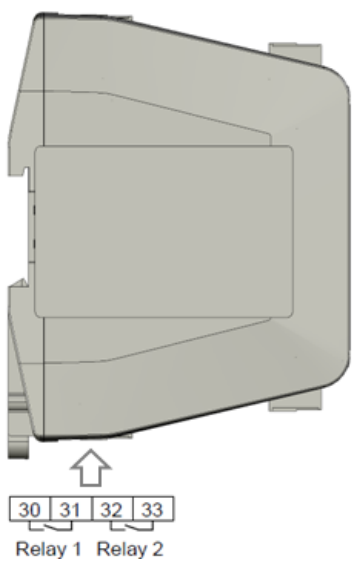
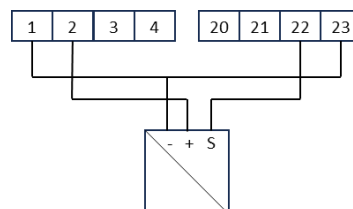
Version with 1 analog output and aux. supply output



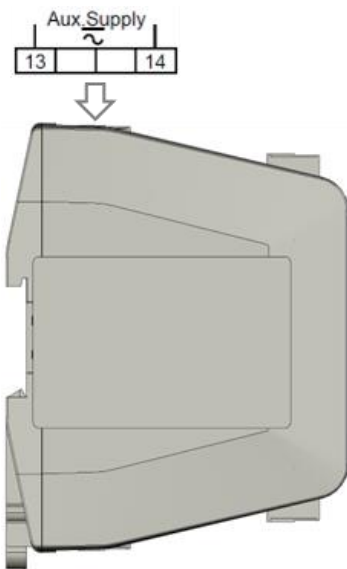
2-wire loop powered transmitter current loops
(4...20 mA)



Connection of three-wire transducer (0...10 V)



2.4 Connections aux.supply



3 Configuration

ConfigLQT v3 is a free configuration software to program the DCR transducer. It is available to download for free from www.tillquist.com.

ConfigLQT are used for Online and Offline configuration of the transducer, save and load settings file, print labels and upgrade firmware.

4 Outputs

4.1 Analog output

4.1.1 Output mode

The analog output can be program with three different ranges, ± 20 mA, ± 5 mA or ± 10 V. The resolution of the output is 16 bits.

4.1.2 Rows

2 to 20 rows of set points can be programmed for each channel.

4.1.3 Low end setting and High end setting

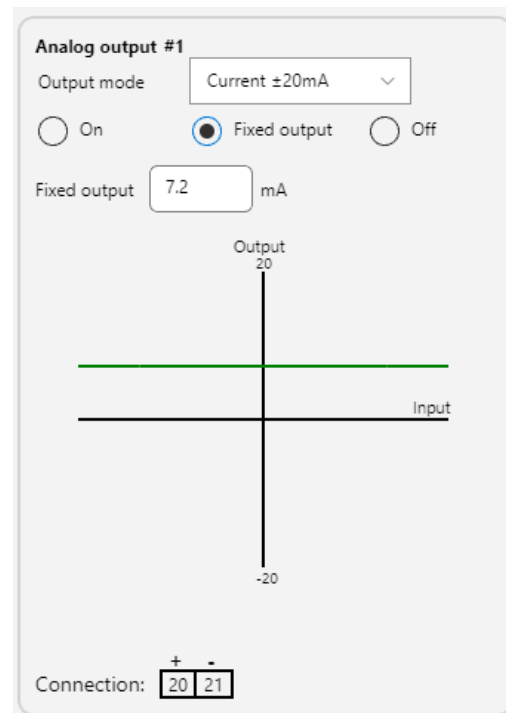
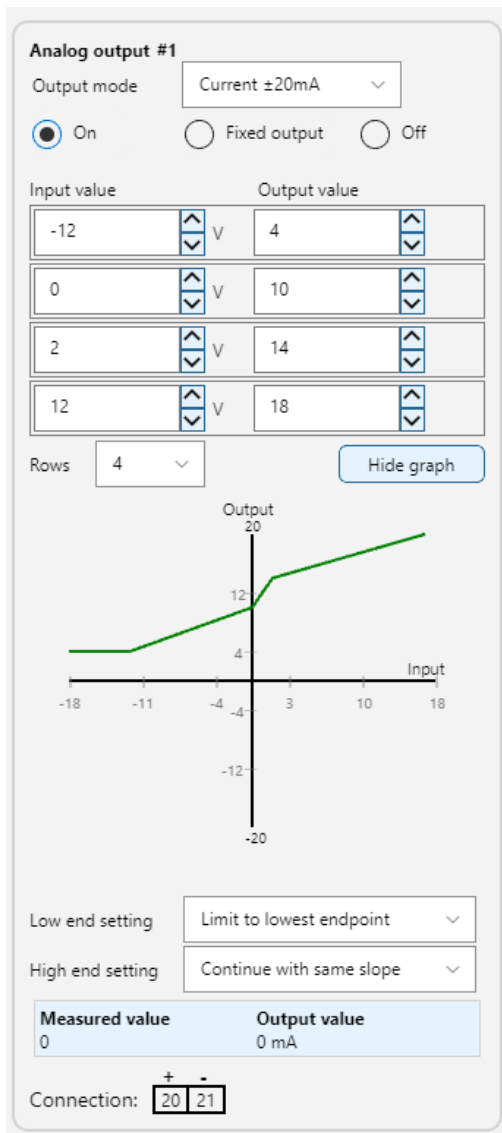
Decides how the analog output signal behave outsides end settings.

4.1.4 Fixed analog output value

Fixed output is useful for testing. A fixed value is set.

4.1.5 Off

Off position set the output signal to 0 mA or 0 V.

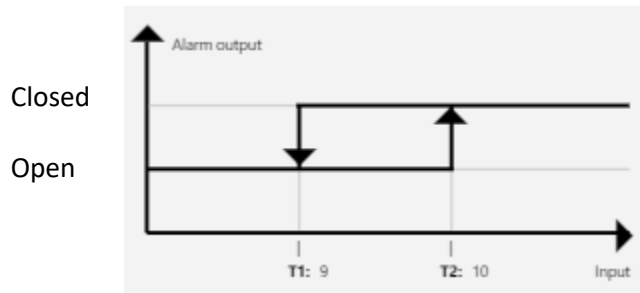


4.2 Relay outputs

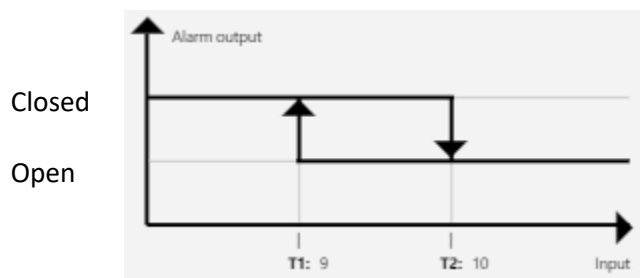
The relays for alarm use are normally open and programmed with the binary function in ConfigLQT. Four different alarm modes are available. Threshold and delay time can be individual set.

4.2.1 Alarm mode

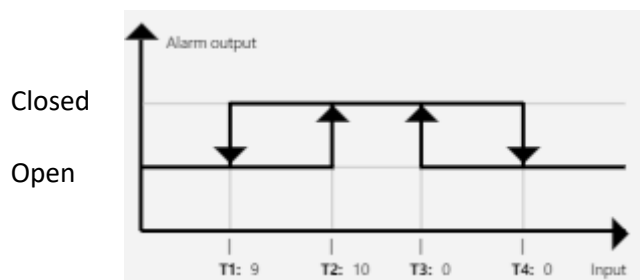
Closed above level



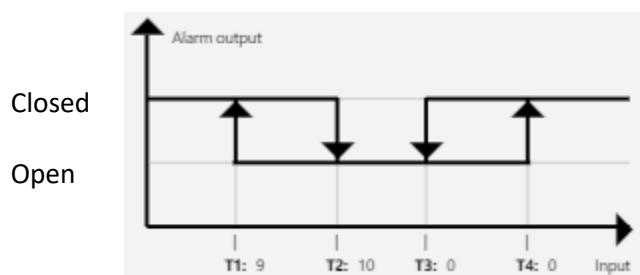
Closed below level



Closed between levels



Closed outside levels



4.2.2 Alarm delay time

The alarm delay time is set in ms (milli seconds). Max delay time is 30 000 000 ms = 500 hours.

4.2.3 LED indicators

The LED at the front shows if the relay is closed or open. It can be inverted in the software. When the delay timer is activated, the LED flash fast before closing and slow before opening.

4.2.4 Fixed relay output

The relay can be set to fixed open or closed. If lost of aux.supply the relay will open.

4.3 Output settings

The outputs can individual be set with optional filter and characteristic set points.

The screenshot displays the 'Output Settings' interface. At the top, a table lists four output configurations:

Input	Filter	Characteristic	Output
Voltage	Use filter	Use Map	Analog Output #1
Voltage	Use filter	Use Map	Analog Output #2
Voltage	Use filter	Use Map	Binary Output #1
Voltage	Use filter	Use Map	Binary Output #2

Below the table, three detailed configuration panels are shown:

- Filter #1:** Input: Voltage, Range: -24 - 24 V, Output: 0. Filter type: AVG, Filter size: 4, Output: 0.
- Map #1:** Input value: 2, 20; Output value: 0, 50. Rows: 2. Low end setting: Continue with same slope. High end setting: Continue with same slope. Output: 0.
- Analog output #1:** Output mode: Current ±20mA. On/Off/Fixed output options. Input value: 0, 50; Output value: 4, 20. Rows: 2. Low end setting: Continue with same slope. High end setting: Continue with same slope. Measured value: 0, Output value: 0 mA. Connection: 20, 21.

4.3.1 Filter

There are two types of user selectable filter to choose from: Moving Average and Binomial Filter.

Both filters are parametrized by their order N, which can range from 0 to 256. The filter length is one more than the order; $L=N+1$.

Contrasting the two filter types, for the same length the Moving Average Filter has a much lower cut-off frequency and the Binomial Filter has much better attenuation above its cut-off.

AVG - Moving Average Filter

A FIR (finite impulse response) filter with all weights equal.

BIN - Binomial Filter

A FIR (finite impulse response) filter with binomial coefficients as weights.

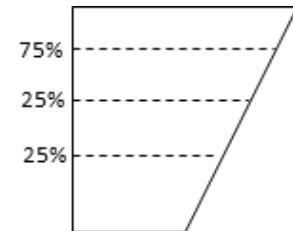
4.3.2 Characteristic

Characteristic can have up to 40 setting points.

Example how to use the characteristic function.

A tank for liquid does not have a homogeneous form. The total volume is 500 liter. The resistive tank transmitter gives 0-180 Ω and analog output signal is 4 – 20 mA.

*180 Ω correspond to 500 liter
146 Ω correspond to 375 liter
105 Ω correspond to 250 liter
62 Ω correspond to 125 liter
0 Ω correspond to 0 liter*



Map #1

Input value	Output value
180	500
146	375
105	250
62	125
0	0

Rows: 4 Show graph

Low end setting
Continue with same slope

High end setting
Continue with same slope

Output: 311.73

Analog output #1

Output mode: Current \pm 20mA

On Fixed output Off

Input value	Output value
500 Ω	20
0 Ω	4

Rows: 2 Show graph

Low end setting: Continue with same slope

High end setting: Continue with same slope

Measured value	Output value
311.73	13.98 mA

Connection: $\begin{matrix} + & - \\ \boxed{20} & \boxed{21} \end{matrix}$

5 Commissioning

5.1 Programming of the transducer

"ConfigLQT" is a free configuration software, it is available for download from Tillquist homepage, www.tillquist.com. The software connects to the transducer and make it possible to change the configuration of adjustable parameters and to visualize live readings.

ConfigLQT supports offline configuration of adjustable parameters.

Save and load configuration file.

Functionality of ConfigLQT

- See online readings of measured values
- Adjust the functionality of the outputs
- Save parameter settings to a file
- Load parameter settings from a file
- Print settings report
- Upgrade firmware

5.2 USB configuration interface

The USB interface serves for configuration and commissioning of the transducer. It is not intended for measurement processing during normal operation!

5.3 LED functionality

DCR have three LED at front, *Power* and *Alarm status*.

5.3.1 Start-up sequence

The LED flash one by one during the start up sequence.

State	Power	AI1 / AI2
Normal operation	On	Shows status
USB communication	Flashing ON/OFF 50 ms	Shows status
Error	Flashing - On 100 ms / Off 100 ms	Off

6 Technical Data

	Technical Data	Details	
Input	Current	±24 mA	
	Voltage	±24 VDC, ±12 VDC, ±300 mV, ±77 mV	
	Resistance 2 wire	0 – 6000 Ω, 0 – 3000 Ω, 0 - 1480 Ω, 0 – 720 Ω	
	Resistance 3 wire	0 - 12 kΩ, 0 - 6000 Ω, 0 - 3000 Ω, 0 - 1500 Ω, 0 - 750 Ω	
	PT100 3-wire	-200 - 850 °C	
	PT250	-200 - 850 °C	
	PT500	-200 - 850 °C	
	PT1000	-200 - 850 °C	
	K	-200 – 1372 °C	
	J	-210 - 1200 °C	
	N	-200 - 1300 °C	
	R	-50 - 1768 °C	
	S	-50 - 1768 °C	
	B	-250 – 1820 °C	
	T	-200 - 400 °C	
	E	-200 - 1000 °C	
	Potentiometer	0 - 235 kΩ, 0 - 45 kΩ, 0 - 6 kΩ, 0 – 1500 Ω	
	Current Shunt	±300 mV, ±77 mV	
	Supply	Auxiliary power supply	24 – 230 VDC / 90 – 230 VAC 50/60 Hz ±10 %
		Burden	max 4.5 W / 10 VA (2 analog output) max 3.5 W / 7 VA (1 analog output + 24 VDC)
Output	Analog outputs	1 or 2	
	Programmable range	±20 mA, ±5 mA, ±10 V	
	Resolution	16 bits	
	External resistance load	Current output: ±20 mA max 500 Ω (10 V) ±5 mA max 2000 Ω (10 V) Voltage output: ±10 V min 500 Ω	
	Response time	<50 msec	
	Ripple	≤0.2%	
	Relay Outputs	2 (Mechanical) 8 A 250 VAC (NO) 8 A 30 VDC – 300 mA 300 VDC (NO)	
General Data	Reference temperature	24 °C	
	Galvanic isolation	Supply, in- and output are galvanically isolated	
	Connection terminals / Torque	Output: 2.5 mm ² / 0.5 Nm	
	Humidity	95 % non-condensing	
	USB	USB Micro-B, port for configuration	
	Temperature	-10...+55 °C (operation) -40...+70 °C (storage) Temperature coefficient < 0.1 % / 10 °C	
	Test voltage	4 kV AC / 1 min	
	Measurement category	Cat. III	
	Overvoltage category	Cat. III	
	Pollution degree	2	
Dimension (W x H x D)	35 x 132 x 101 mm		
Weight	330 gr		

	Protection	IP40 (enclosing), IP20 (terminals)
	Flammability class	UL94 V-0
	Standards	IEC 60688:2021 Transducers SS-EN 61010-1 Safety IEC 61010-2-030 EN 61000-6-2 / -6-4 / -6-5

7 Ordering Codes

	DCR-	0	X	2	XXX
Number of Analog Outputs					
2			2		
1 + 24V 30 mA Aux.Supply			3		
Number of Relay Outputs					
2				2	
Other Requirements					
Standard configuration					000
Customer configuration (to provide ERF)					001