

D.0025710002

Operating instructions (Translation)



Plug-in display unit SD 1

88025710002-04

Englisch

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KRACHT

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1 General

1.1 About the documentation

These operating instructions describe the installation and operation of the following device:

Plug-in display unit SD 1

The device is manufactured in different versions. Information about the version concerned in the individual case can be found on the device's type plate.

These operating instructions are a component of the device and must be kept accessible for the personnel near the device at all times.

If you have any questions about these operating instructions, please contact the manufacturer.

1.2 Manufacturer's address

KRACHT GmbH
Gewerbestraße 20
DE 58791 Werdohl
phone: +49 2392 935-0
fax: +49 2392 935-209
email: info@kracht.eu
web: www.kracht.eu

1.3 Symbolism



Identification of an immediate hazard, which would result in death or severe bodily injury if not avoided.



Identification of a potential medium risk hazard, which would lead to death or severe bodily injury if not avoided.



Identification of a low risk hazard, which could lead to minor or medium bodily injury if not avoided.



Flagging of notices to prevent property damage.



Identification of basic safety instructions. Non-compliance can lead to hazards for people and the device.



Flagging of special user tips and other especially useful or important information.

2 Safety

2.1 Intended use

1. The unit is provided to display and evaluate fluid flow.
2. The unit may only be operated with a flow meter from the company KRACHT that has been provided with a plug connector as per DIN 43650.
3. The unit must not be used in areas with potentially explosive atmospheres, in medical equipment areas or in areas of usage according to DIN EN 61010-1:2011-07; VDE 04-1:2011-07.
4. The device may be operated only in usual industrial atmospheres. If there are any aggressive substances in the air, always ask the manufacturer.
5. Operation of this unit is only permissible with compliance with these operating instructions.
Deviating operating conditions require the express approval of the manufacturer.
6. In case of any use of the device not according to specification, any warranty is voided.

2.2 Personnel qualification and training

The staff designated to assemble, operate and service the device must be properly qualified. This can be through training or specific instruction. Personnel must be familiar with the contents of this operating instructions.



Read the operating instructions thoroughly before use.

2.3 Basic safety instructions



1. Comply with existing regulations on accident prevention and safety at work along with any possible internal operator regulations.
2. Pay attention to the greatest possible cleanliness.
3. Wear suitable personal protection equipment.
4. Do not remove, make illegible or obliterate type plates or other references on the device.
5. Do not make any technical changes on the device.
6. Maintain and clean the device regularly.
7. Use spare parts approved by the manufacturer only.

2.4 Basic hazards

 **WARNING**

Exposed electrical components!

Supply voltage 12 VDC/24 VDC

1. Follow the special safety regulations during all work on electrical installations.
2. Only allow electricians to work on electrical systems.
3. Only use connection lines that are resistant to ambient influences and media.

 **WARNING**

Malfunction!

Risk of injury due to operating mistakes or failure of the unit when controlling plants or process sequences.

1. Suitable safety precautions must be taken when the device is used.
2. In case of a fault or change of the operating behaviour, put the unit out of service.

3 Device description

3.1 Functional principle

The plug-in SD 1 display is a general purpose onsite display for all flow measurement series from the company KRACHT that are equipped with a plug connection as per DIN 43650.

Plug in the display between the unit socket and the connector socket of the flow meter.

The plug-in display can be freely programmed. Program using two keys. They are accessible after you remove the front panel.

The unit can be set for flow measurement or volume measurement.

- Version SD 1-I: Freely selectable
- Version SD 1-K: Specified
- Version SD 1-R: Only flow measurement

If you store the data in a FRAM they are also backed-up in case of a power failure.



Retrofit flow meter

1. Delivered flow meters can be retrofit with the plug-in display. To do that, remove the pre-amplifier board in the unit plug of the flow meter.

Impulse output (SD 1-R)

This version is only suitable for a flow measurement.

If the unit is operated with a flow meter that has one sensor, it is referred to as single-channel sampling.

If the unit is operated with a flow meter that has two sensors, it is referred to as two-channel sampling. The two-channel scanning facilitates a higher measuring resolution and detection of the direction of the flow rate.

Digital output (SD 1-K)

This version is suitable for a flow measurement and a volume measurement.
- Stipulation: in the manufacturer's factory

One switching value and one OFF phase can be programmed for each relay.

- During the flow measurement, 2 relays are used.
- During the volume measurement, 1 relay is used.
(The free contact is used for the "Release volume counting" function.)

The relays can be programmed as a make-contact function, break-contact function, window function or hysteresis function.

Analogue output (SD 1-I)

This version is suitable for a flow measurement and a volume measurement.
 - Stipulation: at the operating company

For the analogue output, one maximum flow value can be programmed that corresponds to an output of 20 mA.

3.2 Type key

Ordering example SD 1						
SD 1	-	K	-	24	/	V
1.		2.		3.		4

Explanation of type key SD 1		
1.	Product name	
2.	Version	
	R	Rectangular signals (incremental signal)
	K	Two relay contacts 24 VDC/1A
	I	Current output 0 - 20 mA; 4 - 20 mA
3.	Supply voltage	
	12	12 VDC
	24	24 VDC
4.	Display	
	No specification	Flow measurement
	V	Volume measurement

4 Technical data

4.1 General information

General information SD 1		
Display	Principle	7 Segment LED 7,62 mm; Red
	Display	0.000 - 9999. (Floating point number display)
	Overflow (>9999)	Display: 9999.
Ambient temperature	Operating temperature	0 °C - 60 °C
	Storage temperature	-25 °C - 85 °C
Keypad		2 Keys Behind the front panel
Housing material		Aluminium
Dimensions		35 mm x 60 mm x 60 mm Height x Width x Depth (Housing)
Housing connection		according to DIN 43650 (4-pole) Reverse-polarity protection
Protection class (DIN 40050)		IP 65
Weight		0.12 kg

4.2 Electrical data

Electrical data SD 1		
Processor		PIC17C42
Mains adapter	Supply voltage	12 VDC ± 20% ----- 24 VDC ± 20%
	Maximum current consumption	approx. 120 mA

4.3 Version

Version SD 1	
SD 1-R	
<i>Impulse output</i> (Rectangular signals)	incremental signal
Impulse amplitude	approx. 0.8 x with 24 VDC power supply, load-dependent
Impulse shape with symmetrical output signal	Rectangular, pulse duty factor/channel 1:1 ± 15 %
Impuls offset between the two channels	90°, ± 30°
Power output per channel	max. 0.3 W, Short-circuit proof
SD 1-K	
<i>Digital output</i> (Two relay contacts)	One closer each 24 Volt 1 A Ω Load Typical switching time 6 ms
SD 1-I	
<i>Analogue output</i> (Current output)	0 - 20 mA, 4 - 20 mA Burden ≤ 250 Ω - with 24 VDC power supply Burden ≤ 50 Ω - with 12 VDC power supply Resolution 10 Bit, Short-circuit proof

5 Transport and storage

5.1 Transport

- After receipt, check the device for transport damages.
- If transport damage is noticed, report this immediately to the manufacturer and the carrier. The device must then be replaced or repaired.
- Dispose of packing material and used parts in accordance with the local stipulations.

5.2 Storage

In case of storage, a dry, dust-free and low-vibration environment is to be ensured. The device is to be protected against influences from weather, moisture and strong fluctuations of temperature.

6 Electrical connection

6.1 General

Electrical connection is made through a plug-type connection in accordance with DIN 43650.

6.2 Terminal layout: Supply voltage

The device is operated using direct current 24 VDC or 12 VDC. Information about the version concerned in the individual case can be found on the device's type plate.

Terminal layout: Supply voltage		
	PIN 1	+24 VDC ----- +12 VDC
	PIN 2	GND
	PIN 3	Terminal layout: SD 1-R SD 1-K SD 1-I
	PIN	

6.3 Terminal layout: SD 1-R (Rectangular signals)

If the unit is operated with a flow meter that has two sensors, it is referred to as two-channel sampling.

If the unit is operated with a flow meter that has one sensor, it is referred to as single-channel sampling.

Terminal layout: SD 1-R - 2-channel version		
	PIN 1	Terminal layout: Supply voltage
	PIN 2	
	PIN 3	Channel 1
	PIN	Channel 2

Terminal layout: SD 1-R - 1-channel version		
	PIN 1	Terminal layout: Supply voltage
	PIN 2	
	PIN 3	Channel 1
	PIN	-

6.4 Terminal layout: SD 1-K (Two relay contacts)

The device has two relay contacts.

The relay contacts switch the supply voltage for external further processing.

Terminal layout: SD 1-K (Flow measurement)		
	PIN 1	Terminal layout: Supply voltage
	PIN 2	
	PIN 3	Relay 1
	PIN	Relay 2

Terminal layout: SD 1-K (Volume measurement)		
	PIN 1	Terminal layout: Supply voltage
	PIN 2	
	PIN 3	Relay 1
	PIN	Release volume count



The relays are equipped with normally open contacts.
 Maximum switching voltage: 30 Volt
 Maximum switching current: 1 A Ω Load

6.5 Terminal layout: SD 1-I (Analogue output)

Terminal layout: SD 1-I		
	PIN 1	Terminal layout: Supply voltage
	PIN 2	
	PIN 3	Analogue output 0 - 20 mA ----- 4 - 20 mA
	PIN	-

Terminal layout: SD 1-I (Volume measurement)		
	PIN 1	Terminal layout: Supply voltage
	PIN 2	
	PIN 3	Analogue output 0 - 20 mA ----- 4 - 20 mA
	PIN	Release volume count

7 Operation start-up

7.1 Preparation

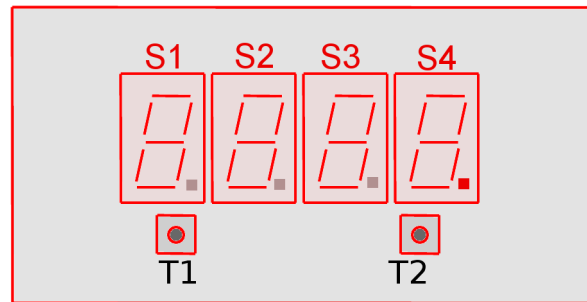
Before every start-up of the plug-in display, the unit must be adapted to the connected flow meter.

7.2 Input

The procedure for entering all values is always the same.

The plug-in display can be freely programmed. Program using two keys. They are accessible after you remove the front panel. **[T1; T2]**

- Remove plastic caps.
- Loose fastening screws.
- Remove the front panel.



7.2.1 Start input

- Simultaneously press and hold keys T1 and T2 for four seconds.
 - Segments S1 and S2 are dimmed.
 - Segments S3 and S4 display menu code number 00.

7.2.2 Changing the menu code

- Press key T1 briefly to run through the menu code numbers.
 - Select menu code number (00 - 10).
- Press key T2 briefly to confirm the menu code number selection.
 - A four-digit input value for the function selection appears. (S1 - S4)

See also [section 7.3.1 "Overview menu code numbers"](#)

7.2.3 Changing the input value

The dot marks every activated segment that was changed.

- Press key T2 briefly to change the input value.
- Press key T1 briefly to change the active segment.

After entering the values, the comma has to be set at the correct decimal point.

- Press key T1 briefly to change the active segment.

Return to the menu code number level:

- Press keys T1 and T2 simultaneously.
 - Segments S1 and S2 are dimmed.
 - Segments S3 and S4 display menu code number 00.
- Release keys T1 and T2.

7.2.4 End input

- Simultaneously press and hold keys T1 and T2 for four seconds.
 - The display mode is activated.

Reattach the front panel to the unit.

- Put on the front panel.
- Tighten fastening screws.
- Put on plastic caps.

7.3 Programming

7.3.1 Overview menu code numbers

Menu code	Standard setting		User value		Function	
	Input value	Unit	Input value	Unit		
00	0.040	[cm ³ /Imp]		[cm ³ /Imp]	Pulse volume flow meter	
01	3.500	[l/min]		[⁽¹⁾]	Maximum value analogue output	
02	0.400	-		-	Damping of digital filters (Permanent period measurement) or	
		[S]		[S]	Gate time in seconds (Gate window measurement)	
03	9999.	[l/min]		[⁽¹⁾]	Switch-on relay 1 ⁽²⁾	
04	9999.	[l/min]		[⁽¹⁾]	Relay OFF phase value 1 ⁽²⁾	
05	9999.	[l/min]		[⁽¹⁾]	Switch-on relay 2 ⁽²⁾	
06	9999.	[l/min]		[⁽¹⁾]	Relay OFF phase value 2 ⁽²⁾	
07	0000.					
	X _ _ _				Measurement	0 Gate window measurement
						1 Permanent period measurement
	_ X _ _				Parameter	0 Flow
						1 Volume
	_ _ X _				Alternative time basis	0 Second
						1 Hour
	_ _ _ X				Time basis	0 Minute
1 Alternative time basis						

Menu code	Standard setting		User value		Function	
	Input value	Unit	Input value	Unit		
08	0 0 0 0.					
	X _ _ _				Analogue signal	0 0 - 20 mA
						1 4 - 20 mA
	_ X _ _				Analogue / Relay	0 Analogue output
						1 Relay contacts
_ _ X _				Display	0 Normal	
					1 180° rotation	
	_ _ _ X				Count input (Flow meter)	0 Two-channel
						1 One-channel
09	1. 0 0 0	[kg/l]		[kg/l]	Desity factor	
10	0. 0 0 0	[Hz]		[Hz]	Limit frequency	
⁽¹⁾ As per the menu code number 07 ⁽²⁾ If the input value is 9999., the relays are switched off.						

7.3.2 Menu code 00

Pulse volume flow meter				
Flow meter	Impulse volume [cm ³ /Imp]	Input value Menu code 00		Flow meter version
		Display: l	Display: ml	
VC 0.025	0.025	0.025	25.00	Two-channel
VC 0.04	0.040	0.040	40.00	
VC 0.1	0.100	0.100	100.0	
VC 0.2	0.245	0.245	245.0	
VC 0.4	0.400	0.400	400.0	
VC 1	1.036	1.036	1036.	
VC 3	3.000	3.000	3000.	
VC 5	5.222	5.222	5222.	
VC 12	12.000	12.00	not possible	
VC 16	16.000	16.00	not possible	
VCA 0.04	0.040	0.040	40.00	One-channel
VCN 0.04	0.040	0.040	40.00	
VCA 0.2	0.200	0.200	200.0	
VCN 0.2	0.200	0.200	200.0	
VC 0.2 AL	0.245	0.245	245.0	Two-channel
VCA 2	2.000	2.000	2000.	One-channel
				Two-channel
VCA 5	5.222	5.222	5222.	One-channel
VCG 2	2.000	2.000	2000.	Two-channel
VCG 5	5.222	5.222	5222.	
VCL 0.1	0.100	0.100	100.0	
SVC 4	0.255	0.255	255.0	Two-channel
SVC 10	1.418	1.418	1418.	
SVC 40	5.130	5.130	5130.	
SVC 100	9.820	9.820	9820.	
SVC 250	18.25	18.25	not possible	
TM 0.275 - TM 4000	See rating plate/accompanying documents			One-channel

7.3.3 Menu code 01

The “Maximum value Analogue output” function can only be set in units of the “Analogue output” (SD 1-I) version.

In menu code number 01 - "Maximum value analogue output", the maximum value is entered that corresponds to an output of 20 mA.

Example:

Maximum value analogue output: 3.500 l/min

If the flow is 3.500 litres/minute, 20 mA is shown on the display.

If the flow is 0.000 litres/minute, 0 mA or 4 mA are shown on the display.

(See also: Menu code 08 - Analogue signal - 0 0 - 20 mA / 1 4 - 20 mA)

With an analogue output the flow measurement or volume measurement is freely selectable.

(Menu code 07 - Parameter - 0 Flow / 1 Volume)

7.3.4 Menu code 02

In menu code number 02 either the cycle duration measurement or the gate time measurement can be set.

The “Damping digital filter” or “Gate time in seconds” can only be used to determine the flow rate.

(Menu code 07 - Parameter - 0 Flow)

In menu code number 07 - Measurement - 0 Gate time measurement / 1 Cycle duration measurement, the function is specified that is entered in menu code number 02.

Permanent period measurement

Permanent period measurement allows very fast measurements. A digital filter makes smoothing possible where there are great fluctuations in flow, thus settling the display.

The larger the value entered, the greater the filter effect.

- Programming value 0.000 - no filter effect
- Programming value 9999. - maximum filter effect



Input signals smaller than 1 Hz are not processed.

Gate window measurement

In the case of gate window measurement, the impulses are counted within a programmed gate window and converted to flow using the counter's impulse volume. The gate time measurement creates a steady display.

The smallest gate window that can be set is 0.1 seconds.

7.3.5 Menu code 03 - 06

The relay functions can only be set in units with the “digital output” (SD 1-K) version.

With a digital output the flow measurement or volume measurement was set during the order.

(Menu code 07 - Parameter - 0 Flow) or

(Menu code 07 - Parameter - 1 Volume)

Relay 1 is programmed in menu code number 03 (ON phase) and menu code number 04 (OFF phase). Relay 2 is programmed in menu code number 05 (ON phase) and menu code number 06 (OFF phase).

Possible switching functions:

Make-contact function

The contact is closed when the switch-on value is reached.

Example:

Switch-on relay: 2.500

Relay OFF phase value: 9999.

Entering 9999. in the OFF phase value has the consequence that only the ON phase value is evaluated.

Break-contact function

The contact is opened when the switch-off value is reached.

Example:

Switch-on relay: 0.000

Relay OFF phase value: 3.000

Entering 0.000. in the ON phase value has the consequence that only the OFF phase value is evaluated.

Window function

Example:

Switch-on relay: 2.500

Relay OFF phase value: 3.000

The relay contact switches in as soon as the On phase has been reached. The relay contact switches off as soon as the OFF phase has been exceeded.

Hysteresis function

Example:

Switch-on relay: 4.000

Relay OFF phase value: 3.000

The relay contact switches in as soon as the On phase has been reached. The relay contact switches off as soon as the OFF phase has been undercut.

7.3.6 Menu code 07

The menu code number 07 includes several functions:

X _ _ _ - Measurement

- 0 - Gate window measurement
- 1 - Permanent period measurement

The function is stipulated that is entered in menu code number 02.

_ X _ _ - Parameter

- 0 - Flow
 - Version SD 1- I: Freely selectable
 - Version SD 1-K: Specified
 - Version SD 1-R
- 1 - Volume
 - Version SD 1- I: Freely selectable
 - Version SD 1-K: Specified

The unit can be set for flow measurement or volume measurement.

_ _ X _ - Alternative time basis

- 0 - Second
- 1 - Hour

_ _ _ X - Time basis

- 0 - Minute
- 1 - Alternative time basis

Example:

Input value	Time basis ⁽¹⁾
_ _ 1 0	Minute
_ _ 0 1	Second
_ _ 1 1	Hour
<i>(1) To set the unit under menu code number 01; 03; 04; 05 and 06.</i>	

7.3.7 Menu code 08

The menu code number 08 includes several functions:

X _ _ _ - Analogue signal

- 0 - 0 - 20 mA
- 1 - 4 - 20 mA

The analogue signal can only be set in units of the "Analogue output" (SD 1-I) version.

_ X _ _ - Analogue / Relay

- 0 - Analogue output
 - Version SD 1-I
- 1 - Relay contacts
 - Version SD 1-K

_ _ X _ - Display

- 0 - Normal
- 1 - 180° rotation

_ _ _ X - Count input

- 0 - Two-channel
- 1 - One-channel

If the unit is operated with a flow meter that has two sensors, it is referred to as two-channel sampling.

If the unit is operated with a flow meter that has one sensor, it is referred to as single-channel sampling.

See [section 7.3.2 "Menu code 00"](#)

In two-channel flow meters, the correct pulse sequence of the channels can be monitored. False pulses are not counted so they do not change the volume measurement.

If the unit detects a fault, "FAUL" appears in the display.



Switch-off of error display

The error display can be switched off.

Menu code 08 - Count input

- 0 - Two-channel = Release error display
- 1 - One-channel = Block of error display

7.3.8 Menu code 09

The density factor enables calculation of densities for mass determination.

- During volumetric measurement, the density factor is set to **1.000**.
- During gravimetric measurements, set the density factor of the technical data sheet of the medium.

7.3.9 Menu code 10

The “Limit frequency” function can only be set during the volume measurement.

The volume measurement is the sum of the medium that is flowing through a flow meter.

A summation of the media is only made after:

- Release volume count
See [chapter 6 “Electrical connection”](#)
- The flow rate of the set limit frequency is exceeded

The limit frequency is usually set to 0.000 .



Volume measurement

1. With a voltage of 24 V on the release input, the volume is totalled. The measurements on the display change.
2. With a voltage of 0 V on the release input, volume is not totalled. The measurements on the display do not change.
3. Changing the voltage from 0 V to 24 V resets the summation to zero. A new summation starts.

8 Maintenance



WARNING

Exposed electrical components!

Supply voltage 12 VDC/24 VDC

1. Follow the special safety regulations during all work on electrical installations.
2. Only allow electricians to work on electrical systems.
3. Only use connection lines that are resistant to ambient influences and media.

Maintenance work:

- Replace defective and worn components.
- Use spare parts approved by the manufacturer only.
- Dispose of packing material and used parts in accordance with the local stipulations.



Barriers and instructions

All barriers and warning signs removed during this must be attached to their original position on completing maintenance and/or repairs.

9 Repairs

9.1 Safety instructions for repair

 **WARNING****Exposed electrical components!**

Supply voltage 12 VDC/24 VDC

1. Follow the special safety regulations during all work on electrical installations.
2. Only allow electricians to work on electrical systems.
3. Only use connection lines that are resistant to ambient influences and media.

 **WARNING****Malfunction!**

Risk of injury due to operating mistakes or failure of the unit when controlling plants or process sequences.

1. Suitable safety precautions must be taken when the device is used.
2. In case of a fault or change of the operating behaviour, put the unit out of service.

9.2 General

The repairs covers:

1. Troubleshooting
Determination of damage, pinpointing and localisation of the damage cause.
2. Elimination of damage
Elimination of the primary causes and replacement or repair of defective components. The repair is generally made by the manufacturer.

Repairs by manufacturer

- Before returning the device, fill in the *return notification* form. The form can be filled in online and is available as a pdf file download.

Repair by equipment builder/operator

If corresponding expertise and sufficient equipment is available, the equipment builder/operator can also make the repairs. Please consult the manufacturer about this.

- Use spare parts approved by the manufacturer only.
- Dispose of packing material and used parts in accordance with the local stipulations.



Warranty

In case of improper implementation, any warranty is voided.



Barriers and instructions

All barriers and warning signs removed during this must be attached to their original position on completing maintenance and/or repairs.

9.3 Detecting and eliminating failures

Failure		Potential causes	Possible measures
1.1	LED display <i>No LED display illuminates</i>	Power failure	Check the supply cable Check the fuses
		Unit defective	To be fixed/replaced by manufacturer
1.2	LED display <i>FAUL</i>	Incorrect programming	Check programming (08 - Count input)
		Sensor on flow meter defective	See operating instructions: Associated flowmeter
In case of unidentified faults, request help from the manufacturer or return the unit to the manufacturer for inspection.			