Operating Instruction

for

Gear Wheel Flow Meter

Model: DZR

optional
plug-on
display

12.15

DZR

1. Contents

Sold by:

2. Note

Please read these operating instructions before unpacking and putting the unit into operation. Follow the instructions precisely as described herein.
The instruction manuals on our website www.kobold.com are always for currently manufactured version of our products. Due to technical changes, the instruction manuals available online may not always correspond to the product version you have purchased. If you need an instruction manual that corresponds to the purchased product version, you can request it from us free of charge by email (info.de@kobold.com) in PDF format, specifying the relevant invoice number and serial number. If you wish, the operating instructions can also be sent to you by post in paper form against an applicable postage fee.

Operating instructions, data sheet, approvals and further information via the QR code on the device or via www.kobold.com

The devices are only to be used, maintained and serviced by persons familiar with these operating instructions and in accordance with local regulations applying to Health & Safety and prevention of accidents.

When used in machines, the measuring unit should be used only when the machines fulfil the EC-machine guidelines.

PED 2014/68/EU

In acc. with Article 4, Paragraph (3), "Sound Engineering Practice", of the PED 2014/68/EU no CE mark.
Table 8, Pipe, Group 1 dangerous fluids

3. Instrument Inspection

Instruments are inspected before shipping and sent out in perfect condition.
Should damage to a device be visible, we recommend a thorough inspection of the delivery packaging. In case of damage, please inform your parcel service / forwarding agent immediately, since they are responsible for damages during transit.

Scope of delivery:
- Gear Wheel Flow Meter   model: DZR

4. Regulation Use

The Gear Wheel Flow Meter is a measuring device for the continuous measurement of the flow of liquids. The various models enable it to be used for media of differing viscosity and lubrication.

The user must ensure that the medium to be measured is compatible with the materials used in the DZR (see under chapter 12. Technical Information).

The maximum permissible operating conditions given under "Technical specifications" must not be exceeded.

Any use of the DZR, which exceeds the manufacturer's specifications, may invalidate the warranty. Therefore, any resulting damage is not the responsibility of the manufacturer. The user assumes all risk for such usage. The application specifications include the installation, start-up and service requirements specified by the manufacturer.

5. Operating Principle

The KOBOLD Gear Wheel Flow Meter series DZR have been designed for a cost-effective flow measurement for viscous fluids. The measuring unit consists of a pair of gear wheels which is moved by the flow according to the principle of gear wheel motor. The bearings are – according to the material combination – either ball bearings or gliding bearings. The different versions vary through different housing materials, lubrication properties, through the medium being used and the accuracy.

6. Mechanical Connection

Before delivery the Gear Wheel Flow Meter was tested in the factory and is ready to use as soon as it has been fitted and the electrical leads connected. The space required for the fitted unit is given in the section titled "Dimensions". Safe access to the integral measuring unit for visual inspection should be provided at all times, including while the unit is in operation.

Attention! When mounting and transporting the flow meter, make sure that it is secured by the housing only and not by the plug on top.

6.1. Mechanical Installation

Depending on the type of connection fitting, the unit is connected to the plant either via a connection plate or via pipe connectors located in the centre of the housing.

Attention! Only piping and connectors which are rated for the anticipated pressure range may be used. Specifications of the particular manufacturer have to be observed.

6.1.1. Plate connection

- Before mounting the flow meter, thoroughly clean the pipes.
- Secure the connecting plate to its intended position in the plant.

Make sure that the seals are properly seated. The connecting surface must be free of contamination, residues of colour etc.

- Place the housing on the connection plate, aligning the fastening holes.
- Screw the housing firmly to the connecting plate.

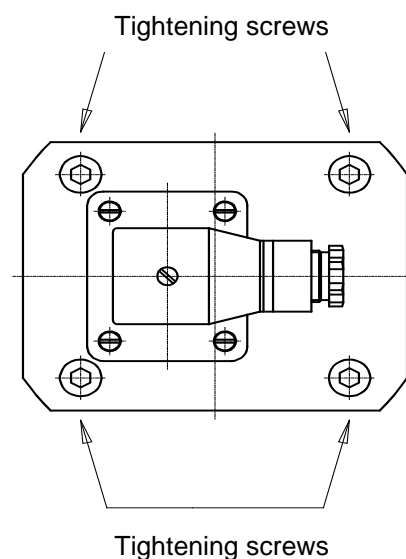**Attention! Tighten the connecting plate screws alternate crosswise. While doing so, adhere to the following tightening torque values.**

Tightening screws

Tightening torque for connecting plates

Measuring range code	001/003/005	009	011	013
Tightening torque Nm	14	35	120	120

- After starting up the process, check all connections for leakage.

Tightening screws

6.1.2. Mounting onto other connecting plates or valve blocks

The required flatness and roughness values for the mounting surfaces are given below.

Measuring range code		001/003/005	009	011	013
Flatness	μm	0.01	0.01	0.02	0.02
Depth of roughness R_t	μm	10	10	10	10

The Gear Wheel Flow Meter must be mounted as described above under "Plate connection".

6.1.3. Pipe connection

- Before mounting the flow meter, thoroughly clean the piping system.
- Connect the pipes to the inlet and outlet of the meter unit, observing the manufacturer's instructions.
- When installing, ensure that no sealant enters the pipes.

Attention! The Gear Wheel Flow Meter must not be tensioned during installation.

- After starting up the process, check all connections for leakage.

7. Electrical Connection

This work may only be done by a qualified electrician.

Electrical specifications

| Number of measuring channels	2
Operating voltage	U_B = 24 V DC $\pm$ 20%, polarised
Pulse amplitude	$U_A \geq 0,8\ U_B$
Pulse shape for symmetrical output signals	Square wave, sampling ratio/channel 1:1 $\pm$ 15%
Pulse displacement between the two channels	90° $\pm$ 30°
Power requirement	$P_{b\ max}$ = 0.9 W
Output power per channel	$P_{a\ max}$ = 0.3 W, short-circuit proof
Protection type	IP 65

Requirements: A 24V (DC) supply lead must be provided for the preamplifier.

- The electrical connections have to be wired up to the terminal connection diagram below.

> **Note! For comfortable working the plug may be removed from the housing lid to connect the cables; please re-plug afterwards.**

The assignment of the terminals for channels 1 and 2 has an effect on the direction of rotation shown for the gear wheels and therefore on the sign (+ or -) of the measured volume flow display on the evaluation electronic.
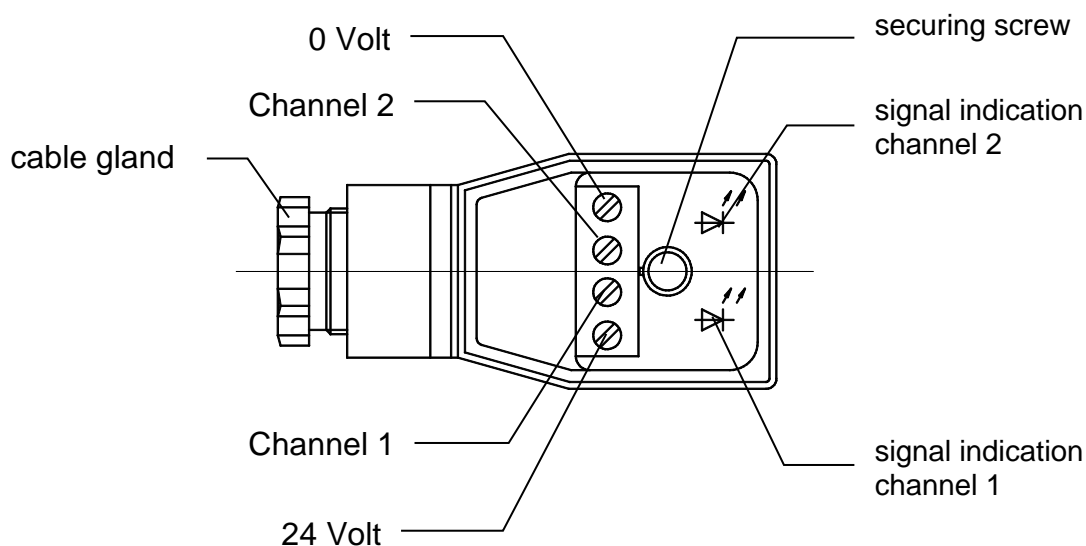
> **Attention! Once mounting is completed the securing screw and the cable gland must be tightened. Be careful not to over-tighten.**
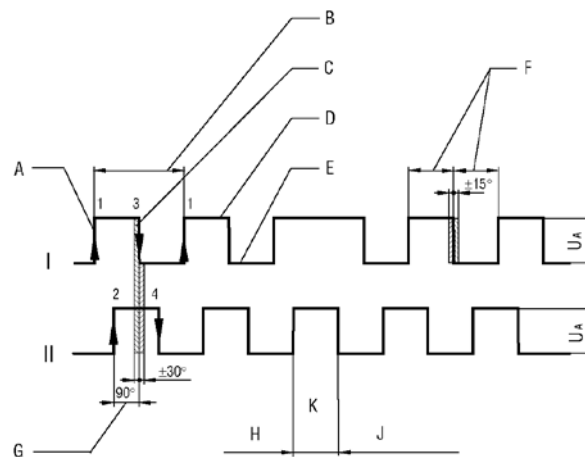
DZR

7.1. Signal Characteristics

Channel I
A   rising edge
B   one pulse
     (corr. to flow rate of geom.
     tooth volume V_{gz})
C   falling edge
D   ON phase
E   OFF phase
F   pulse duty factor 1:1 ± 15 %

Channel II
G   channel offset
H   flow direction 1
K   Reversal of flow direction
J   flow direction 2

7.2. Removing the Flow Meter

Attention! Ensure that the pipes are de-pressurised and the electrical connection is powerless. The unit and pipes can still contain the conveyed medium or a cleaning agent. All regulations concerning this medium must be observed. Sufficiently large collecting containers should be placed in readiness.

- Release the securing screw on the plug.
- Remove the plug from the housing.
- *Plate connection:* Remove the screws fastening the flow meter to the plate.
- *Pipe connection:* Remove the pipe connections from the housing and if necessary, remove the housing from the holding device.

Attention! When using media that hardens, clean the Gear Wheel Flow Meter with a suitable cleansing agent as promptly as possible.

8. Commissioning

Attention! The Gear Wheel Flow Meter must only be operated within the permitted limits, which are given under chapter 12. Technical Information. Ensure that the medium to be measured is compatible with the materials of the Gear Wheel Flow Meter. The medium must not contain any abrasive particles. In case of doubt, consult the manufacturer.

The Gear Wheel Flow Meter has been factory-tested before delivery. It is ready to use as soon as it has been mounted and the electrical leads connected. When it is in use the two LEDs in the connector are illuminated to indicate a continuous flow of fluid through the measuring unit.

8.1. Permitted Operating Limits

Attention! The flow resistance Δp must not exceed 16 bar, otherwise it leads into mechanical damage.

The ambient conditions must comply with the limits given in the technical specifications.

9. Maintenance

Flow meters are basically maintenance-free. However, if the liquids conveyed could leave deposits in the measuring unit, it may become necessary to clean it (see below). Otherwise, the unit can be cleaned with the rest of the plant at the usual times.

Attention! When using media that hardens, clean the Gear Wheel Flow Meter with a suitable cleansing agent as promptly as possible.

Check at regular intervals that the securing screws are firmly seated and tighten them if necessary (observe the correct tightening torque, which is given in the section on mounting and removing the flow meter.).

Attention! Whenever work is done on the Gear Wheel Flow Meter and before removing it, ensure that the pipes are de-pressurised.

10. Cleaning

DZR-1/2/5 and 6 units: Never open these particular units yourself, as they can only be re-assembled in working order by a specialist.

Attention! Ensure that the pipes are de-pressurised and the electrical connection is powerless. The equipment and pipes may still contain the conveyed medium or a cleaning agent. All regulations concerning this medium must be observed. Sufficiently large collecting containers should be placed in readiness.

- Remove the Gear Wheel Flow Meter (see section on mounting and removing the unit).
- Drain the measuring unit.
- Loosen the securing screws that hold the two halves of the housing together. The (4 or 8) hexagon socket screws are accessible from below the housing.

Attention! When removing the upper section of the volume counter, do not use screwdrivers or similar tools as levers to pry apart. Also pliers must not be used to remove the gear wheels from the housing.

- Clean the interior of the housing, the gear wheels and the bearings with a suitable cleaning agent.

If mechanical damage is found in the interior of the housing or on the gear wheels the complete unit must be returned to the manufacturer for repair.

- Insert both gear wheels and their bearings in the lower section of the housing.
- Lay the O ring in the groove of the housing.
- Place the upper section of the housing over the lower section (use locating pins).
- Tighten all the screws that hold the housing together, going alternately across from one to the next, using the correct torque (see below).

Attention! All parts must be free of contamination. Ensure that no contaminants remain inside the Gear Wheel Flow Meter.

Tightening torque for securing the housing, DZR-3 and DZR-4

Measuring range code	005	009	011	013
Tightening torque Nm	40	65	145	145

- Remount the housing in the plant as described above under "Mechanical Connection".

11. Recognising and Correcting Faults

If the Gear Wheel Flow Meter is not operating perfectly, first check the electrical components while the unit is operating.

Attention! This work may only be done by a qualified electrician.

If troubleshooting software is not available, use the following diagnostic table.

Fault	Possible cause	Remedy
Both LEDs on the Gear Wheel Flow Meter are lit but the values displayed are wrong	Faulty connection between the Gear Wheel Flow Meter and the analysing unit	Check the connection and replace the cable or connector if necessary
One LED is dark during operation.	Damaged wiring between sensor and circuit board, or individual soldered points on the board	Renew the defective cable or soldering
	The corresponding sensor is defective	Send the meter to the manufacturer for repair
Both LEDs are dark during operation	Faulty preamplifier	Check preamplifier and replace if necessary
	Power supply failure	Check supply cable and fuses
	Since both sensors are unlikely to fail at once, it can be assumed that the measuring unit has stopped	**Switch the Gear Wheel Flow Meter off immediately**! Send Models DZR-1 and 2 units to the manufacturer for repair. Models DZR-3 and 4 units can be dismounted and cleaned (see under "Maintenance")
Leakage, escaping medium	Faulty O ring in housing.	Send Models DZR-1 and 2 units to the manufacturer for repair and consultation. Check the compatibility of the seal on Models DZR-3 and 4 units, consult the manufacturer if necessary and fit a new set of seals (obtainable from the manufacturer)
	Faulty O ring between Gear Wheel Flow Meter and connecting plate	Check seal for compatibility, fit new O rings.

12. Technical Information

Operating instructions, data sheet, approvals and further information via the QR code on the device or via www.kobold.com

13. Order Details

Operating instructions, data sheet, approvals and further information via the QR code on the device or via www.kobold.com

14. Pressure Loss Diagrams

Operating instructions, data sheet, approvals and further information via the QR code on the device or via www.kobold.com

15. Dimensions

Operating instructions, data sheet, approvals and further information via the QR code on the device or via www.kobold.com

16. Disposal

Note!

- Avoid environmental damage caused by media-contaminated parts

- Dispose of the device and packaging in an environmentally friendly manner

- Comply with applicable national and international disposal regulations and environmental regulations.

Batteries

Batteries containing pollutants are marked with a sign consisting of a crossed-out garbage can and the chemical symbol (Cd, Hg, Li or Pb) of the heavy metal that is decisive for the classification as containing pollutants:

Cd[1]   Hg[2]   Pb[3]   Li[4]
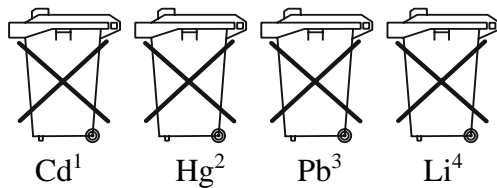
1. „Cd" stands for cadmium
2. „Hg" stands for mercury
3. „Pb" stands for lead
4. „Li" stands for lithium

Electrical and electronic equipment
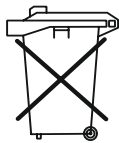
17. EU Declaration of Conformity DZR

We, KOBOLD Messring GmbH, Nordring 22-24, 65719 Hofheim, Germany, declare under our sole responsibility that the product:

Gear Wheel Flow Meter   **Model: DZR-…**

to which this declaration relates is in conformity with the following EU directives stated below:

2014/30/EU	**EMC Directive**
2011/65/EU	**RoHS** (category 9)
2015/863/EU	Delegated Directive (RoHS III)

Also, the following standards are fulfilled:

EN 55011:2016+A1:2017+A11:2020+A2:2021   Industrial, scientific and medical equipment - Radio-frequency disturbance characteristics - Limits and methods of measurement

EN 61000-4-2:2009   Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test

EN 61000-4-3:2006+A1:2008+A2:2010   Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test

EN 61000-4-4:2012   Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test

EN 61000-4-5:2014+A1:2017   Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test

EN 61000-4-6:2014+A1:2017   Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields

EN 61000-4-8:2010   Electromagnetic compatibility (EMC) - Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test

EN 61000-6-2:2019   Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments

EN 61000-6-4:2019   Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments

Hofheim, 10. October 2023

H. Volz   J. Burke
General Manager   Compliance Manager

18. EU Declaration of Conformity SD1

We, KOBOLD Messring GmbH, Nordring 22-24, 65719 Hofheim, Germany, declare under our sole responsibility that the product:

Plug-on display   **Model: SD1**

to which this declaration relates is in conformity with the following EU directives stated below:

2014/30/EU	**EMC Directive**
2011/65/EU	**RoHS** (category 9)
2015/863/EU	Delegated Directive (RoHS III)

Also, the following standards are fulfilled:

EN 55032:2015+AC:2016+A11:2020+A1:2020 Electromagnetic compatibility of multimedia equipment - Emission requirements
EN 61000-4-2:2009 Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test
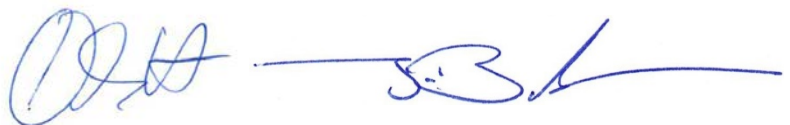**EN 61000-4-3:2006+A1:2008+A2:2010**   Electromagnetic compatibility (EMC) - Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test
EN 61000-4-4:2012 Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test
EN 61000-4-6:2014 Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields
EN 60664-1:2007   Insulation coordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests

Hofheim, 10. October 2023

H. Volz   J. Burke
General Manager   Compliance Manager

S D   1
Operating Instructions

1. Safety

The safety notes included in these operating instructions are indicated by this 'attention-getter' symbol.
If the text accompanying this symbol is not heeded, danger to personnel or equipment may result.

Other instructions, which are not safety warnings, but which give advice on optimum operation, are indicated by a hand.

General safety instructions

The electronic SD1 is constructed to the latest standards in technology. The SD1 should be operated only
- in technically sound condition,
- as instructed,
- with awareness of the safety precautions, following these operating instructions.

The SD1 must only be operated as an item of equipment installed in an internal area.
The SD1 must only be operated in the prescribed condition.
The stated limiting values (see also section on "Technical Data") must, under no circumstances, be exceeded.

Personnel engaged in the installation, operation and maintenance of the SD1 must be appropriately qualified. This qualification can be obtained by appropriate training or instruction. Such personnel must be familiar with the contents of these operating instructions.

During all operations the relevant national regulations relating to safety precautions in the work place and where applicable, internal regulations of the operator must be observed, even if these are not detailed in these operating instructions.

The SD1 must not be operated in hazardous areas, nor in areas where medical apparatus is in use, nor in areas which are expressly named in VDE 0411 Part 100.

If the SD1 is used for the control of machines or sequential processes where damage to the machine or accident to operating personnel is possible as a consequence of failure or faulty operation of the SD1, then appropriate safety precautions must be implemented.
In the case of variations (including those relating to operating behaviour), which prejudice safety, the SD1 must be switched off immediately.

During installation work on the SD1, the power supply must always be disconnected. Installation work must only be carried out by appropriately qualified personnel.

2. Description

The plug-in display unit SD 1 may be used with any KOBOLD volume counter which uses a plug-in connection according to DIN 43650.

The display unit is simply inserted between the plug and the plug socket on the volume counter. The displayed value will be the actual flow rate. The square wave signals remains available for external processing.

Volume counters already supplied can be equipped with the plug-in display unit. To achieve this the amplifier card must be removed from the plug socket.

The plug-in display unit is freely programmable. All necessary settings can be achieved with two keys. The programmed data is stored on an EEPROM and therefore saved in case of power failure.

As an option the plug-in display is available with an analogue output (0-20 mA, 4-20 mA) proportional to flow rate. The square wave signal is then not applicable.

The plug-in display unit works with 24 VDC or 12 VAC.

Due to it's characteristics, possibilities and low costs this instrument will be your first choice especially for measuring of flow and volume.

Manufacturers address:

KOBOLD Messring GmbH
Nordring 22 - 24
65719 Hofheim

Tel.   06192 / 299-0
Fax   06192 / 23398

3. Connecting the SD1

This section deals with the layout of the connections on the SD1. The electrical connection has to be made by a plug-in connection acc. to DIN 43650.

3.1 Connecting the voltage supply

The SD1 is operated with an voltage of 24 VDC or 12 VDC. The adjustment is achieved by means of solder jumpers.

The connections are made as follows :

Terminal 1	+24 VDC	(brown)
Terminal 2	GND	(white)

3.2 Connecting SD1 with rectangular output.

The SD 1 is available in three versions:

- SD1 – R   with two rectangular signals with a pulse offset of 90°.
- SD1 – I   with analog output (0-20 mA/4-20 mA)
- SD1 – K   with relay contact

Connections are different in each version.

Option with rectangular output:

Connection of rectangular output has to be made on clamps.

Terminal 3	Channel 1	(green)
Terminal ⏚	Channel 2	(yellow)

If the SD1 works with a volume counter, which has 2 sensors, it is a 2-channel version. The square wave pulses are displaced from one another by 90°. It is therefore possible to detect the direction. This is referred to as a two channel layout. If the SD 1 works with a volume counter, which has only 1 sensor, it is a 1-channel version. Connection on clamp ⏚ (channel 2) is not necessary.

Single channel or two channel connection must be set on the SD1. The settings required are made under menu reference „**08**" at the **"counter input"** position (see **4.1 overview of the input values**).

3.3 Connecting the SD1 with analog output

The SD1 is available in 3 versions

- SD1-R   with two rectangular signals with a pulse offset of 90°,
- **SD1-I**   with analog output (0-20 mA/4-20 mA),
- SD1-K   with relay contact.

Connections are different in every serial-model modification.

Option with analog output (0-20mA/4-20 mA):

Connection of analog output has to be made on clamps.

Terminal 3	Analog Output **(+)**	(green)
Terminal 2	GND	(white)

In accordance with the software, the settings 0-20 mA and 4-20 mA are available for signal selection. The selection is carried out by programming the SD1 under menu reference "**8**" at the "**Analogue output**" position. The functions are set using "**0**" or "**1**" (see **4.1 Overview of the input values**).

How does the analogue output function ?

The function of the analogue output can be freely selected, i.e. it can be assigned to the measurement parameters of flow rate or volume.

For adjusting volume-/flow measurement please see chapter **3.5 and 3.6**.

A maximum value can be programmed for the analogue output. The maximum value corresponds to an output of 20 mA.

The details of programming the maximum value are given in **section 4.6 What must be programmed when connecting the analogue output ?**

3.4 Connecting the SD1 with relay contacts.

The SD1 is available in 3 models:

- SD1-R   with two rectangular signals with a pulse offset of 90°,
- SD1-I   with analog output (0-20 mA/4-20 mA),
- **SD1-K**   with relay contact.

Connections are different in every serial-model modification.

Option with relay contact:

The SD1 has two relay contacts. The relay contacts are connected to the supply potential. That means the contacts switch the supply voltage to external processing. Connection has to be made on clamps.

⚠️   The relays are provided with normally-open contacts. The switching voltage is 30 V, maximum switching current is 1A.

Connection of relay contact has to be made on clamps.

Terminal 3	Relay 1	(green)
Terminal ⏚	Relay 2	(yellow)

How do the relays operate ?

The function of the relays can be set as required, i.e. each relay can be allocated to the flow rate or volume measurement parameters.

An on and an off switching value can be programmed for each relay. The relay switches when the switch-on value is exceeded. When the switch-off value is undershot, the relay drops out again. The relays can be programmed as normally-open or normally-closed.

The programming of the switch-on and switch-off values is given in **section 4.5 What must be programmed when connecting the relay outputs?**.

Wird das SD1 in der Betriebsart Volumenmessung betrieben, entfällt das Relais 2.

For adjusting volume and flow measurement please see chapter **3.5 and 3.6**.

3.5 How is the flow rate measurement activated ?

The SD1 can be switched to flow measurement or volume measurement. This will be made by programming SD1 under menu "**7**" at step "**display**". The flow rate will be adjusted by "**0**" and the volume by "**1**". (see 4.1 for overview of input values).

As soon as a medium flows through the volume counter a flow rate indication appears. No special action is required. The instantaneous flow rate is indicated, as a rule in litres per minute.

The SD1 must be adjusted to the actual volume counter that is connected. The procedure is given in **section 4.2 What must be programmed when connecting a volume counter?**

3.6 How is the volume measurement activated ?

The SD1 can be switched to flow measurement or volume measurement. This will be made by programming SD1 under menu "**7**" at step "**display**". The flow rate will be adjusted by "**0**" and the volume by "**1**". (see 4.1 for overview of input values).

By volumetric measurement is implied the summation of the amount of a medium which has flowed through a volume counter. As a rule the indication is in litres.

When the limiting frequency has been passed and a release signal has been given a summation will be made. To programm limiting frequency under menu "10" you have to take the volume counter's impulse frequency in hertz (Hz). Usually the limiting frequency has to be set to 0.000.

Connection of release signal output has to be made on clamps:

Terminal ⏚	summation enable	(yellow)

If there is a voltage of 24 V at the enable input, summation of the volume commences. The measured values on the display change.

If there is a voltage of 0 V at the enable input, summation of the volume is stopped. The measured values on the display do not change.

When the voltage at the enable input is changed from 0 V to 24 V the summation is reset to zero. The determination of the volume starts again.

3.7 Error display

On two channel volume counters it is possible to monitor the correct pulse sequence on the channels. Faulty pulses are not counted and thus do not change the volume measurement.
If an error is established by the SD1, the character sequence "**FAUL**" appears in the display.

The error display can also be completely isolated. This is carried out under the menu reference "**08**" at the **" counter input"** position. The error display is enabled with a **"0"** and blocked with a **"1"** (see **4.1 Overview of the input values**).

4. SD1 programming

Each time the SD1 is to be operated, it is necessary to adapt the unit to the volume counter that is connected.

Input procedure:

The input procedure is the same for all input values and is therefore described once only. Programming is carried out by means of two keys which are accessible on removing the front cover. The positions of these two keys is shown below.
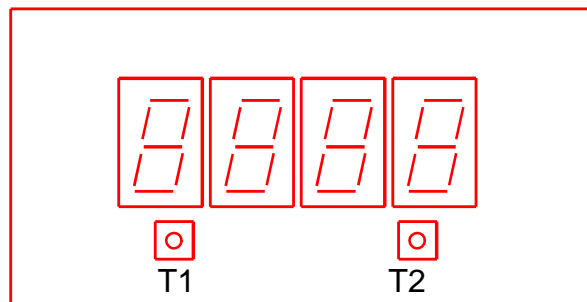
Start input operation

"T1" is depressed for approx. two seconds to start the input operation.
The first two segments are switched dark, segments three and four display the menu reference number **"00"**. Release **"T1"**.

Change menu reference

By briefly pressing **"T1"** the menu reference numbers **"00" to "10"** can be displayed in sequence.
An input value is concealed behind each menu reference number.
To display the input value, press **"T2"** briefly. A four digit input value appears.

Change input value

The point marks the digit which can be changed by actuating **"T2"**.
The point can be moved by actuating **"T1"**.
After setting the numerical values the point must be placed at the correct position.
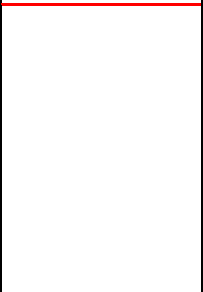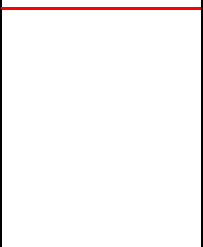On actuating **"T1"** and **"T2"**, the display reverts to the menu-reference level. The menu reference **"00"** is displayed again.

Stop input value

To exit the input operation, depress **"T1"** and **"T2"**. again for approx. four seconds.

4.1 Overview of the input values

The values which are required to be set can be inserted in the column labelled "Input value-User".

Menu – Reference	Input value - User	Standard setting	Function	Unit
00		0.040	Pulse volume of volume counter	ml
01		3.500	Maximum value Analogue output	l/m
02		0.400	Damping Digital filter or gate time in seconds	1
03		9999.	Pull-in" value Relay 1	l/m
04		9999.	"Drop-out" value Relay 1	l/m
05		9999.	Pull-in" value Relay 2	l/m
06		9999.	"Drop-out" value Relay 2	l/m
07		0000	Time base: **0** = Minute **1** = Alternative time base Alternativ time base:**0** = Second **1** = Hour Display: **0** = Flow rate **1** = Volume Measurement: **0** = Gate time **1** = Period measurement	
08		0000	Counter input : **0** = 2 channel **1** = 1 channel Display: **0** = Normal **1** = 180° Rotation Analog/Relay:: **0** = Analogue output **1** = Relays Analogue output **0** = 0-20mA **1** = 4-20 mA	
09		1.000	Density	Kg/l
10		0.000	Limiting frequency	Hz

If the on and off values for the relays are set at 9999. , then the relays are isolated.

4.2 What must be programmed when connecting a volume counter?

The SD1 is set-up for the connected volume counter. This is carried out under menu reference **"00 - pulse volume counter"**, menu reference **"09 - density"**, and under menu reference **"08"** at the position **"counter input"**.

The pulse volumes for KOBOLD Volume counters can be obtained from the Table. The **"X"** characters in the "Input value Menu reference 08" column are of no significance in setting the volume counter.

Designation	Material	Input value Menu reference 00	Input value Menu reference 08	
VC 0,025	Sp. Gr. Iron*	0,025 cm^3	XXX0	2 channel
VC 0,04	Sp. Gr. Iron	0,040 cm^3	XXX0	2 channel
VC 0,2	Sp. Gr. Iron	0,245 cm^3	XXX0	2 channel
VC 0,4	Sp. Gr. Iron	0,400 cm^3	XXX0	2 channel
VC 1	Sp. Gr. Iron	1,036 cm^3	XXX0	2 channel
VC 3	Sp. Gr. Iron	3,000 cm^3	XXX0	2 channel
VC 5	Sp. Gr. Iron	5,222 cm^3	XXX0	2 channel
VC 10	Sp. Gr. Iron	10,48 cm^3	XXX0	2 channel
VCA 0,2	Aluminium	0,200 cm^3	XXX1	1 channel
VC 0,2 AL	Aluminium	0,245 cm^3	XXX0	2 channel
VCA 2	Aluminium	2,000 cm^3	XXX1	1 channel
VC 0,2 **.**JR	High grd. St.*	0,200 cm^3	XXX0	2 channel
VC 1 .JR	High grd. St.*	1,000 cm^3	XXX0	2 channel
VC 5 .JR	High grd. St.*	5,000 cm^3	XXX0	2 channel
VCL 0,1 PA(B)	High grd. St.*	0,100 cm^3	XXX0	2 channel
VCL 0,1 PG	High grd. St.*	0,100 cm^3	XXX1	1 channel

  * Sp. Gr. Iron = Spheroidal graphite iron   * High grd. St. = High grade steel

Example:

A VC0.04 volume counter is connected. The pulse volume is 0.040 cm^3. The VC 0.04 Volume counter has a 2 channel layout.

- The value 0.040 is entered under menu reference "00".

- A "0" is entered under menu reference "08" at the position designated "counter input".

Additionally a density factor can be adjusted to indicate the mass. Density of medium will be adjusted under menu "**09 – density factor**".
For volumetric measurement density factor has to be adjusted to "**1.000**".

4.3 How to change time on flow display ?

You can choose between second, minute and hour to change time on flow display by adjusting menu **07**.

Setting the time base:

Time base	Input value Menu reference 07

Minutes	XX00
Minutes	XX10
Seconds	XX01
Hours	XX11

The **"X"** characters in the "Input value Menu reference 07" column are of no significance in setting the time base.

4.4 How to find out the flow rate?

The SD1 commands two measuring systems to determine the flow:
- duration of period or measurement of pulse width and
- gate time.

You can choose between "gate time measurement" or " duration of period measurement" under menu **07**.

Duration of period :

With the measurement of the period duration the time between two pulses is measured and is processed with the pulse volume to the flow.

Input signals smaller than 1 Hz are not processed.

The measurement of period duration enables very fast measuring. If the flow values fluctuate greatly the digital damping filter makes a smoothing and thereby a calming of the flow indicating unit possible.
A digital filter can be activated under the menu reference **"02"**. The higher the input value the greater the filter effect.

Programmed value 0000:   no filter effect
Programmed value 9999:   maximum filter effect

Gate time measurement:

With the gating time measurement the pulses within a programmed gating time are counted and processed with the pulse volume to the flow.

Gate time can be adjusted under menu **02**. Adjustable minimum gate time is 0.1 second.

4.5 What must be programmed when connecting the relay outputs ?

Relay function can be adjusted only if the instrument was ordered with option relay contacts (SD1-K.). The relays can be allocated to flow rate or volume measurement.

Flow rate measurement
A **"0"** is inserted under the menu reference **"07"**. This takes place at the position designated **"Display"** (see **4.1 Overview of the input values**).

Volumetric measurement
A **"1"** is inserted under the menu reference **"07"**. This takes place at the position designated **"Display"** (see **4.1 Overview of the input values**).

Switch functions
For Relay 1, programming takes place under the menu references **"03"** and **"04"**, for Relay 2 under the menu references **"05"** and **"06"** (see **4.1 Overview of the input values**).

The following switch functions can be obtained::
Normally-open function
On reaching the switch-on value the contact is closed.
Example: Switch-on value (pull-in):   2,500
                     Switch-off value (drop-out):   9999

The relay contact is switched when the switch-on value is exceeded. The switch-off value of **9999** has the consequence, that only the switch-on value is evaluated. The relay is not disconnected when the switch-off value is reached.

Normally-closed function
On reaching the switch-off value the contact is opened.
Example: Switch-on value: 0.000
                     Switch-off value: 3,000

The relay contact is switched so long as the switch-off value is not reached. The switch-on value of **0.000** has the consequence, that only the switch-off value is evaluated. The relay is not switched-off if the switch-on value is reached.

Window function
Example: Switch-on value: 2,500
                     Switch-off value: 3,000

Hystresis switch
The relay contact is switched when the switch-on value is reached. If the switch-off value is exceeded, the relay opens again.

Example: Switch-on value: 4.000
                     Switch-off value: 3.000

4.6 What must be programmed when connecting the analogue output ?

The analog output can be used only if the instrument was ordered with analog output
(SD1-I...).
The analogue output can be assigned to flow rate or volume measurement.

Flow rate measurement
A **"0"** is inserted under the menu reference **"07"**. This takes place at the position
designated **"Display"** (see **4.1 Overview of the input values**).

Volumetric measurement
A **"1"** is inserted under the menu reference **"07"**. This takes place at the position
designated **"Display"** (see **4.1 Overview of the input values**).

Signal selection

Menu reference 08	Analogue output

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

The digits identified with an **"X"** in the Menu reference **"08"** column are of no
significance to the setting procedure.

The maximum value is entered under the menu reference **"01"**, maximum analogue
output, corresponding to an output of 10 V or 20 mA.

Example:
Maximum analogue output value: 3,500 [Litres / minute]

The flow rate is 3,500 Litres/minute, so 20 mA are output. If the flow rate is 0,000
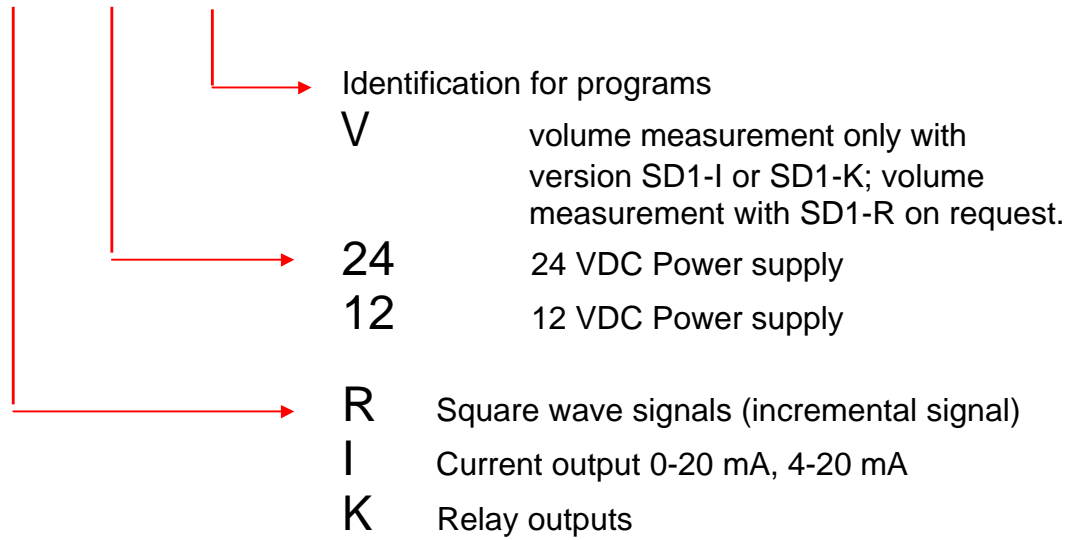Litres/minute, then 0 mA is output.

5. Technical Data

Processor	PIC 17C42
Power pack Supply Maximum input current	18 VDC – 28 VDC optional 10 – 19 VDC ca. 120 mA
General data Display	Principle : 7 Segment LED, 7,62 mm, red Display :0.000 ... 9999 with floating point overrun (>9999) : display 9999
Control keys Housing material Dimension Protection class (DIN 40050) Weight Connections	Two keys behind the front cover Aluminium Height (without plug) approx. 35mm, width approx. 60mm, depth approx. 60 mm IP 65 ca. 0,12 Kg Angled connector DIN 43650 (4-pins) polarized
Analogue outputs (Option)	Current output 0 - 20 mA, 4 - 20 mA / load <= 250 Ohm, 18-28 VDC power supply load <= 50 Ohm bei 10 VDC power supply Resolution 10 bit, short-circuit proof
Pulse output	Incremental signal
Pulse amplitude	Approx. 0.8 x supply voltage, load dependent
Pulse shape with symm. Output signal	Square wave, pulse duty factor/channel 1:1, +/-15%
Pulse offset between two channels	90°, +/- 30 °
Output power/channel	max. 0,3 W short-circuit-proof
Relay contacts	each 1 N.O., 24 Volt / 1 A, typ. operating time 6 ms
Ambient conditions	
Operating temperature Storage temperature	0 C to + 60 °C -25 °C to +85 °C

6. Type code

Example :

SD1 - R - 24 / .

Identification for programs

V	volume measurement only with version SD1-I or SD1-K; volume measurement with SD1-R on request.
24	24 VDC Power supply
12	12 VDC Power supply
R	Square wave signals (incremental signal)
I	Current output 0-20 mA, 4-20 mA
K	Relay outputs

7. Connections

The electrical connections are made by a plug-connection DIN 43650
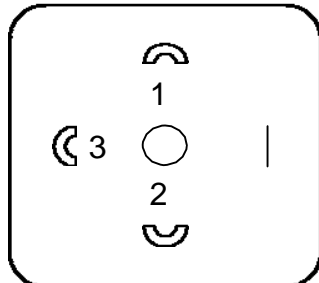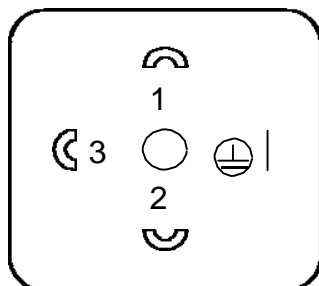
Connections Version **SD1-R-24**

PIN 1   = UB+
PIN 2   = GND
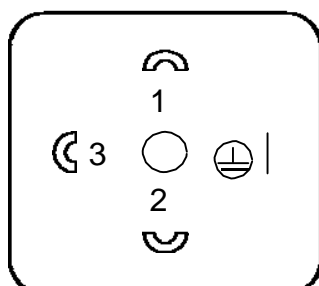PIN 3   = Channel 1
PIN ⏚   = Channel 2
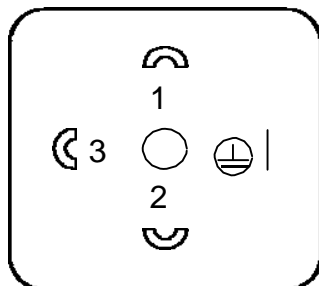
Connections Version **SD1-I-24**

PIN 1   = UB+
PIN 2   = GND
PIN 3   = Analogue output 0/4-20 mA
PIN ⏚   = Enable summation

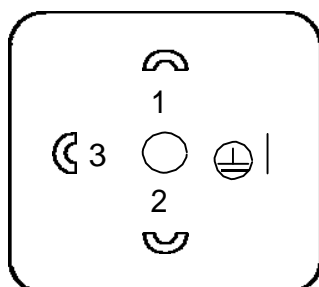Connections Version **SD1-I-24 / V**

PIN 1   = UB+
PIN 2   = GND
PIN 3   = Analogue output 0/4-20 mA
PIN ⏚   = Enable summation

Connections Version **SD1-K-24**

PIN 1   = UB+
PIN 2   = GND
PIN 3   = Relay 1
PIN ⏚   = Relay 2

Connections Version **SD1-K-24 / V**

PIN 1   = UB+
PIN 2   = GND
PIN 3   = Relay 1
PIN ⏚   = Enable summation