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Front View

Rear View

1. Technical Data

Power supply:

either 110 V / 60 Hz or 230 V / 50 Hz (must be specified with order)
Over-/undervoltage: +15%
-5% with Current Output "On";
-20% with Current Output "Off"
Standard power socket, power cord[6]
6 Volt Accumulator for battery operation

Input:

Pulses from Pulse Generator built into Gas Meter,
round 5-pin-socket
suitable for all RITTER TG- and BG-type Gas Meters
(Type and Model programmable via the control buttons)

Output:

1. Interface RS 232 (Standard Sub-D-9-pin-socket):
   Signal: +/- 15 Volts
   Transmission rate: 9,600 Baud
   Data = 8 Bit, Parity = N, Stopbit = 1
2. Analog Output, programmable, round 5-pin-socket:
   (a) Current Output: 4 - 20 mA or 0 – 20 mA
   Or
   (b) Voltage Output : 0 - 1 Volt

Display:

large 2-line LCD Display, 16 characters per line
Display language programmable: English / German
Display contrast adjustable (via the Menu)
Display of:
- measured Gas Volume in [Liters]
- actual Flow Rate in [Liters per hour]

[6] The power cord is provided only when the Unit is delivered into countries with the German Standard for socket/plug.

Display: **(continued)**
- programmed Gas Meter type/model
- power status (Mains / Battery / Low Batt)

Control elements:

Push-buttons, waterproof

Button	Function
ON/OFF	On/Off
RESET	(in measurement Mode): Resetting the Display to zero
ENTER	(in set-up mode): For scrolling through provided Menu Options and saving of selected option
MODE	(in Measurement Mode): Choice of Display “Volume” and/or “Flow Rate”
SELECT	(in set-up mode): For selection of required Menu Option

Further Functions:
- Data transmission via RS 232 to a PC
- Configuration of the EDU 32 FP from the PC
- Pre-selection of a minimal or maximal Flow Rate
- Acoustic Signalling (Beep) when the Flow Rate values exceed the pre-selected min./max. range
- Power supply for the power interface can be turned off (to increase the running time during battery operation)

Control Codes:
(for data transmission from Interface RS 232 to Computer)

Ctrl-V (Hex 16) provides:	VOL 00000,00 LTR
Ctrl-F (Hex 06) provides:	FLOW 000,00 L/H
Ctrl-C (Hex 03) causes:	RESET
Ctrl-T (Hex 14) provides:	Type + Power Status

Fuse: 0.1 Ampere - located at the rear wall in a fuse drawer below the power socket. The fuse drawer contains a spare fuse as well.

Dimensions: Width x depth x height = 155 x 200 x 120 mm

Weight: 1.4 kg

Temperature Range: 0 °C to + 50 °C

Scope of supply:
- Power cord (with delivery into countries with German Standard for socket / plug only);
- Connection cord to Pulse Generator

2. General Overview

2.1. Application

The EDU 32 FP accessory is a microcomputer-controlled counter and display apparatus. It is designed to be used in conjunction with RITTER Gas Meters, to count and display the absolute volume and flow-rate of Gases flowing through the RITTER meter. It consists of a unit in a separate (desk top) casing with a two-line Plain-Text-LCD-Display, and can be used with all types of RITTER Gas Meters. The following individual alterations and functions can be programmed via the Control Buttons:

1. Gas Meter type being used
2. Individual measurement range (min./max. flow rates) for custom-built Gas Meters
3. Upper and lower limiting values for Flow Rate
4. Pulse Generator in use: Standard (200 Pulses per revolution of the measurement drum), Ex-Proof (50 Pulses/Revolution) or custom-built Models (customer-preferred number of pulses under 200 or 50 respectively)
5. Language German/English in the Display
6. Analog-Output: Current Output or Voltage Output
7. Contrast adjustment of the Display

2.2. Standard Adjustment Specifications

If the EDU 32 FP is ordered together with a Gas Meter, or ordered separately but with notification included of the type of Gas Meter with which it will be used, it will be delivered to the Customer already programmed for that Meter. If ordered separately with no such notification, it will be programmed to the following standard specifications:

Gas Meter Type:	TG 05
Sensor Type	PG 3.2
Language:	English
Output Signal:	4 - 20 mA
Current Out	OFF

Point 6 below explains how the Display Unit can be programmed for other adjustments, should these be required

2.3. Changing the fuse

Before changing the fuse, disconnect the mains supply cable from the unit!

The EDU contains a semi time-lag fuse of 0.1 ampere. The fuse is in a fuse drawer located on the rear panel in the black “rectangle” directly under the mains supply socket.

After having disconnected the unit from the mains supply, the fuse drawer can be pulled out. This can be done by inserting the tip of a little screwdriver into the slit at the top edge of the drawer , squeezing out the drawer with gentle pressure.

The fuse drawer contains two fuses, an “active” one and an additional one as a replacement-fuse. The “active” fuse which is held by a friction spring, is visible when the drawer is removed. This “active” fuse can be taken out of the friction spring by pushing the spring side-

ways. The replacement fuse is positioned inside of a storage bin which is located directly in front of the “active” fuse. It can be pushed out of the bin with the screwdriver.

3. Initial Installation

The unpacked Unit can be connected to the Mains supply via the provided (1) Mains Cable. When not connected to a Mains Supply, it automatically operates with the built-in 6 Volt Lead-Gel Accumulator.

(1) The power cord is provided only when the Unit is delivered into countries with the German Standard for socket/plug.

3.1. Connection of the Display Unit to the Gas Meter

A Connecting Cable with round 5-pin plugs is provided to attach the Display Unit to the Gas Meter. It needs only to be inserted into the two appropriate sockets. The Display Unit socket is located at the back of the apparatus, and is labelled "Input/Eingang". The connection point for the Gas Meter is the Pulse Generator socket, which is located on the side of the Counter Mechanism housing, at the 7-O'clock position.

For a description of the Display Unit "Input/Eingang" socket: refer to Point 7.1.

3.2. Turning on the EDU 32

The Display Unit is turned on by pressing the ON/OFF button. Pressing this button a second time will turn the Unit off. When first turned on, the Unit will display for 3 seconds, details of the apparatus type and of the Version Number of the installed Software. (Initial Announcement)

Initial Announcement:

```
Ritter      EDU 32 FP
VERSION 5.1
```

After this Initial Announcement, the following details will be displayed: The Gas Meter type for which the Display Unit has been programmed; the power status (Mains / Battery / Low Batt) and the Gas Volume in litres. Every time that the Unit is switched on, please check that it has been programmed for use with the correct Gas Meter type! If the programmed Gas Meter type is not the same as the Gas Meter in use, measurement errors will inevitably occur! (For further information on Display Announcements, refer to Point 4: "Display".

Display Example:

```
TG 05          Battery
VOL 0000,000 LTR
```

The Display Unit is then ready for operation.

3.3. Battery Operation

3.3.1. General

The built-in Battery is a rechargeable, maintenance-free and fully-sealed Lead-Gel Accumulator. It can be recharged simply by connecting the Display Unit to a Mains Supply. Overloading of the Accumulator is not possible, no matter how long the Display Unit remains connected to the Electricity Supply.

When the Display Unit is battery operated, the displayed power status will be "Battery".

3.3.2. Technical Data

Voltage (internal):	6.8 Volts
Battery Service Life:	⇒ 4 hours with Pulse Generator connected and 4-20 mA Current Output turned **on** and maximum current of 20 mA
	⇒ 18 hours with Pulse Generator connected and 4-20 mA Current Output turned off
Display "Low Batt":	indicates that the Battery charge is down to about 10% capacity, with a remaining operational duration of about 0.5 / 1.5 hours with Current Output turned on / off.
Recharging time:	about 12 hours (Overloading not possible)
Life span:	4 years or 200 recharge/discharge cycles

3.3.3. Care when not in regular use

The Display Unit must never be stored with an empty Accumulator, otherwise damage to the Accumulator is likely to occur after about 24 hours (as a consequence of sulphation of the lead plates). **The Accumulator should be recharged by connecting the EDU to the mains supply for about 2 - 3 hours no later than every three months. It is not necessary to switch on the EDU while recharging.**

3.3.4. Accumulator Change

1. **Pull power cord out of the socket!**
2. A screw is located in each of the four feet of the Accumulator - that is, on the bottom of the casing , in each of the four corners. These screws are accessed by pushing the covers over the Accumulator feet sideways and outwards.
3. After undoing the screws, lift the upper part of the housing from the lower part. These two parts are internally connected by a wide band cable, which leads from the main board to the Display. The upper part of the housing should therefore be very carefully removed and placed on its head in front of the lower part.
4. The Accumulator is secured to the base plate of the Accumulator Support with two holding clamps. It can be removed by undoing the nut on each holding clamp, and by detaching the connecting cable from the Accumulator Poles.
5. After inserting a new Accumulator, the reassembly of the casing follows the same directions, but in reverse order.

4. Display

4.1. General

The unit has a two-line LCD-Display with 16 characters per line; character height: 7.5 mm. The brightness of the characters can be adjusted using the Control Buttons in the set-up mode or over a connected PC (please refer to Points 6.2 / 6.3). The display languages of English or German are also selectable/programmable in the set-up mode.

4.2. Display Modes

Various alternating display modes can be selected by use of the "MODE" button (when operated in measurement mode). Each press of this button switches the display to the next selection choice (Toggle Principle).

Display Mode 1
(=Initial Display when the Unit is switched on):
1st Line: Gas Meter Type + Power Status
2nd Line: Volume in Liters

Example:
Gas Meter Type TG 1
Mains operated,
Language English:

```
TG 1            Mains
VOL      00000,00 LTR
```

Display Mode 2
1st Line: Gas Meter Type + Power Status
2nd Line: Flow Rate in Liters/hour

Example (as before):

```
TG 1            Mains
FLOW       000,00 L/H
```

Display Mode 3
1st Line:
2nd Line:

Example (as before):

```
FLOW       000,00 L/H
VOL      00000,00 LTR
```

After a further press of the MODE button, the first Display Mode again appears.

4.3. Display of "Power Status"

The Power Status shown in the Display will be indicated by one of the following:

- "Mains": Unit is connected to Mains Supply
- "Battery": Unit is battery operated
- "Low Batt": Battery charge is down to 10% capacity (see Point 3.3 "Battery Operation"). The display “Low Batt” blinks.

4.4. List of Decimal Places and Increments in Volume and Flow Displays

The resolution and the number of decimal places displayed for Volume [ltr] and Flow Rate [ltr/h] varies, depending on the Gas Meter type for which the Unit is programmed and the serial no. of the connected Gas Meter. These are listed in the following tables 1 to 3.

Gas Meter type	Volume [ltr]	Flow Rate [ltr/h]	Time Window for Average Calculation [sec]
TG 05, TG 1	00**0**00.00	000.00	30
TG 3, TG 5, TG 10	**0**00**0**00.0	0**0**00.0	30
TG 20, TG 50	0**0**00**0**00	00**0**00	30
BG 4	000**0**00.0	0**0**00.0	6
BG 6	0**0**00**0**00	00**0**00	8
BG 10	0**0**00**0**00	00**0**00	12
BG 16	0**0**00**0**00	00**0**00	15
BG 25	0**0**00**0**00	00**0**00	9
BG 40	0**0**00**0**00	00**0**00	6

Table 1: List of Decimal Places and Duration of Time Windows for Calculation of Average Flow Rate for connected **Gas Meters up to and including Serial No. 17.105** (model 3/1996) which are equipped with a Pulse Generator with a 100-slit-disc.

Gas Meter	Volume [ltr]		Flow Rate [ltr/h]		Time Window for Average Calculation
type	Decimals	Resolution	Decimals	Resolution	[sec]
TG 01	000.0000	0.0005	0000.0	0.2	9
TG 05	000.0000	0.0025	0000.00	0.3	30
TG 1	0,000.000	0.005	0,000.00	0.6	30
TG 3	0,000.000	0.015	0,000.0	1.8	30
TG 5	0,000.000	0.025	0,000.0	3.0	30
TG 10	00,000.00	0.05	0,000.0	6.0	30
TG 20	000,000.0	0.1	00,000	12	30
TG 25	0,000.000	0.125	0,000.0	32.2	14
TG 50	00,000.00	0.25	00,000	75	12
BG 4	00,000.00	0.05	0,000.0	30	6
BG 6	000,000.0	0.1	00,000	45	8
BG 10	00,000.00	0.25	00,000	75	15
BG 16	000,000.0	0.5	00,000	120	15
BG 40	000,000.0	0.5	00,000	300	6
BG 100	000,000.0	0.5	00,000	900	2

Table 2: List of Decimal Places and Duration of Time Windows for Calculation of Average Flow Rate for

- connected **Gas Meters with Serial No. 17.106** (model 3/1996) **and following**
- **Pulse Generators with a 200-slit-disc**

Gas Meter type	Volume [ltr]		Flow Rate [ltr/h]		Time Window for Average Calculation
	Decimals	Resolution	Decimals	Resolution	[sec]
TG 01	0,000.000	0.002	000.00	0.16	45
TG 05	00,000.00	0.01	0,000.0	0.6	60
TG 1	00,000.00	0.02	0,000.0	1.2	60
TG 3	00,000.00	0.06	0,000.0	3.6	60
TG 5	000,000.0	0.1	00,000	6	60
TG 10	000,000.0	0.2	00,000	12	60
TG 20	000,000.0	0.4	00,000	24	60
TG 25	000,000.0	0.5	0000.0	31.7	57
TG 50	0,000,000	1.0	00,000	72	50
BG 4	000,000.0	0.200	00,000	30	30
BG 6	000,000.0	0.400	00,000	48	30
BG 10	0,000,000	1.000	00,000	120	30
BG 16	0,000,000	2.000	00,000	240	30
BG 40	0,000,000	2.000	00,000	248	25
BG 100	0,000,000	2.000	00,000	720	10

Table 3: List of Decimal Places and Duration of Time Windows for Calculation of Average Flow Rate for

- connected **Gas Meters with Serial No. 17.106** (model 3/1996) **and following**
- **Pulse Generators with a 50-slit-disc**

4.5. Display-Overflow from too high a Volume

If the accumulative volume exceeds the maximum volume to be displayed, the display would start at “zero” again

4.6. Display-Overflow from too high a Flow Rate

When the connected Gas Meter type is selected on the EDU, the maximum flow rate according to the Data Sheet for that Meter will be automatically defined as such. For custom-made Gas Meters, the appropriate maximum flow rate can be programmed in (See Point 6).

If the connected Gas Meter is operated with a flow rate that is higher than the maximum indicated for it in its Data Sheet, the announcement “Too Fast” will appear in the Display.

4.7. Resetting the Display Values

All displayed values can be returned to zero using the RESET button. As protection against the RESET button being pressed by mistake, it has a short response delay built-in. It must be held pressed for about 0.5 sec. to activate it. After resetting, the Initial Announcement (with the identification name EDU 32 FP and the Program Version Number) will be displayed again for about 3 seconds.

5. Calculation of Average Flow Rates

The calculation of flow rates is based on use of a time window which is stated in table 2 in paragraph 4.4. The calculation of flow rates is done by measuring the time between 2 incoming pulses. The calculation of the output to the current and voltage interface (Analog Output) can be made using one of two methods (setting in set-up menu, see paragraph 6.1, point 12):

5.1. The Arithmetic Method

- Moving average within the respective time window with equal weighting of single values
- Recommended when fluctuations in the flow rate are large
- Fast, small changes will be averaged

5.2. The Integrating Method

- Moving average within the respective time window with larger weighting of last values by an e-function
- Recommended when fluctuations in the flow rate are small
- Changes in the flow rate will be displayed immediately

6. Programming the Unit (Set-up)

The Unit can be programmed via

- the Control Buttons
- a connected PC

6.1. Programming via the Control Buttons

Programming of the Unit is carried out from the set-up menu. The set-up menu is activated by pressing the ENTER and SELECT Buttons at the same time (for about 0.5 seconds).

Warning: By activating the set-up menu, all measurement values will be reset to zero, as a new initialisation follows.

Activation of the set-up mode will be indicated in the Display as shown below, to differentiate it from the operational mode:

>>>>Set-up<<<<

Each time the ENTER Button is pressed in the set-up mode, the individual menu points will be successively called up. The SELECT Button has a selection function and pressing the SELECT Button will then select the desired setting. Following this, pressing the ENTER Button will save the selected Setting and move to the next Menu Point.

If no input is made in the set-up mode within a time frame of 20 seconds, the program leaves the set-up mode, having saved all instructions given up to that time (Exception: Application of a maximum Volume value for the Analog-Output, Point 6.2.14).

After the last Menu Point, the set-up menu will be closed through a new initialisation, which will save the given data.

6.2. Set-up Menu:

6.2.1. Language

>>>>Set-up<<<< **Deutsch**	**>>>>Set-up<<<<** **English**

6.2.2. Contrast

>>>>Set-up<<<< **LCD Contrast 0**	**>>>>Set-up<<<<** **LCD CONTRAST 7**

The Contrast is programmable in a Scale range of 0 to 7. 0 is the smallest and 7 the greatest contrast. The contrast is increased by one scale value with each press of the SELECT Button.

6.2.3. Gas Meter Type

>>>>Set-up<<<< **Type TG05**	**>>>>Set-up<<<<** **Type TG05P**

Each press of the SELECT Button calls up the next Gas Meter type in increasing order of Meter size (in the order of the Gas Meter types in Tables 1 and 2 in Point 4.4). After the last Gas Meter (BG100), the first (TG01) will appear again.

Example on the right: A “P” behind the Gas Meter type indicates that this Meter was programmed individually (see also Menu Point 6).

6.2.4. Sensor Type

>>>>Set-up<<<< **Sensor PG V2.0**	**>>>>Set-up<<<<** **Sensor PG V2.0Ex**
>>>>Set-up<<<< **Sensor PG V3.X**	**>>>>Set-up<<<<** **Sensor PG V4.0**
>>>>Set-up<<<< **Sensor PG V4.1**	**>>>>Set-up<<<<** **Sensor PG V5.0**

Sensor type “V3.X” stands for all sensors of version V3

Attention: If the sensor “V2.0Ex” is connected to the EDU via an “Isolated Switch Amplifier” or “Sensor Output Interface Terminal”, it must be selected:

- Sensor type “V3.X”
- Pulses 50/Rev (see par. 6.2.5 as well)

6.2.5. Slit disc / encoding disc

>>>>Set-up<<<< Pulses 50/Rev	>>>>Set-up<<<< Pulses 200/Rev
>>>>Set-up<<<< Pulses 2 x200/Rev	>>>>Set-up<<<< Pulses 500/Rev

Selection of Gas Meter's slit disc / encoding disc:

Please refer to the data sheet of the delivered Pulse Generator which states the number of pulses per revolution and select the respective menu point accordingly.

6.2.6. Standard-/Individual-Parameter

>>>>Set-up<<<< Parameter Stand.	>>>>Set-up<<<< Parameter extra

"Parameter Stand.": Activation of the pre-programmed standard values for the Gas Meter type.

"Parameter extra": Activation of the altered values from individual programming
(The configuration of the "Parameter extra" can only be made via the RS 232 Interface and PC, not via the Buttons of the EDU 32 FP itself)
When a Gas Meter is individually programmed and this is activated, a "P" will appear in the Display behind the Gas Meter type (see Menu Point 3).

6.2.7. Alarm Function "maximum flow rate"

>>>>Set-up<<<<	
Flow max	012.90

An Alarm Maximum Flow Rate value in [ltr/h] can be programmed within the measurement range of the Gas Meter, such that **overshooting** this value will cause a built-in Beeper to give an alarm. In order for this to happen however, the Beeper must be activated through the Menu Point "Beeper". Exceeding the flow rate produces a repeating sequence of notes in the form of "short-pause-long" ("beep - pause - beeeeeep").

The Alarm Maximum Flow Rate value can be programmed by pressing the SELECT Button. By constantly holding the SELECT Button pressed, the Alarm Maximum Flow Rate value will be automatically increased. The longer the Button is pressed, the faster the values will be increased. After releasing the Button and pressing it again, the counting process begins slowly again. After reaching the maximum flow rate of the measurement range of the respective Meter, the values will start counting at zero again.

When the programmed value is exceeded, the actual true flow rate value is sent to the RS 232 Interface regardless, as it is assumed that this value will be further processed in an external system with its own limiting value processes. This occurs independently of the programmed maximum flow rate for that Meter.

6.2.8. Alarm Function "minimum flow rate"

>>>>Set-up<<<<	
Flow min	**001.2**

An Alarm Minimum Flow Rate value in [ltr/h] can be programmed within the measurement range of the Gas Meter, such that **undershooting** this value will cause a built-in Beeper to give an alarm. In order for this to happen however, the Beeper must be activated through the Menu Point "Beeper". Being under this flow rate value produces a repeating sequence of notes in the form of "long -pause" ("beeeeeep - pause").

The Alarm Minimum Flow Rate value can be programmed by pressing the SELECT Button. By constantly holding the SELECT Button pressed, the Alarm Minimum Flow Rate value will be automatically increased. The longer the Button is pressed, the faster the values will be increased. After releasing the Button and pressing it again, the counting process begins slowly again. After reaching the maximum flow rate of the measurement range of the respective Meter, the values will start counting at zero again.

When undershooting the programmed value, the actual true flow rate value is sent to the RS 232 Interface regardless, as it is assumed that this value will be further processed in an external system with its own limiting value processes. This occurs independently of the programmed minimum flow rate for that Meter.

6.2.9. Beeper

>>>>Set-up<<<<	
BEEPER	**ON**

>>>>Set-up<<<<	
BEEPER	**OFF**

The Beeper must be activated or deactivated depending on whether a signal is required to indicate that programmed maximum and minimum flow rates have been exceeded or not reached. Even when the Beeper is deactivated, other technical warning signals will be given (=> short circuit at the Current Output, => EEPROM defect).

6.2.10. Selection of Current Output or Voltage Output

>>>>Set-up<<<<	
CURRENT OUT	**ON**

>>>>Set-up<<<<	
CURRENT OUT	**OFF**

A power supply is required for the operation of any Current Interface. To operate the Current Interface of the EDU (4-20 mA or 0-20 mA) the EDU's internal power supply can be used.

"Current Output ON":

A 24 Volt subsidiary (additional) voltage is generated in the EDU 32 FP from the line voltage of the EDU 32 FP over an internal DC/DC-Converter. In this way, the Current Interface can be used without an external power supply.

The Voltage Output is not switched off in this mode, rather, it delivers 0-3 Volt or 600 mV – 3 Volt respectively (please refer to next Point 6.2.11)

"Current Output OFF":

No 24 Volt subsidiary (additional) voltage is generated, the Current Interface is switched off.

The Voltage Output delivers 0-1 Volt

The creation of the 24-Volt auxiliary voltage requires a higher power supply, which results in a reduction of the operating time of the Unit under battery operation (Point 3.3.2 also refers to this). Therefore, "Current OFF" should be selected when the Current Interface is not required.

The position "Current ON" is also indicated by a green LED light on the back of the Unit.

6.2.11.Selection of the measurement range for the current output signal

>>>>Set-up<<<<
CURR. OUT 4-20mA

>>>>Set-up<<<<
CURR. OUT 0-20mA

"Curr. Out 4-20mA": Measurement Range 4 – 20 mA
The Voltage Output delivers 600 mV – 3 Volt in this mode

Curr. Out 0 – 20 mA: Measurement Range 0 – 20 mA
The Voltage Output delivers 600 mV – 3 Volt in this mode

6.2.12.Calculation of the Flow Rate average

>>>>Set-up<<<<
FLOW e-Funct.

>>>>Set-up<<<<
FLOW arithmet

"Flow e-Funct.": The flow rate average is calculated as e-function by calculating the integral.

"Flow arithmet": The flow rate average is calculated arithmetically

6.2.13.Selection of „Flow rate " or „Volume" for the Analog-Output signal

>>>>Set-up<<<<
Analog Flow

>>>>Set-up<<<<
Analog Volume

„Analog Flow":
The Analog-Output signal is proportional to flow rate

„Analog Volume":
The Analog-Output signal is proportional to accumulative volume

6.2.14.Maximum volume value for Analog-Output signal

>>>>Set-up<<<<
Max 000,5120 LTR

For the indication of volume as an Analog-Output signal, a maximum Volume value must be programmed in, by which the maximum value of the Analog signal will be achieved. In order to obtain the greatest possible resolution, the selection of the maximum volume value is made in discrete increments. These result from the number of slits in the Pulse Generator disc and the Gas Meter type, as well as from the different volume values per

pulse. The possible increment is automatically determined according to the selected Gas Meter.

After this Menu point has been selected using the ENTER Button, the desired value can be programmed in using the SELECT Button. The lower and upper limits of the maximum volume value are presented in the following Table. By pressing the SELECT Button once, the volume value will be increased by the amount of the lower limit value. By constantly holding the SELECT Button pressed, the volume value will be automatically increased. The longer the Button is pressed, the faster the values will be increased. After releasing the Button and pressing it again, the counting process begins slowly again.

Once the desired value has been reached, it can be saved by pressing the ENTER Button. **Warning:** If nothing is entered within a 20 second period, the Program leaves the set-up mode **without saving** a possibly newly selected maximum volume value.

Gas Meter Type	Lower limit = Increment [ltr]	Upper limit [ltr]
TG 01	0.128	196.608
TG 05	0.64	983.04
TG 1	1.28	1,966.08
TG 3	3.84	5,898.24
TG 5	6.400	9,830.4
TG 10	12.8	19,660.8
TG 20	25.6	39,321.6
TG 25	32.0	9,984.0
TG 50	64.0	98,304
BG 4	12.8	19,660.8
BG 6	25.6	39,321.6
BG 10	64.0	98,304
BG 16	128	196,608
BG 25	128	196,608
BG 40	128	196,608
BG 100	128	196,608

Table: Upper and lower limits for the maximum volume values, by which the maximum value of the analog signal can be achieved.

For a comprehensive description of the Analog Output: see Point 7.2

6.3. Programming via connected PC

All program settings which can be made via the Control Buttons can also be made via a PC. The PC must be connected to the RS232 Interface of the EDU. The advantage of this is that the input of figures can be done much more easily.

A further advantage exists in the possibility of being able to program-in further parameters with a PC (via the RS232 Interface on the EDU). The program can be adapted to match custom-made alterations to the Gas Meter being used, or application-specific parameters can be set. Examples are as follows:

Number of pulses of the Pulse Generator per revolution of the Gas Meters measuring drum

Setting of a different flow rate value at which the maximum value of the Analog Output can be reached.

Decimal place positions for volume and flow rate indications

In order to do this however, users require a detailed knowledge of the internal programming of the EDU. If needed, please contact either the Ritter Company or your local Ritter Distributor.

To transfer data from a PC to the EDU, the following is required:

- PC
- Serial Cable
- Terminal program (hyperterminal) eg Procom or Hyperterminal in Windows

When using a terminal program (e.g. Hyperterminal in Windows), a direct connection must be made via a COM interface (COM1, COM2 etc.) between the PC and EDU. The terminal program has to be adjusted to the COM interface being used. The EDU can be switched into the set-up mode using the control codes Ctrl-C and Ctrl-E. Both control codes must be sent within 0.5 seconds. The EDU Display will indicate when the EDU is in set-up mode.

The EDU "Enter"-Function is then replaced by the RETURN key on the PC, and the "Select"-Function by the space-bar. These two keys on the computer keyboard can be used in the same way as the above-mentioned Control Buttons on the EDU to change settings. Parallel to this, settings can also be changed using the Control Buttons on the EDU. All settings and alterations appear on the computer monitor (terminal or terminal program of the computer) and in the EDU Display.

If the EDU is in normal operational mode, the actual content of the EEProm can be read in Intel-Hex-Format using the Ctrl-R function. This string contains all created settings, as well as, if applicable, any special programming. Special programming can also be transmitted via the terminal program in Intel-Hex-Format to the EDU.

7. In-/Outputs

7.1. Socket "Pulse Input"

(For Wiring Diagram of the socket, refer to Point 8)

The pulses from the built-in Pulse Generator on the Gas Meter are read by the EDU via this analogue input socket (acc. DIN 41524 type "D"). The required power supply (5 Volts) for the operation of the Pulse Generator is given out by this socket as well.

This power supply is given out via an internal resistor of 1 kOhm at the Pin "LED +" and "LED GND". The power supply runs the LED of the Pulse Generator's photo interrupter, or any connected electrical sensor designed to work with this voltage.

The two Pins "+ Darlington" are two separate input channels for the pulses to be read in. Ritter Gas Meter Pulse Generators at present use only one input channel. A pulse is generated when one of these input channels is connected to GND. GND is the respective earth reference point. The input resistor has a value of about 20 kOhm when using the

sensor types PG 2.0 and PG 3.0. When using the sensor type PG 2.0EX, the value of the input resistor is about 200 Ohm. The signals are shaped by the EDU via a Schmitt-Trigger. The lower trigger threshold value is about 1.5 Volts, and the upper trigger threshold value is about 3.5 Volts.

7.2. Socket "Analog Output"

(For Wiring Diagram of the socket, refer to Point 8)

An Current Output signal (4 – 20 mA or 0 – 20 mA) and also an Voltage Output signal (0 – 1 Volt) can be transmitted via the round 5-pin "Analog Output" socket (acc. DIN 41524 type "D") at the back of the Unit. The values of these signals are proportional to the programmed measuring unit (refer to point 6.2.13) which is:

a) the actual **flow rate** or

b) the summarised **volume**

of the gas in the connected Gas Meter. To this socket can be connected, for example, an Analogue-Recorder, Regulator etc.

7.2.1. Current Output

The advantage of the Current Output is that the transmission of measurement signals can also occur over longer distances without being fundamentally influenced by outside disturbance.

For the respective measurable variable (Flow Rate/Volume), the following Minimum and Maximum Output signal values apply:

Measurable variable			Output Signal [mA]
Flow Rate [Ltr/h]	Volume [Ltr.]	Corresponds to	
0	0		0 or 4
max. **Flow Rate** of the connected Gas Meter as given in its Data Sheet	max. **Volume** corresponding to the Programming according to Points 6.2.14		20

The standard output signal is preset at 4 - 20 mA for the measurable variable „Flow Rate ". To program the Output signal to 0 –20mA, see Point 6.2.11, to program the measurable variable, see Point 6.2.13.

The Current Interface is provided with a voltage of 24 V from within the Unit.

If the permissible current is exceeded by a malfunction within the EDU, the Unit switches the internal 24 Volt voltage off and the text "24 Volt" appears in the upper left-hand corner of the Display. At the same time, the green LED light at the back of the EDU 32 FP goes out and the internal Beeper gives off a continuous tone. After about 3 seconds, the Unit checks whether the overload is still present. If it is still present, the EDU 32 FP switches the Current Interface off again; after a short disconnection of the Display, the text "24 Volt" appears in the Display again and the continuous Beeper tone is given off again.

As the Current Interface output is short circuit proof and current limited, this announcement indicates that there is an internal error in the Unit.

7.2.2. Voltage Output

In order to activate the Voltage Output as Analog Output, the Current Output has to be switched off. The selection/programming is made via the set-up menu (Point 6.2.10: "Selection of Current Output or Voltage Output" refers).

The impedance of the Voltage Output Port is about 3 kOhm. Connected recorders or similar instruments should therefore have an input impedance of 10 kOhm or more, in order to avoid influencing the Voltage value.

For the respective measurable variable (Flow Rate/Volume), the following Minimum and Maximum Output signal values apply:

<table>
<tr><td colspan="2">Measurable variable</td><td rowspan="2">Corresponds to</td><td>Output Signal [V]</td></tr>
<tr><td>Flow Rate [Ltr/h]</td><td>Volume [Ltr.]</td><td></td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>max. Flow Rate of the connected Gas Meter as given in its Data Sheet</td><td>max. Volume corresponding to the Programming according to Points 6.2.14</td><td></td><td>1</td></tr>
</table>

To program the measurable variable, see Point 6.2.13.

7.2.3. Output of Flow Rate

The length of the intervals between the pulses is measured for the calculation of the flow rate. This means that a change in the flow rate has an immediate influence on the Voltage and Current Output values. If no pulse is measured for longer than 10 seconds, the flow rate is calculated as "Zero". Because the Analog values are generated over a 16-bit pulse-width modulation, the level has to be given out over a so-called "Integrator". This Integrator reacts with a short delay within seconds and also dependant upon whether the calculation Mode is set to "Arithmetic" or "e-Function" (smoothing).

The higher the maximum pulse frequency is, the faster the output can react to changes.

Examples when set to „arithmetic" Mode:

1. TG 05 max. Frequency 1.6666 Hz for a pulse generator with 50 Pulses/Drum Revolution
   ⇒ Reaction time from 0 mA – 20 mA about 65 seconds.
2. BG 100 – max. Frequency 88 Hz for a pulse generator with 200 Pulses/Drum Revolution
   ⇒ Reaction time from 0 mA – 20 mA about 7 seconds.

The times in the examples correspond to a spring function, this means that the Gas Meters spring from not moving at all to the highest flow rate or alternatively that it suddenly ceases to move from the highest flow rate. This does not reflect reality. The data provided in the examples therefore symbolically indicate the maximum possible leading and trailing edges of the signal in relation to the maximum counting frequency. As the change in the Analog Output level is immediately readjusted with the change in the flow rate, only high springs in the flow rate can lead to a short delay in the output of the Analaog values.

7.2.4. Signal-Overflow from too high a Flow Rate

When the connected Gas Meter type is selected on the EDU, the maximum flow rate according to the Data Sheet for that Meter will be automatically defined as such. For customer-made Gas Meters, the appropriate maximum flow rate can be programmed in (see Point 6).

If the connected Gas Meter is operated with a flow rate that is higher than the maximum indicated for it in its Data Sheet, the Output signal will remain constant once it reaches its maximum value. This means that for any overrun of flow rate, the Voltage Output will have a constant value of 1 Volt (when programmed to Voltage Output Signal), and the Current Output will have a constant value of 20 mA (when programmed to Current Output Signal).

7.3. Interface RS 232

(For Wiring Diagram, refer to Point 8)

The Display Unit can be connected to a Computer using the Interface RS 232.

For doing so the data transmission cable must be a cable with nine leads and with nine-pole terminals on both ends. All used leads between plug and socket of the cable are connected directly with each other, i. e. pin 2 of the plug is connected with pin 2 of the socket, pin 3 with pin 3 and so on. The pins/leads used for the data transmission are listed in point 7.3.1.

7.3.1. Interface Description:

Sub-D-9-Socket:	Pin 2 = TxD	Transmitted Data
	Pin 3 = RxD	Received Data
	Pin 4 = DTR	Data Terminal Ready (for Hardware-Handshake)
	Pin 5 = GND	Ground
	Pin 6 = RTS	Request To Send (for Hardware-Handshake)

Signal Voltage:	+/- 15 Volts
Data Transmission:	9600 Baud, Data = 8 Bit, Parity = N, Stopbit = 1

All of the data which are indicated in the Display can be transmitted to a Computer. In order to receive data, a Computer Program must send Control-Codes to the Interface. The Control Codes and the corresponding data are listed in Point 7.3.2.

7.3.2. Control-Codes:

Ctrl-V	Hex 16	provides:	VOL 00000,00 LTR (List of Decimals see Point 4, Table 1 & 2)
Ctrl-F	Hex 06	provides:	FLOW 000,00 L/H (List of Decimals see Point 4, Table 1 & 2)
Ctrl-C	Hex 03	causes:	RESET
Ctrl-T	Hex 14	provides:	Type + Power Status
		e.g. :	TG 05 Battery
			TG 10 Mains
			TG 20 Low Batt etc.

The Interface will only send data when it has received a Control-Code. The text will be written in either English or German, depending on which language it has been programmed for use.

Use of the Control-Code "Ctrl-C" resets the Unit in the same way as pressing the RESET Key: All internal registers (counters) are set to zero, the programmed Set-up Values are then read, the Initial Announcement appears in the Display, followed by the Display Mode 1 values (refer to Point 4: "Display Modes").

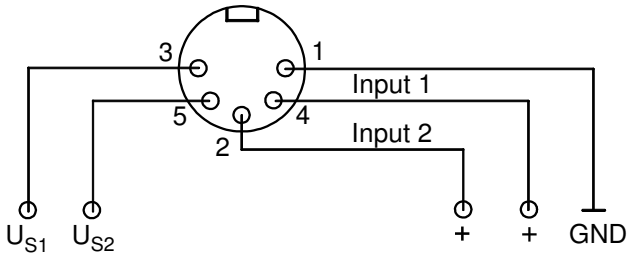
7.3.3. Hardware-Handshake:

The adjustment of the Interface 232 to the connected Computer regarding the Hardware-Handshake is performed automatically. After receipt of a Control-Code (e.g. Ctrl-V for Volume), the Interface transmits the requested byte sequence (e.g. for Volume) as follows:

1. When the connected Computer offers a Hardware-Handshake, that means, when the DTR signal is set to "High" at the reception site (i.e. the Computer), the Interface will set the RTS signal to "High", and will transmit information (in the form of a byte sequence) until the DTR signal is again set to "Low" by the Computer.
2. When the connected Computer does not offer a Hardware-Handshake, that means when the DTR signal is not set to "High" within a defined time delay, the Interface will transmit the total byte sequence according to X-ON / X-OFF mode after that period of time has elapsed. The time delay equals the transmission time of a character at 9,600 Baud (= 0.8 msec).

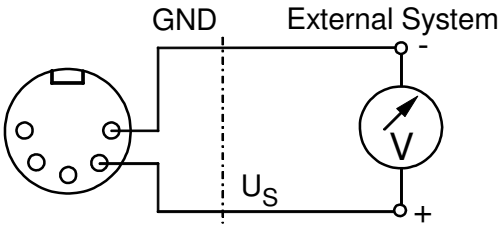
8. Wiring Diagrams for In- and Output Sockets

Socket: „Pulse/Input“:
(acc. DIN 41524 type “D”)



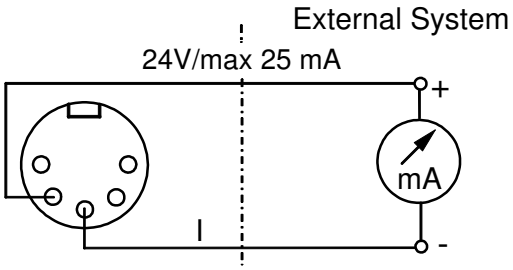
Socket "Analog Output":
(acc. DIN 41524 type “D”)

Voltage Output signal

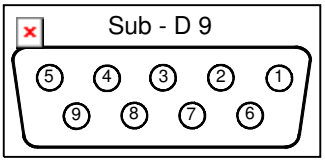


"Analog Output" Socket:

Output current signal with
internal power supply



Interface RS 232:



Pin 2 = TxD Transmitted Data
Pin 3 = RxD Received Data
Pin 4 = DTR Data Terminal Ready (for Hardware Handshake)
Pin 5 = GND Ground
Pin 6 = RTS Request To Send (for Hardware Handshake)