Electronic
SD 1, AS 8, FM 16, ASR 16, ASR 20
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<td>Type code and dimensions</td>
<td>RM 16</td>
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<td>Function and product characteristics</td>
<td>ASR 16</td>
</tr>
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<td>Technical data</td>
<td>ASR 16</td>
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<tr>
<td>Type code</td>
<td>ASR 16</td>
</tr>
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<td>Dimensions</td>
<td>ASR 16</td>
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<tr>
<td>Function and product characteristics</td>
<td>ASR 20</td>
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<tr>
<td>Technical data</td>
<td>ASR 20</td>
</tr>
<tr>
<td>Dimensions</td>
<td>ASR 20</td>
</tr>
</tbody>
</table>
The plug-in display unit SD 1 may be used with any KRACHT flow meter 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 or the volume. The square wave signal 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 FRAM and therefore saved in case of power failure.

Function + Product characteristics SD 1 - Service

The SD1 Service is an plug-in display unit which may be used with any KRACHT flowmeter with plug-in connection according to DIN 43650.

The display unit is simply put on the plug socket of the flow meter.

The accupack supplies the SD1 and the sensors with power.

No seperate power supply is necessary.

If the accus are empty the SD1 Service can be operated and charged with the enclosed charger.

The impuls volume is freely programmable.

All necessary settings can be achieved with two keys.

The programmed data are stored on a FRAM and therefore saved in case of empty accus.

With the accu pack an operating time of 30 hours is possible without recharging.
## Technical data SD 1 + SD 1-Service

### SD 1

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processor</td>
<td>PIC 17 C 42</td>
</tr>
<tr>
<td>Power unit</td>
<td></td>
</tr>
<tr>
<td>Supply</td>
<td>18 VDC – 28 VDC</td>
</tr>
<tr>
<td></td>
<td>optional 10 – 19 VDC</td>
</tr>
<tr>
<td>Current input</td>
<td>approx. 120 mA</td>
</tr>
<tr>
<td>General data</td>
<td></td>
</tr>
<tr>
<td>Display</td>
<td>principle: 7 segment LED, 7.62 mm, red</td>
</tr>
<tr>
<td></td>
<td>display: 0.000 ... 9999 with floating decimal point</td>
</tr>
<tr>
<td></td>
<td>overflow (&gt;9999): display 9999</td>
</tr>
<tr>
<td>Keyboard</td>
<td>two keys behind the front panel</td>
</tr>
<tr>
<td>Housing material</td>
<td>aluminium</td>
</tr>
<tr>
<td>Dimensions</td>
<td>height(without plug) approx. 35 mm, width approx. 60 mm, depth approx. 60 mm</td>
</tr>
<tr>
<td>Protection (DIN 40050)</td>
<td>IP 65</td>
</tr>
<tr>
<td>Weight</td>
<td>approx. 0.12 kg</td>
</tr>
<tr>
<td>Connections</td>
<td>angled connector DIN 43650 (4-pins) polarized</td>
</tr>
<tr>
<td>Analog output (optional)</td>
<td>current output</td>
</tr>
<tr>
<td></td>
<td>0 – 20 mA, 4 – 20 mA</td>
</tr>
<tr>
<td></td>
<td>load &lt;= 250 Ohm, at 18–28 VDC supply</td>
</tr>
<tr>
<td></td>
<td>load &lt;= 50 Ohm, at 10 VDC supply</td>
</tr>
<tr>
<td></td>
<td>10 bit resolution, short-circuit-proof</td>
</tr>
<tr>
<td>Pulse output</td>
<td>Incremental signal</td>
</tr>
<tr>
<td>Pulse amplitude</td>
<td>approx. 0.8 x supply voltage</td>
</tr>
<tr>
<td>Pulse shape with</td>
<td>square wave, pulse duty</td>
</tr>
<tr>
<td>symmetrical output signal</td>
<td>factor/channel 1:1, +/- 15%</td>
</tr>
<tr>
<td>Pulse offset between</td>
<td>90°, +/- 30°</td>
</tr>
<tr>
<td>two channels</td>
<td></td>
</tr>
<tr>
<td>Output power/channel</td>
<td>P_{\text{max}} = max. 0.3 W</td>
</tr>
<tr>
<td></td>
<td>short-circuit-proof</td>
</tr>
<tr>
<td>Environmental conditions</td>
<td>Operating temperature 0 °C up to +60 °C</td>
</tr>
<tr>
<td></td>
<td>Storage temperature -25 °C up to +85 °C</td>
</tr>
</tbody>
</table>

### SD 1-Service

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processor</td>
<td>PIC 17 C 42</td>
</tr>
<tr>
<td>Current supply</td>
<td></td>
</tr>
<tr>
<td>Accumulator</td>
<td>6 VDC</td>
</tr>
<tr>
<td>Working time</td>
<td>approx. 30 hours</td>
</tr>
<tr>
<td>Battery charger</td>
<td>controlled by micro-controller</td>
</tr>
<tr>
<td>Input voltage</td>
<td>230 V AC</td>
</tr>
<tr>
<td>Charging current</td>
<td>max. 700 mA</td>
</tr>
<tr>
<td>Charging time</td>
<td>approx. 4 hours</td>
</tr>
<tr>
<td>General characteristics</td>
<td></td>
</tr>
<tr>
<td>Display</td>
<td>principle: 7 segment LED, 7.62 mm, red</td>
</tr>
<tr>
<td></td>
<td>display: 0.000 ... 9999 with floating point</td>
</tr>
<tr>
<td></td>
<td>overflow (&gt;9999): display 9999</td>
</tr>
<tr>
<td>Keyboard</td>
<td>two keys on the front side</td>
</tr>
<tr>
<td>Housing material</td>
<td>aluminium</td>
</tr>
<tr>
<td>Protection (DIN 40050)</td>
<td>IP 65</td>
</tr>
<tr>
<td>Weight</td>
<td>approx. 0.46 kg</td>
</tr>
<tr>
<td>Connections</td>
<td>angled connector DIN 43650 (4-pins) polarized</td>
</tr>
<tr>
<td>Environmental conditions</td>
<td>Operating temperature 0 °C up to +60 °C</td>
</tr>
<tr>
<td></td>
<td>Storage temperature -10 °C up to +85 °C</td>
</tr>
</tbody>
</table>
Type code, dimensions and electrical connections SD 1

Type code

Product name

SD 1 - R - 24 / V

output signal
R  square wave signal
(incremental signal)
I  current output
  0 – 20 mA, 4 – 20 mA
K  two relais contacts
  24 VDC / 1A

operating voltage
24  24 VDC
12  12 VDC

Dimensions

Electrical connection

Version: K

PIN 1  = 12/24 VDC
PIN 2  = GND
PIN 3  = Relais 1
PIN 4  = Relais 2

Version: I

PIN 1  = 12/24 VDC
PIN 2  = GND
PIN 3  = Channel 1
PIN 4  = —

Version: R

PIN 1  = 12/24 VDC
PIN 2  = GND
PIN 3  = Channel 1
PIN 4  = Channel 2

At version V = Volume measurement on Pin [ ] lays „Enable Summation“
### Function

- The microcontroller AS 8 processes incremental input signals from KRACHT Volume Counters and other sensors.
- The input signals are filtered in the unit, interpreted and converted into the values of flow rate and volume.
- The user may choose to have either flow rate or volume displayed.
- Two relays, one analog output or one serial interface are available for further, external processing.

### Product characteristics

- EMC construction
- Programmable micro-processor
- Used for KRACHT Volume Counters and other sensors with 24 volt incremental signals
- Power supply voltage: 230/120 V, 50/60 Hz
- 24 VDC / 12 VDC
- Integrated sensor power supply: 24 VDC 50 mA
- Flow rate or volume measurement
- Smoothing function by means of a digital filter
- 2 programmable relays
- User-selected analog output current: ± 20 mA, 0...20 mA, 4...20 mA
- Voltage: ± 10 V, 0...10 V
- Serial interface RS 232
- Selectable time basis (sec, min, hrs)
- Selectable units for display
- Enclosure with dimensions according to DIN

### Examples of application

- Flow rate measurement . . . . . hydraulic test stand
- Volume measurement . . . . . consumption record
- Volume measurement . . . . . indirect cylinder
- Path measurement . . . . . . . .
- Ratio measurement . . . . . . two-component devices
- Dosing . . . . . . . . . . . . . . filling units
- Test apparatus . . . . . . . . . volume counter
## Technical data AS 8

### Processor

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pic 17C42</td>
<td></td>
</tr>
<tr>
<td>Supply</td>
<td>230 VAC, +6% ... – 10% / 50 – 60 Hz, optional 120 VAC, 24 VDC, 12 VDC</td>
</tr>
<tr>
<td>Power input (power consumption)</td>
<td>ca. 3.5 W</td>
</tr>
<tr>
<td>Sensor supply</td>
<td>24 VDC +/- 20%, 50 mA</td>
</tr>
</tbody>
</table>

### General data

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display principle</td>
<td>7 segment LED, 13.2 mm, red</td>
</tr>
<tr>
<td>display</td>
<td>0.000 ... 9999 with floating decimal point</td>
</tr>
<tr>
<td>overflow (&gt;9999)</td>
<td>display 9999</td>
</tr>
<tr>
<td>overflow (&lt;-9999)</td>
<td>display -9999</td>
</tr>
<tr>
<td>status indicator</td>
<td>LEDs K1 and K2 for relays 1 and 2</td>
</tr>
<tr>
<td>Keyboard</td>
<td>three keys behind the front panel, optional keys on front panel</td>
</tr>
<tr>
<td>Housing</td>
<td>for switch panel plug-in unit made of plastic</td>
</tr>
<tr>
<td>Panel frame</td>
<td>96 x 48 mm, DIN 43700</td>
</tr>
<tr>
<td>Insertion depth</td>
<td>ca. 122 mm with plug board</td>
</tr>
<tr>
<td>Panel cutout</td>
<td>92 x 45 mm, tolerance + 0.8 x + 0.6 mm</td>
</tr>
<tr>
<td>Protection (DIN 40050)</td>
<td>IP 54 in appropriate switch panel mounting</td>
</tr>
<tr>
<td>Ground (weight)</td>
<td>approx. 0.4 kg</td>
</tr>
<tr>
<td>Connections</td>
<td>15 pins terminal connecting block</td>
</tr>
</tbody>
</table>

### 2 relay contacts

- one normally-open-contact switching-time each

### 2 digital inputs

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input impedance</td>
<td>&gt;= 7500 Ohm</td>
</tr>
<tr>
<td>Input amplitude</td>
<td>low &lt;= 9 volt, high &gt;= 12 volt</td>
</tr>
<tr>
<td>Switching time</td>
<td>typ. 1 ms</td>
</tr>
</tbody>
</table>

### 1 analogue output

- current or voltage output adjustable by means of jumper
- ± 10 volt, 0 – 10 volt, 2 – 10 volt / load >= 1 kOhm,
- 10 bit resolution, short-circuit-proof
- ± 20 mA, 0 – 20 mA, 4 – 20 mA / load <= 250 Ohm,
- 10 bit resolution, short-circuit-proof

### 1 volume counter input

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input impedance</td>
<td>&gt;= 7500 Ohm</td>
</tr>
<tr>
<td>Input amplitude</td>
<td>low &lt;= 9 volt, high &gt;= 12 volt</td>
</tr>
<tr>
<td>Rate-of-flow principle of measurement</td>
<td>period length measurement (rising tooth flank)</td>
</tr>
<tr>
<td>Maximum input frequency</td>
<td>1Hz ... 2500 Hz</td>
</tr>
<tr>
<td>Measurement range totalizer</td>
<td>2 x 10⁹ pulses</td>
</tr>
</tbody>
</table>

### Serial interface

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS 232</td>
<td>cable length &lt;= 15 m</td>
</tr>
<tr>
<td>Input voltage</td>
<td>max. ± 30 V</td>
</tr>
<tr>
<td>Input current</td>
<td>typ. ± 3 mA at ± 9 V input voltage</td>
</tr>
<tr>
<td>Output current</td>
<td>typ. ± 3 mA</td>
</tr>
<tr>
<td>Adjustment (selection)</td>
<td>9600 baud, 8 bit, no parity, 1 stop bit</td>
</tr>
<tr>
<td>Cable</td>
<td>shield data cables recommended</td>
</tr>
</tbody>
</table>

### Environmental conditions

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature</td>
<td>0 °C up to + 60 °C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>−25 °C up to + 85 °C</td>
</tr>
</tbody>
</table>
Type code and dimensions AS 8

**Type code**

**Product name**

**AS 8 – U – 230 – ... / F**

**Analogue output**

- **U** Voltage ± 10 V
- **I** Current ± 20 mA
- **RS** Serial
  - interface RS 232
- **O** without analog output
  - (RS 232 available)
  - just for 12 and 24 volt

**Power supply voltage**

- **230** 230 V – 50/60 Hz
- **120** 120 V – 50/60 Hz
- **24** 24 VDC
- **12** 12 VDC

**Keyboard**

- **without specification**
  - Switches behind front cover
  - **F** with keys on front panel

**Versions**

- **without specification**
- **Standard =** Row rate or volumetric measurement
  - **RP** Row rate controller
  - **DOS** Dosing program
  - **ZM** Cylinder stroke measurement
  - **A2F** Row rate and sum measurement
  - **D2F** Row rate and difference measurement
  - **VA** Ratio measurement
  - **V2F** Row rate and ratio measurement
  - **PUR** Ratio controller
  - **FM20** Flow rate indication
  - switchable for all
  - KRACHT volume counter
  - **SIM** Simulator for volumetric meter

**Optional:** Desktop unit

- 19” plug-in unit

**Dimensions**

**Panel cutout**

- **96**
- **92**
- **89.5**
- **42.5**

**Terminals**

- **102**
- **122**
- **29**
Flow rate measurement

**Flow rate indication**
- The incremental input signals are filtered, converted and processed by the microcontroller to yield the dimensions of flow rate.
- Any of the following physical units can be set for the indicator reading: l/h, l/min, l/s, or US gal/hr, US gal/min, US gal/s.

**Functional characteristics**
- The standard version AS 8 is an indication and control device for dynamic flow rate and volume measurement. The setting is made by means of three keys, which are accessible on removal of the front cover.
- The switch-over between the display units is made by means of DIP switches, located behind the front cover.
- Two programmable relays, an analogue output, or an RS 232 serial interface, are available for further external processing.
- The integrated 24 VDC transducer supply enables the Volume Counter to be directly connected.
- The type AS 8 series measuring devices are available as built-in control panel units, as bench units or as 19" rack-mounted units.

Volumetric measurement

**Volume indication**
- The incremental input signals are summed and converted to the dimensions of volume by the microcontroller, using a programmable factor.
- The physical units l and US gal can be set for display.
- A 24 volt digital input enables the summation to be reset to zero.
Flow rate controller

- Two relay contacts enable the overshoot of permissible error bandwidths to be signalled.
- Programming and setting is carried out by means of three keys which are accessible on removal of the front cover. Optional via keys on front panel (version /F).

Rotational speed controller

- A further application example is that of rotational speed regulation.
- The required speed is set on the AS 8. The actual rotational speed is detected by the rotary transducer and fed to the AS 8 as a square-wave signal.
- The controller output is connected to the motor via a frequency converter and used to control the rotational speed.

Functional characteristics

- The AS 8-RP Flow rate controller version controls the flow rate of a component.
- The required flow rate is set on the AS 8. The flow rate is detected by the Volume Counter and fed to the AS 8 as a square-wave signal.
- The controller output is connected to a continuously variable valve via a position amplifier, or is used to control the speed of a delivery pump.

Flow rate controller

- The integrated 24 VDC transducer supply enables the direct connection of the Volume Counter.
- The type AS 8 series measuring devices are available as built-in control panel units, as bench units, or as 19" rack-mounted units.
Dosing AS 8-DOS

- The AS 8 dosing version is especially designed for employment in dosing lines. It allows of one Volume Counter to be connected.

- 6 dosages (programmes) can be stored in the AS 8. Specific dosages are called up via the three keys on the front panel. The input values are arranged in menus.

Functional characteristics

- The filling process is started by the digital input. The AS 8 resets the last dosage quantity and switches the dosage valve. The Volume Counter measures the flow and delivers square wave signals to the AS 8. The AS 8 sums the input signals. When the quantity is reached the dosage valve will be switched.

- The second relais contact enables the indication of faulty dosages.

- The settings are made by using the three keys on the front panel. The input values are arranged in menus.

- The integrated 24 VDC sensor supply enables direct connection to the Volume Counter.

- The type AS 8 measuring devices are available as built-in control panel units, as desk-top units, or as 19" rack-mounted units.
Cylinder stroke measurement AS 8-ZM

Functional characteristics

- The cylinder stroke measurement version of the AS 8 enables an indirect measurement to be made of hydraulic drive movements, in combination with a Volume Counter.
- In this system, the Volume Counter is installed in an operating line, to generate pulses which are proportional to the flow rate and to indicate the direction of flow.
- The electrical pulses are converted by the microcontroller into the physical dimensions of flow rate and volume, or stroke and velocity. Erroneous measurements, due to leakage at the end positions, can be prevented by means of a programmable blocking frequency. The signals are only processed when the flow rate exceeds the blocking frequency.
- Two relays, an analogue output or an RS 232 interface, are available for additional external processing.
- Programming and setting is carried out by means of three keys, which are accessible on removal of the front cover.
- The type AS 8 series measuring devices are available as built-in control panel units, as bench units, or as 19" rack-mounted units.

Reset (Zero position)

Volume counter
deg: 200 mm

Two relay contacts

Analogue output
± 10 volt, 0–10 volt
± 20 mA, 0–20 mA,
4–20 mA or RS 232

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Flow rate and sum measurement AS 8 - A2F

- **Component A**: e.g.: 10 l/m
- **Component B**: e.g.: 5 l/m

**Sum indication**

\[ A + B = 15.00 \text{ l/m} \]

**Flow rate component A**: 10 l/m

**Flow rate component B**: 5 l/m

**Key** F3

**Analog output**

- 0 – 10 Volt,
- 0/4 – 20 mA.

**Relay**

**Key** F1

**Key** F2

**Functional characteristics**

- **Two Volume Counters** could be connected to the AS 8-A2F. The AS 8 shows the flow rate of component A and B and the sum A+B.
- The different indications are switched by the keys F1, F2 and F3.
- For each Volume Counter a density factor can be put in.
- One square-wave signal is required of each Volume Counter. The input signals are filtered, converted and processed by the microcontroller to yield a sum.
- The settings are made using the three keys of the Front panel. The input values are arranged in menus.
- Two relay contacts, an analogue output or an RS 232 interface are available for additional external processing.
- The type AS 8 series measuring devices are available as built-in control panel units, as bench units, or as 19” rackmounted units.
- The integrated 24 VDC transducer supply enables the direct connection of the Volume Counter.

**Row rate component A = 10 l/m**

**Row rate component B = 5 l/m**
**Flow rate and difference measurement AS 8 - D2F**

- **Component A**
  - e.g.: 10 l/m

- **Component B**
  - e.g.: 5 l/m

**Difference indication**

\[ A - B = 5.00 \text{ l/m} \]

**Analogue output**

- 0 – 10 Volt,
- 0/4 – 20 mA

**Relay**

**Row rate component A = 10 l/m**

**Row rate component B = 5 l/m**

**Functional characteristics**

- Two Volume Counters could be connected to the AS 8-D2F. The AS 8 shows the flow rate of component A and B and the difference A–B.
- The different indications are switched by the keys F1, F2, and F3.
- For each Volume Counter, a density factor can be put in.
- One square-wave signal is required of each Volume Counter. The input signals are filtered, converted and processed by the microcontroller to yield a difference.
- The settings are made using the three keys of the front panel. The input values are arranged in menus.
- Two relay contacts, an analogue output or an RS 232 interface are available for additional external processing.
- The integrated 24 VDC transducer supply enables the direct connection of the Volume Counter.
- The type AS 8 series measuring devices are available as built-in control panel units, as bench units, or as 19" rackmounted units.
Ratio measurement AS 8-VA

Mixture ratio measurement

- Two programmable relays, an analogue output, or an RS 232 serial interface, are available for further external processing.
- The programming and settings are achieved via three keys, accessible on removal of the front cover. Optional via keys on front panel (version /F).
- The integrated 24 VDC transducer supply enables the direct connection of the Volume Counter.
- The type AS 8 series measuring devices are available as built-in control panel units, as bench units, or as 19" rack-mounted units.

Rotational speed ratio measurement

- The AS 8 mixture indicator displays the mixing ratio of two components.
- A square-wave signal is required from each volumetric meter. The input signals are filtered, converted and processed by the micro-controller to yield a mixture ratio.

Rotational speed ratio indicator

- Another application example is that of rotational speed ratio measurement. The pulse trains A and B from the rotary transducers are detected and indicated on the AS 8 as a rotational speed ratio.

Functional characteristics
Flow rate and Ratio measurement AS 8 - V2F

- Two Volume Counters could be connected to the AS 8-V2F. The AS 8 shows the flow rate of component A and B and the mixture ratio A/B.
- The different indications are switched by the keys F1, F2 and F3.

- For each Volume Counter a density factor can be put in.
- One square-wave signal is required of each Volume Counter. The input signals are filtered, converted and processed by the microcontroller to yield a mixture ratio.
- The settings are made using the three keys of the front panel. The input values are arranged in menus.
- Two relay contacts, an analogue output or an RS 232 interface are available for additional external processing.
- The integrated 24 VDC transducer supply enables the direct connection of the Volume Counter.
- The type AS 8 series measuring devices are available as built-in control panel units, as bench units, or as 19” rackmounted units.

Functional characteristics

**Component A**
e.g.: 10 l/m

**Component B**
e.g.: 5 l/m

**Mixture ratio indication**
A/B = 2.000

**Row rate component A** = 10 l/m

**Row rate component B** = 5 l/m

**Analogue output**
0 – 10 Volt, 0/4 – 20 mA

**Relay**

**key** F3

**key** F1

**key** F2
Ratio controller AS 8-PUR

- The ratio controller version of the AS 8 controls the mixing ratio of two components.
- The mixing ratio of the reference component A to component B is set on the AS 8.
- The volumetric flows are detected by the Volume Counter and fed to the AS 8 as square-wave signals. The input signals are filtered, converted and processed by the microcontroller, to yield a mixing ratio. The controller output is either directly connected, or connected via a position amplifier, to a continuously controllable valve, or used to control the speed of a delivery pump.
- Two relay contacts enable the overshoot of permissible error bandwidths to be signalled.
- All settings are made using three keys, which are accessible on removal of the front cover. Optional via keys on front panel (version /F). The input values are arranged in menus.
- The integrated 24 VDC transducer supply enables the direct connection of the Volume Counter.
AS 8 PUR-TESTER

The volume counters could be connected to the AS 8 PUR-TESTER. Depending on the volume counters type of connection either the cables with Cannon-connector or with Hirschmann-connector have to be used.

The AS 8 PUR-TESTER shows the flow rate of component A and B and the mixture ratio A/B.

The different indications are switched by the keys F1, F2 and F3. For each volume counter a density factor can be put in.

One square-wave signal is required of each volume counter. This input signals are filtered, converted and processed by the micro-controller to yield a mixture ratio.

The setting are made using the three keys on the front panel. The input values are arranged in menus.

An analogue output is available for additional external processing. The integrated 24 VDC transducer supplies enables the direct connection of the volume counter.

The delivery contains:
- AS 8 with keys on front panel, software version V2F assembled in a desk-top unit.
- 2 cables for Cannon-connector.
- 2 cables for Hirschmann-connector.

Functional characteristics

Front view

Rear view with analogue output

All dimensions in mm

Approx. 165
Flow rate display unit AS 8-FM20

Functional characteristics

- One Volume counter can be connected to the AS 8-FM20.
- By pressing the „Select“ button each Volume Counter size of KRACHT GmbH can be selected. The internal configuration like geometrical tooth volume and the setting of the analogue output are made automatically.
- The indication is made in l/min. The selection of current or voltage analogue output can be made by changing the jumper position inside the AS 8.
- The AS 8-FM20 will be delivered in a desk-top unit.
Function and product characteristics FM 16

Function

- The microcontroller FM 16 processes incremental input signals from KRACHT Volume Counters and other sensors.
- The input signals are interpreted in the processor using a measuring technique similar to that of the period length measurement, whereby the acceleration (or deceleration) of the volume flow influences the determination of the current flow rate. This measurement process makes the current flow rate available as an analog value at any time. The result is a very precise measurement, even with highly dynamic processes. (e.g. zero crossing during volumetric reversal)

Product characteristics

- EMC construction
- Programmable microprocessor
- Used for KRACHT Volume Counters and other sensors with 24 volt incremental signals
- Power supply voltage 24 VDC
- Flow rate measurement
- Leveling function by means of a digital filter
- User-selected analog output:
  - Current: ± 20 mA
  - Voltage: ± 10 V
- Serial interface RS 232
- Illuminated display
- Three short-stroke keys with film covering
- Enclosure with dimensions according to DIN

Example of application

Preparing of valve characteristic curves... test stand
**Technical data FM 16**

**Processor**

**SAB 80C 166 CPU**

- **Power unit**
  - Supply: 24 VDC
  - Power input (power consumption): approx. 4.5 W

**General data**

- **Display**: two-line LC display with 16 characters each, character height 8 mm, illuminated background RED
- **Keyboard**: three mechanical short-stroke keys, stroke distance 0.5 mm
- **Housing**: housing for switch panel plug-in unit made of plastic
- **Panel frame**: 144 x 72 mm, DIN 43700
- **Insertion depth**: ca. 170 mm with plug board
- **Panel cutout**: 138 x 68 mm, tolerance +1.0 x +0.7 mm
- **Protection (DIN 40050)**: IP 54 in appropriate switch panel mounting
- **Ground (weight)**: approx. 1 kg

**4 relay contacts**

- one normally-open-contact switching-time each

**4 digital inputs**

- electrical isolated by the optocoupler
- **Input impedance**: >= 6 kOhm
- **Input amplitude**: low <= 10 volt, high >= 12 volt
- **Switching time**: typ. 1 ms

**4 analogue inputs**

- galvanical isolated for 24 volt supply
- **Input impedance**: unit on: > 20 kOhm
  
- unit off: > 10 kOhm
- **Signal selection**: 0 – 10 volt, 10 bit resolution
- **Protection wiring**: Protective circuit against excessive voltage, max. input voltage 30 volts

**1 analogue output**

- current or voltage output adjustable by means of jumper
- **Voltage output**: ± 10 volt, 0 – 10 volt, 2 – 10 volt / load >= 1 kOhm,
  
- 12 bit resolution, short-circuit-proof
- **Current output**: ± 20 mA, 0 – 20 mA, 4 – 20 mA / load <= 250 Ohm,
  
- 12 bit resolution, short-circuit-proof

**1 volume counter input**

- electrical isolated by the optocoupler
- **Input impedance**: 6 kOhm
- **Input amplitude**: low <= 11 volt, high >= 13 volt
- **Rate-of-flow principle of measurement**: period length measurement taking into consideration the acceleration of the gear pair
- **Maximum input frequency**: < 10 kHz

**Serial interfaces**

- **RS 232**: cable length <= 15 m
- **Input voltage**: max. ± 30 V
- **Input current**: typ. ± 3 mA at ± 9 V input voltage
- **Output current**: typ. ± 3 mA
- **Adjustment (selection)**: 9600 baud, 8 bit, no parity, 1 stop bit
- **Shield data cables recommended**
- **RS 485**: electrical isolated by the optocoupler
- **Input impedance**: >= 12 kOhm
- **Adjustment (selection)**: 75, 600, 1200, 2400, 4800, 9600, 19200, 38400 baud
- **7 or 8 bit data width, selectable parity, 1 or 2 stop bits**
- **Shielded data cables, twisted pairs, recommended**

**Environmental conditions**

- **Operating temperature**: 0 °C up to +50 °C
- **Storage temperature**: -25 °C up to +85 °C
Type code and dimensions FM 16

Type code

Product name

EXAMPLE

FM 16 - U - 24

Optional:
desktop unit

Analogue output

U  voltage ± 10 V

I  current ± 20 mA

Power supply voltage

24  24 VDC

Dimensions

Panel cutout

144 x 72

138 x 88

Terminal

135.5 x 155

65.5 x 170
Function

- The microcontroller ASR 16 processes incremental input signals.
- The input signals are filtered in the unit, interpreted and converted into the physical sizes flow rate and volume.
- Analogue inputs allow the connection of pressure transducers, temperature sensors and the like.
- All measurements from the electronic sensors are indicated on the display.

Product characteristics

- EMC construction
- Programmable microprocessor
- Used for KRACHT Volume Counters and other sensors with 24 volt incremental signals
- Power supply voltage 24 VDC
- Easily surveyed LC display
- Functions for set parameters and configuration are password protected.
- Serial interface for printer or configuration serial (in series)
- Standardized programs allow for a variety of applications
- Data input – by means of the keyboard – is menu-driven; the dialogue language is either German or English.
- Leveling function by means of a digital filter
- Data storage in battery-buffered RAM
- Bilingual operation: German/English

Function

- Relay contacts, analogue outputs and serial interfaces are available for further, external processing.
- Standardized programs are available for a wide variety of applications.
- Data input – by means of the keyboard – is menu-driven; the dialogue language is either German or English.

Product characteristics

- Up to four analogue control outputs.
  - Current: ±20 mA, 0–20 mA, 4–20 mA
  - Voltage: ±10 volt, 0–10 volt
- Up to sixteen binary inputs / outputs
- Four analog inputs 0–10 volts
- Up to five analog outputs current: ±20 mA, 0–20 mA, 4–20 mA
  - Voltage: ±10 volt, 0–10 volt
- Up to five electrical isolated incremental counter inputs
- Built-in apparatus with dimensions according to DIN
## Technical data ASR 16

### Processor

<table>
<thead>
<tr>
<th>Power unit</th>
<th>SAB 80C 166 CPU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply</td>
<td>24 VDC</td>
</tr>
<tr>
<td>Power input (power consumption)</td>
<td>according to the level of construction ca. 4.5 W until ca. 20 W</td>
</tr>
</tbody>
</table>

### General data

<table>
<thead>
<tr>
<th>Display</th>
<th>two-line LC display with 16 characters each, character height 8 mm, illuminated background GREEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keyboard</td>
<td>18 mechanical short-stroke keys, stroke distance 0.5 mm</td>
</tr>
<tr>
<td>Housing</td>
<td>housing for switch panel plug-in unit made of plastic</td>
</tr>
<tr>
<td>Panel frame</td>
<td>144 x 144 mm, DIN 43700</td>
</tr>
<tr>
<td>Insertion depth</td>
<td>ca. 170 mm with plug board</td>
</tr>
<tr>
<td>Panel cutout</td>
<td>138 x 138 mm, tolerance + 0.8 x + 0.6 mm</td>
</tr>
<tr>
<td>Protection (DIN 40050)</td>
<td>IP 54 in appropriate switch panel mounting</td>
</tr>
<tr>
<td>Ground (weight)</td>
<td>according to the level of construction ca. 1 kg until 1.5 kg</td>
</tr>
</tbody>
</table>

### Relay contacts

<table>
<thead>
<tr>
<th>Digital inputs</th>
<th>electrical isolated by the optocoupler</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input impedance</td>
<td>&gt;= 6 kOhm</td>
</tr>
<tr>
<td>Input amplitude</td>
<td>low &lt;= 10 volt, high &gt;= 12 volt</td>
</tr>
<tr>
<td>Switching time</td>
<td>typ. 1 ms</td>
</tr>
</tbody>
</table>

### Analogue inputs

<table>
<thead>
<tr>
<th>Input impedance</th>
<th>galvanically isolated for 24 volt supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signal selection</td>
<td>0–10 volt, 10 bit resolution</td>
</tr>
<tr>
<td>Protection wiring</td>
<td>protective circuit against excessive voltage, max. input voltage 30 volts</td>
</tr>
</tbody>
</table>

### Analogue outputs

<table>
<thead>
<tr>
<th>Voltage output</th>
<th>current or voltage output adjustable by means of jumper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current output</td>
<td>± 20 mA, 0–20 mA, 4–20 mA / load &lt;= 250 Ohm, 12 bit resolution, short-circuit-proof</td>
</tr>
</tbody>
</table>

### Volume counter inputs

<table>
<thead>
<tr>
<th>Input impedance</th>
<th>6 kOhm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input amplitude</td>
<td>low &lt;= 11 volt, high &gt;= 13 volt</td>
</tr>
<tr>
<td>Rate-of-flow principle of measurement</td>
<td>period length measurement or gate time measurement</td>
</tr>
<tr>
<td>Maximum input frequency</td>
<td>&lt; 10 kHz</td>
</tr>
</tbody>
</table>

### Serial interfaces

<table>
<thead>
<tr>
<th>Serial interfaces</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS 232</td>
</tr>
<tr>
<td>cable length</td>
</tr>
<tr>
<td>Input voltage</td>
</tr>
<tr>
<td>Input current</td>
</tr>
<tr>
<td>Output current</td>
</tr>
<tr>
<td>Adjustment (selection)</td>
</tr>
<tr>
<td>Cable</td>
</tr>
<tr>
<td>RS 485</td>
</tr>
<tr>
<td>electrical isolated by the optocoupler</td>
</tr>
<tr>
<td>Input impedance</td>
</tr>
<tr>
<td>Adjustment (selection)</td>
</tr>
<tr>
<td>Cable</td>
</tr>
</tbody>
</table>

### Environmental conditions

| Operating temperature  | 0 °C up to +50 °C |
| Storage temperature    | −25 °C up to +85 °C |
## Type code ASR 16

<table>
<thead>
<tr>
<th><strong>Number of counter inputs</strong></th>
<th>Optional:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1 counter input</td>
</tr>
<tr>
<td>2</td>
<td>2 counter inputs</td>
</tr>
<tr>
<td>5</td>
<td>5 counter inputs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Number of voltage inputs</strong></th>
<th>4</th>
<th>4 voltage inputs 0 ... 10V</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>Number of voltage outputs</strong></th>
<th>0</th>
<th>voltage output, may be selected</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>± 10 V, 0 ... 10 V</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>± 10 V, 0 ... 10 V</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Special code number</strong></th>
<th>... e.g. for customised specification version of program</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>Number of current outputs</strong></th>
<th>Optional</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>U clock component</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Power supply voltage</strong></th>
<th>24</th>
<th>24 VDC</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th><strong>Software – version</strong></th>
<th>19&quot; plug-in unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>P</td>
<td>standard program</td>
</tr>
<tr>
<td>PA</td>
<td>addition in the flow rates</td>
</tr>
<tr>
<td>PD</td>
<td>difference in the flow rates</td>
</tr>
<tr>
<td>RP</td>
<td>flow rate control</td>
</tr>
<tr>
<td>ZM</td>
<td>cylinder path measurement</td>
</tr>
<tr>
<td>DOS</td>
<td>dosing program</td>
</tr>
<tr>
<td>PUR</td>
<td>flow rate and ratio control</td>
</tr>
<tr>
<td>LB</td>
<td>leakage / breakage monitor</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Number of digital inputs and outputs</strong></th>
<th>4</th>
<th>4 digital inputs and outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>8 digital inputs and outputs</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>12 digital inputs and outputs</td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>16 digital inputs and outputs</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Number of voltage outputs</strong></th>
<th>0</th>
<th>0 voltage output, may be selected</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>± 20 mA, 4 ... 20 mA</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>± 20 mA, 4 ... 20 mA</td>
</tr>
</tbody>
</table>
Examples of application

- Flow rate measurement ................................................ test stand
- Volume measurement .................................................. consumption record
- Volume measurement .................................................. cylinder path measurement
- Synchronization control of cylinders ................................ hydraulic units
- Dosing ........................................................................ filling units
- Flow rate control ......................................................... multi-component units
- Control of the mixture ratio ......................................... multi-component units
- Leakage- / breakage control ......................................... hydraulic units
Function and product characteristics ASR 20

Function

- The ASR 20 is a combination of operator panel and controller in one device. A lot of flow specific applications can be realized.
- The ASR 20 processes incremental signals.
- Standardized programs are available for a wide variety of applications.
- Standardized programs are available for different kind of applications.

Product characteristics

- The number of in- and outputs can be adjusted to the specific application.
- Relay contacts, analogue outputs and serial interfaces are available for further external processing.
- The measured values are indicated on a LC-display.

- Used for KRACHT volume counters and other sensors with 24 V incremental signals.
- Up to 6 additional moduls can be used.
- Analogue inputs allow the connection of pressure transducers, temperature sensors and the like.
- The input signals are filtered in the unit, interpreted and converted into the physical sizes flow rate and volume.
**Technical data ASR 20**

### Power unit
- **Supply**: 24 VDC ± 25%
- **Power consumption**: max. 20 W

### General data
- **Display**: 5.7 Zoll QVGA (320 x 240 characters) black/white, LC-display, illuminated backround
- **Keyboard**: 8 softkeys and 32 function keys
- **Housing**: housing for switch panel plug-in
- **Panel frame**: 205 x 220 mm (w x h)
- **Insertion depth**: 136 mm with plug board
- **Panel cutout**: 191 x 202 mm
- **Protection**: IP 65 (front side)
- **Weight**: approx. 1.95 kg

### Operating conditions
- **Mounting position**: horizontal ± 45°
- **Ambient temperature**: 0 to 50 °C (depending on mounting)
- **Humidity when operating**: 10 to 90% (not condensating)
- **Storage temperature**: -20 to 60 °C
- **Humidity at storage**: 5 to 95% (not condensating)

### In-/outputs of the basic device
- **Digital inputs**: 10; 4 of these counter inputs (one channel)
- **Input voltage**: 24 V ± 25%
- **Input current at 24 V**: approx. 4 mA
- **Digital outputs**: 9; 1 of these relais contact
- **Switching voltage**: 24 V ± 25%
- **Output current**: max. 0.4 A

### Additional modules
- **L.0090208203**: Analogue input modul 1 x ± 10 V or 0 – 20 mA (± 20 mA possible) potentiometer operating, 12 bit resolution
- **L.0090208204**: Analogue input modul 4 x ± 10 V, 12 bit resolution
- **L.0090209210**: Analogue input modul 4 x 0 – 20 mA
- **L.0090208205**: Analogue output modul 2 x ± 10 V or 0 – 20 mA (4 – 20 mA possible) 12 bit resolution
- **L.0090208206**: Digital input modul 10 digital inputs 24 VDC
- **L.0090208208**: Digital input modul 10 digital inputs, thereof 4 inputs for volume counters (one channel)
- **L.0090209213**: Digital output modul 8 digital outputs 24 VDC/ 0.5 A
- **L.0090208214**: Temp.-input modul 2 x PT 100 3-line from – 200 °C to +850 °C
- **L.0090209213**: RS 232-modul interface RS 232
- **L.0090209228**: RS 485-modul interface RS 485
Dimensions ASR 20

Dimensions in mm

Panel cutout

Dimensions in mm
Transfer pumps

Transfer pumps for lubricating oil supply equipment, low pressure filling and feed systems, dosing and mixing systems.

Mobile hydraulics

Single and multistage high pressure gear pumps, hydraulic motors and valves for construction machinery, lorry-mounted machines.

Industrial hydraulics

Cetop directional control and proportional valves, hydraulic cylinders, pressure, quantity and stop valves for pipe and slab construction, hydraulic accessories for industrial hydraulics (mobile and stationary use).

Volutronic®

Gear flow meters and electronics for volume and flow metering technology in hydraulics, processing and lacquering technology.

With our decades of experience, we are at your side, world-wide, for the professional mastery of specific applications and complete solutions in hydraulics and process technology.