Pulse Generator	Properties	Page
Version V2.0ex	• 50 pulses per revolution of measuring drum • For use with TG05 to TG50, BG4 to BG100 • Uni-directional • Applicable for ex-proof areas [2]	03.20
Version V3.2	• 200 pulses per revolution of measuring drum • For use with TG05 to TG50, BG4 to BG100 • Uni-directional • Not applicable for ex-proof areas	03.15
Version V4.01	• 2 x 200 pulses per revolution of measuring drum • For use with TG05 to TG50, BG4 to BG100 • Bi-directional • Not applicable for ex-proof areas	03.25
Version V4.11	• 500 pulses per revolution of measuring drum • For use with TG05 to TG50, BG4 to BG100 • Uni-directional • Not applicable for ex-proof areas	03.32
Version V5.0	• 50 pulses per revolution of measuring drum • For use with TG01 version V4.x • Uni-directional • With standard output socket: Not applicable for ex-proof areas With optional explosion-proof output socket: Applicable for ex-proof areas [1]	03.37

[2] Please note: According to European laws (EC directive 94/9/EC), a Declaration of Conformity ("ATEX" Declaration of Conformity) must be available for the gas meter, in which the Pulse Generator is built into, if and when the meter shall be used in ex-proof areas. This Declaration of Conformity is available for all meter models made out of PE-el (model no. 8).

Quick reference:

- 200 pulses per revolution of measuring drum
- For use with TG05 to TG50, BG4 to BG100
- Uni-directional
- Not applicable for ex-proof areas

Application: The Pulse Generator for **RITTER** gas meters is a rotary encoder for pulse output. It can be used to transfer the measured gas volume for remote display and/or data processing (calculation of flow rate, data transfer via RS232) to the accessory EDU 32 or to an external measuring system / PC. In the latter case, the external system must provide the power supply for the photo sensor as well as the evaluation circuit/logic which enables the direct readout of the measured volume and flow rate. For connection to an external system, please refer to the electrical data on page 03.17 and the wiring diagrams on page 03.18.

Components: The Pulse Generator is located within the housing of the counter mechanism of the Gas Meter (behind the dial plate) and it consists of the following components:

- Optical encoding film disc
- mini board with integrated infra-red photo sensor and LED operating indicator
- round, 5-pin output socket (180°, DIN 41524)

Description: The measuring drum of drum-type meters and the measuring unit of bellow-type meters are coupled 1:1 to the slit disc via a magnetic coupling. The slits/flags of the slit disc rotate through the U-shaped photo sensor, thereby interrupting the light beam of the photo diode intermittently. Thus, the photo interrupter converts the revolution of the measuring drum into a sequence of pulses. The number of pulses represents the **volume of gas** which has passed through the Gas Meter, depending on the respective resolution (see table on Page 03.16). The frequency of the sequence of pulses is a measure of the rotational speed of the measuring drum and thereby a measure of the **flow rate** of the gas.

For operation of the photo sensor, an external electric power supply in the range of 5-24 Volts DC is required. More electrical data are stated on the data sheet 03.17. The output signal is a rectangular pulse, whereby the pulse level (= min./max. voltage of the signal) depends on the power supply:

- Power Supply 5 V $\Rightarrow$ Output Signal Level 0.7 / 3.7 Volt
- Power Supply 24 V $\Rightarrow$ Output Signal Level 2 / 21 Volt

For power supply values between 5 and 24 Volts, the output signal level can be linearly interpolated for the first approximation.

Output Socket: The pin connection of the 5-pin output socket is shown on data sheet 03.17.

Sample circuit: The connection of a measurement instrument to the Pulse Generator is shown schematically on data sheet 03.18.

Use with Drum-type Gas Meters:

Drum-type gas meters are volumetric gas meters. That means, that they are measuring gas volume precisely. When the Pulse Generator is used with drum-type gas meters for recording the gas flow, it is possible for the respective Voltage Output curve (line) to be slightly wavy, even when gas flow is constant. This is (unpreventably) caused by the type of construction of the

measuring drum: the drum consists of four separate chambers, which are closed and opened in sequence. The previous chamber **has to be** closed **before** the next chamber will open.

This compulsory measurement is the reason for the high measuring accuracy. However, each closing also causes a little build-up of pressure at the inside of a chamber. The surface tension creates an additional pressure increase during emerging of a chamber (water highest surface tension, oil: lower, CalRix lowest). The resulting pressure increase causes a small reduction in the rotational speed of the measuring drum. This is barely visible to the eye but is documented precisely by a computer/transcriber. Thus, the slightly wavy output line at constant input flow documents the **true** flow through the gas meter.

Performance Data:

Gas Meter [Type]	Pulses per Revolution* [P/R]	Gas Flow per Revolution* [ltr/R]	Resolution [ltr/Pulse]	Pulses per Liter [Pulse/ltr]	Maximum Pulse Frequency [Pulse/min]
TG 01	not applicable				
TG 05	200	0.5	0.0025	400	400
TG 1	200	1.0	0.005	200	400
TG 3	200	3.0	0.015	66.7	400
TG 5	200	5.0	0.025	40	400
TG 10	200	10	0.05	20	400
TG 20	200	20	0.1	10	467
TG 25	200	25	0.125	8	933
TG 50	200	50	0.25	4	1,200
BG 4	200	10	0.05	20	2,000
BG 6	200	20	0.1	10	1,667
BG 10	200	50	0.25	4	1,067
BG 16	200	100	0.5	2	833
BG 40	200	100	0.5	2	2,167
BG 100	200	100	0.5	2	2,167

* TG types: Revolution of measuring drum
(= revolution of large needle of dial plate)
BG types: Revolution of large needle of dial plate

Temperature range:

- 0 to +55°C

At higher temperatures the Pulse Generator must be cooled by flushing the counter mechanism casing with room air.
Necessary equipment: Optional connection nozzle at counter mechanism casing.

Humidity range:

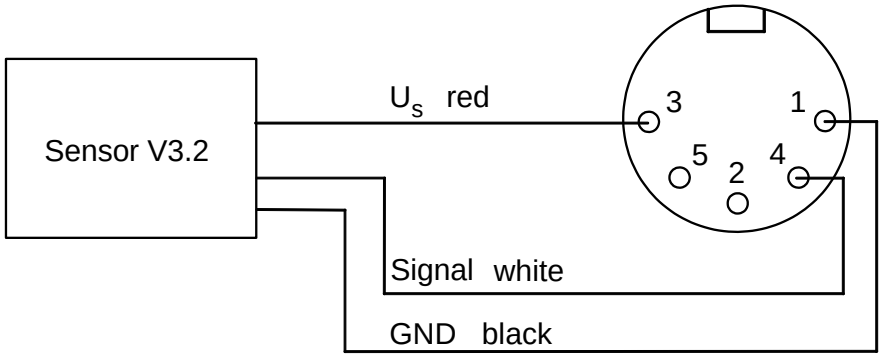
- 0 to 65% relative humidity, **non-condensing**

With a higher humidity, the circuit board of the Pulse Generator can be covered with a protective lacquer. Please indicate prior to order.

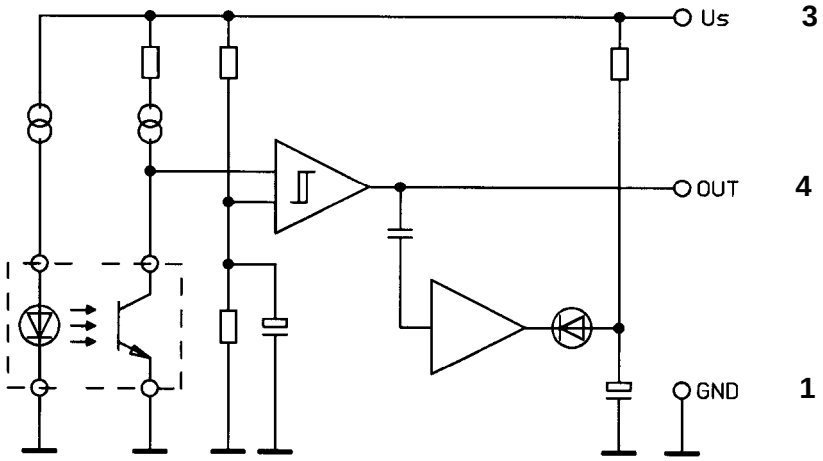
Electrical Data:

Supply Voltage U_S		5 – 24	V DC
Supply Current		< 3	mA
Voltage output Us = 5 V:	high level	min. 3.7	V
	low level	max. 0.7	V
Voltage output Us = 24 V:	high level	min. 21	V
	low level	max. 2	V
Current Output	Source	min. +7	mA
	Sink	min. -6	mA
Operating Frequency photo diode		0 – 250	Hz

Pin configuration of the Output Socket:
(View to **plug-side** of the socket)

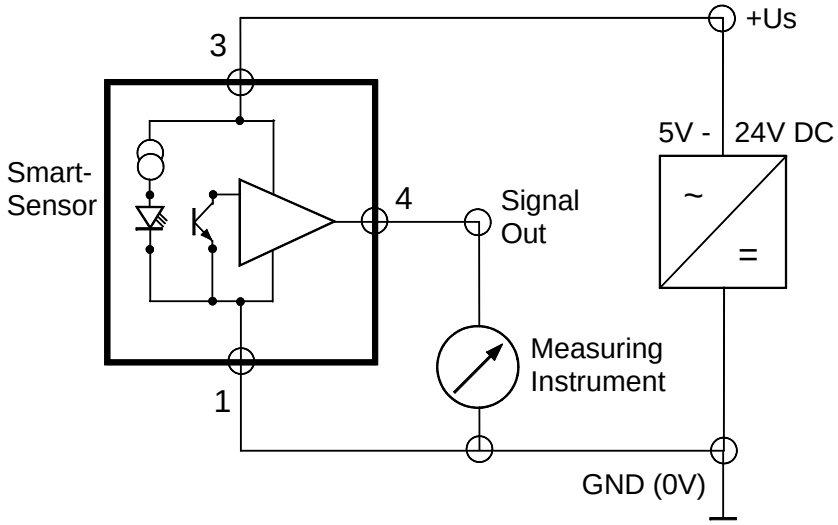


Circuit diagram:



The circuit contains a complementary transistor output which is short circuit protected against both Ground and the supply voltage U_S.

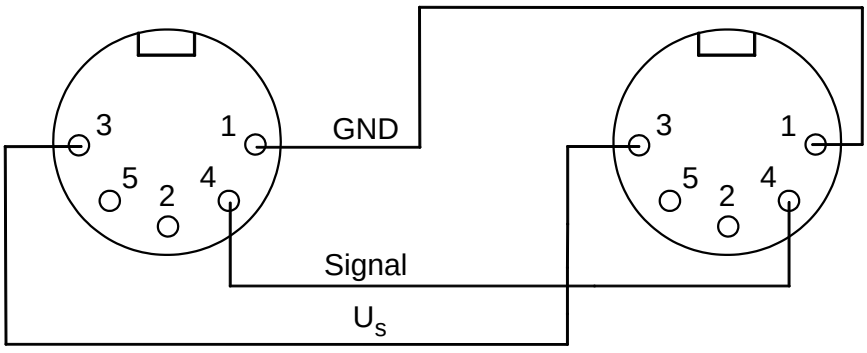
Wiring diagram / sample circuit (schematic):



Connection of the Pulse Generator
to the "Electronic Display Unit" EDU 32 FP (optional accessory)**:**

The Pulse Generator can be connected to the optional accessory "Electronic Display Unit" by means of the 3-pin connection cord, which is supplied in conjunction with the Electronic Display Unit. The Electronic Display Unit contains the power supply for the inductive sensor as well as the evaluation circuit/logic which enables the direct readout of the measured volume [ltr] and flow rate [ltr/h].

Wiring of the Pulse Generator to the EDU socket
(view to **plug-side** of the sockets):



Pulse Generator Output Socket EDU Input Socket

The measurement results displayed by the Electronic Display Unit can be transmitted to a computer via the standard-type interface RS 232 (refer to chapter 4 "Electronic Display Unit" as well). Additionally, the value of the flow rate can be transmitted to an analog measurement device via the standard-type analog output (0-1 Volt or 4-20 mA).

Set-up of EDU:

- Programming of sensor type: Select sensor type "PG V3.X"
  (please refer to the EDU Operation Instructions par. 6.2.4 as well)
- Programming of slit disc / encoding disc: Select "200 Pulses/Rev"
  (please refer to the EDU Operation Instructions par. 6.2.5 as well)

Dimensions of slit disc:

	TG05 to TG50 BG
Diameter:	144
Slit width:	1.0
Flag width:	1.2

Exchanging the spare parts kit „Complete Photo diode "

The kit consists of the following components which are already mounted on a transparent plastic cover plate:

- Photo diode on a mini board,
- Fixture,
- Wiring,
- 5-pin socket.

Removal of the built-in kit:

- Remove the plug of the signal transmission cable from the socket of the pulse generator,
- Unscrew the 4 screws of the transparent cover plate,
- Remove the cover plate together with the built-in-kit.

Replacement with the new kit:

- Carefully mount the fork-shaped photo diode over the circumference of the folio disc without bending the disc,
- Fasten the cover plate to the counter mechanism casing with the 4 screws. By way of the free play in the washer holes the photo diode can be positioned such that the folio disc can freely rotate through the middle of the fork-shaped photo diode. After that tighten the screws to fix the built-in-kit.

Quick reference:

- 50 pulses per revolution of measuring drum
- For use with TG05 to TG50, BG4 to BG100
- Uni-directional
- Applicable for ex-proof areas [3]

Application: The Pulse Generator for **RITTER** gas meters is a rotary encoder for pulse output. It can be used to transfer the measured gas volume for remote display and/or data processing (calculation of flow rate, data transfer via RS232) to the accessory EDU 32 or to an external measuring instrument (PC, transcriber). In the latter case, the external system must provide the power supply for the sensor as well as the evaluation circuit/logic which enables the direct readout of the measured volume and flow rate. For connection to an external system, please refer to the pin configuration on page 03.21 and the electrical data on page 03.23.

This explosion proof Pulse Generator is equipped with an inductive sensor for use in hazardous environments[3] according categories[4] ATEX 1G and ATEX 2G. Approval No.: PTB 99 ATEX 2219 X, marking: ⟨Ex⟩ II 1 G EEx ia IIC T6

For use in **ex-proof areas** an external switch amplifier has to be installed between Pulse Generator (gas meter) and the power supply (for example by the EDU) for galvanic decoupling.

For selection of the gas meter model to be used in ex-proof areas: See footnote.

Equipment: The Pulse Generator is located within the casing of the counter mechanism of the Gas Meter (behind the dial plate) and it consists of the following components:

- Sit disc
  - Sensor: inductive proximity switch with PTB/ATEX certificate
  - 3-pin ex-proof output socket

Description: The measuring drum of drum-type meters and the measuring unit of bellow-type meters are coupled 1:1 to the slit disc via a magnetic coupling. The slits/flags of the slit disc rotate through the U-shaped inductive sensor. Thus, the inductive sensor converts the revolution of the measuring drum into a sequence of pulses. The number of pulses represents the **volume of gas** which has passed through the Gas Meter, depending on the respective resolution (see table on page 03.21). The frequency of the sequence of pulses is a measure of the rotational speed of the measuring drum and thereby a measure of the **flow rate** of the gas.

For operation of the inductive sensor, an external electric power supply with 5 Volts DC is required. More electrical data are stated on the data sheet 03.23. The output signal is a rectangular pulse, whereby the pulse level (= min./max. voltage of the signal) depends on the user-side circuit, i.e. the value of the used resistors.

[3] Please note: According to European laws (EC directive 94/9/EC), a Declaration of Conformity ("ATEX" Declaration of Conformity) must be available for the gas meter, in which the Pulse Generator is built into, if and when the meter shall be used in ex-proof areas. This Declaration of Conformity is in preparation for all meter models made out of PE-el (model no. 8).

[4] Equivalence of categories and zones: category 1 = zone 0, category 2 = zone 1, category 3 = zone 2
"G" stands for "gas" ("D" for "dust")

Output Socket: The pin connection of the 3-pin output socket is shown on page 03.21.

Use with Drum-type Gas Meters:

Drum-type gas meters are volumetric gas meters. That means, that they are measuring gas volume precisely. When the Pulse Generator is used with drum-type gas meters for recording the gas flow, it is possible for the respective Voltage Output curve (line) to be slightly wavy, even when gas flow is constant. This is (unpreventably) caused by the type of construction of the measuring drum: the drum consists of four separate chambers, which are closed and opened in sequence. The previous chamber **has to be** closed **before** the next chamber will open.

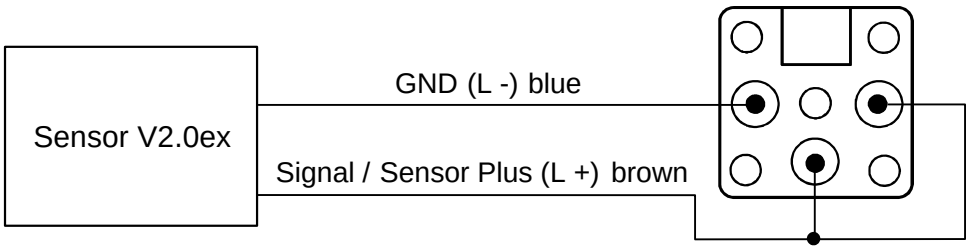
This compulsory measurement is the reason for the high measuring accuracy. However, each closing also causes a little build-up of pressure at the inside of a chamber. The surface tension creates an additional pressure increase during emerging of a chamber (water highest surface tension, oil: lower, CalRix lowest). The resulting pressure increase causes a small reduction in the rotational speed of the measuring drum. This is barely visible to the eye but is documented precisely by a computer/transcriber. Thus, the slightly wavy output line at constant input flow documents the **true** flow through the gas meter.

Performance Data:

Gas Meter [Type]	Pulses per Revolution* [P/R]	Gas Flow per Revolution* [ltr/R]	Resolution [ltr/Pulse]	Pulses per Liter [Pulse/ltr]	Maximum Pulse Frequency [Pulse/min]
TG 01	not applicable				
TG 05	50	0.5	0.01	100	100
TG 1	50	1.0	0.02	50	100
TG 3	50	3.0	0.6	17	100
TG 5	50	5.0	0.1	10	100
TG 10	50	10	0.2	5	100
TG 20	50	20	0.4	3	117
TG 25	50	25	0.5	2	233
TG 50	50	50	1.0	1	300
BG 4	50	10	0.2	5	500
BG 6	50	20	0.3	3	417
BG 10	50	50	1	1	267
BG 16	50	100	2	1	208
BG 40	50	100	2	1	542
BG 100	50	100	2	1	1,333

* TG types: Revolution of measuring drum
(= revolution of large needle of dial plate)
BG types: Revolution of large needle of dial plate

Pin configuration of the Output Socket:
(View to the (female) socket)



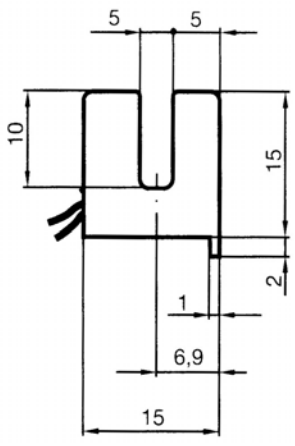
Temperature range:

- -25°C to +70°C
- At higher temperatures the Pulse Generator can be cooled by flushing the counter mechanism casing with room air. Necessary equipment: Optional connection nozzle at counter mechanism casing.

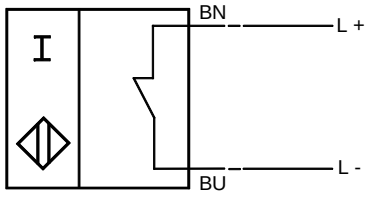
Dimensions of slit disc:

	TG01	TG05 to TG50 BG
Diameter:	n / a	144
Slit width:		5.8
Flag width:		3.4

Dimensions of Sensor:



Standard symbol, connection:



Technical Data:

Slot width	5	mm
Entry depth	5 … 7	mm
Nominal voltage	8	V
Current consumption:		
Sensing face covered	≤ 1	mA
Sensing face free	≥ 3	mA
Switching frequency	0 … 2000	Hz
Hysteresys	0.05 … 0.65	mm
EMC to	EN 60947-5-2	
In compliance with	DIN EN 60947-5-6 (NAMUR)	
Protection to IEC 60529	IP67	
Operating temperature	-25 … +100	°C
Connection	0.5 m, leads LIY	
Conductor cross section	0,14 mm^2	
Casing material	PBT	
Ex category	1G, 2G	

Connection of the Pulse Generator to the "Electronic Display Unit" EDU 32 FP (optional accessory)**:**

The EDU is not suitable for use in ex-proof areas and must therefore be positioned outside of the ex-proof area.

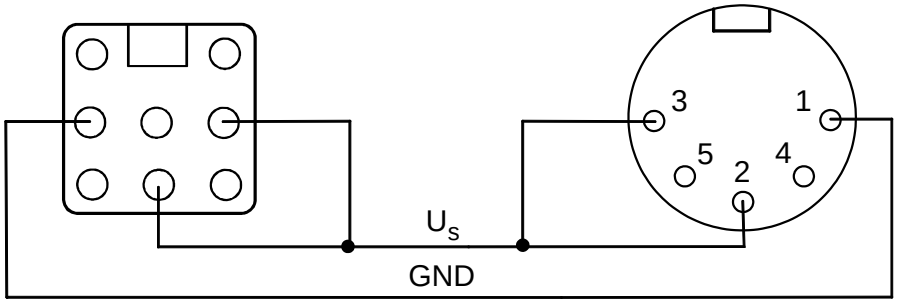
In this case the pulse generator must be connected to the EDU via an external switch amplifier for galvanic decoupling of the power supply (by the EDU).

For programming of the EDU for this application please refer to the instructions in "Set-up of the EDU" below.

In case the gas meter is not positioned in an ex-proof area and/or shall be connected to the EDU for testing purposes only, the Pulse Generator can be connected to the EDU by means of the 3-pin connection cord, which is supplied in conjunction with the EDU.

The Electronic Display Unit contains the power supply for the inductive sensor as well as the evaluation circuit/logic which enables the direct readout of the measured volume [ltr] and flow rate [ltr/h].

Wiring of the Pulse Generator to the EDU socket
(view to **plug-side** of the sockets):



Pulse Generator Output Socket EDU Input Socket

The measurement results displayed by the Electronic Display Unit can be transmitted to a computer via the standard-type interface RS 232 (refer to chapter 4 “Electronic Display Unit” as well). Additionally, the value of the flow rate can be transmitted to an analog measurement device via the standard-type analog output (0-1 Volt or 4-20 mA).

Set-up of EDU:

1. Gas meter is positioned inside of ex-proof area and connected to the EDU via an external switch amplifier for galvanic decoupling of the power supply (by the EDU):
   - Programming of sensor type: Select sensor type “PG **V3.X**” (please refer to the EDU Operation Instructions par. 6.2.4 as well)
   - Programming of slit disc / encoding disc: Select “50 Pulses/Rev” (please refer to the EDU Operation Instructions par. 6.2.5 as well)
2. Gas meter is positioned outside of ex-proof area and connected to the EDU via the 3-pin connection cord, which is supplied in conjunction with the EDU:
   - Programming of sensor type: Select sensor type “PG **V2.0Ex**” (please refer to the EDU Operation Instructions par. 6.2.4 as well)
   - Programming of slit disc / encoding disc: Select “50 Pulses/Rev” (please refer to the EDU Operation Instructions par. 6.2.5 as well)

Quick reference:

- 2 x 200 pulses per revolution of measuring drum
- For use with TG05 to TG50, **not** for BG types (because of pawl with BG types)
- Bi-directional[1]
- Not applicable for ex-proof areas

Application: The Pulse Generator for **RITTER** gas meters is a rotary encoder for pulse output. It can be used to transfer the measured gas volume for remote display and/or data processing (calculation of flow rate, data transfer via RS232) to the accessory EDU 32 or to an external measuring system / PC. In the latter case, the external system must provide the power supply for the photo sensor as well as the evaluation circuit/logic which enables the direct readout of the measured volume and flow rate. For connection to an external system, please refer to the electrical data on page 03.28 and the wiring diagram on page 03.28.

The version V4.01 is a twin channel encoder with bi-directional recognition of the rotation of the measuring drum. **(Please note the footnote!)** This feature provides the possibility to recognize a backward rotation of the measuring drum caused by a change of the gas pressure from over- to under-pressure or by vibration of the drum (e.g. due to a pulsating gas flow with negative pressure peaks). (A mono-channel encoder would wrongly cumulate the pulses (= volume) in these conditions.)

Please note however: The ability to measure a backward rotation does not mean that the gas meter can measure a continuing reversed gas flow correctly. The measuring drum is measuring correctly only at standard gas flow direction from the gas inlet towards the gas outlet. This gas flow direction can either be generated by a positive (over)pressure at the gas inlet or by a negative (under)pressure at the gas outlet. The feature of bi-directional recognition of the rotation of the measuring drum is only for compensation of limited backward rotations or vibrations.

Components: The Pulse Generator is located within the housing of the counter mechanism of the Gas Meter (behind the dial plate) and it consists of the following components:

- Optical encoding film disc
- Sensor unit with integrated twin infra-red photo sensors and LED operating indicators
- Round, 5-pin output socket (180°, DIN 41524)

Description: The measuring drum of drum-type meters and the measuring unit of bellow-type meters are coupled 1:1 to the slit disc via a magnetic coupling. The optical encoding bars of the film disc rotate through the U-shaped photo sensor, thereby interrupting the light beam of the photo diode intermittently. Thus, the photo interrupter converts the revolution of the measuring drum into a sequence of pulses. The number of pulses represents the **volume of gas** which has passed through the Gas Meter, depending on the respective resolution (see table on page 03.27). The frequency of the sequence of pulses is a measure of the rotational speed of the measuring drum and thereby a measure of the **flow rate** of the gas.

[1] Die Erkennung der Drehrichtung erfolgt durch die Auswertung der Signale der zwei Kanäle. Die hierzu erforderliche Logik ist in der Digitalen Anzeigeeinheit EDU 32 enthalten, d.h., die EDU32 zeigt das resultierende Volumen an (= Volumen Vorwärtslauf minus Volumen Rückwärtslauf). Bei Anschluss an ein externes Erfassungssystem muss die Auswertung der beiden Kanäle durch das Erfassungssystem erfolgen.

For operation of the photo sensor, an external electric power supply in the range of 5-28 Volts DC is required. More electrical data are stated on the data sheet 03.28. The output signal is a rectangular pulse, whereby the pulse level (= min./max. voltage of the signal) depends on the power supply voltage and current load (please refer to the table on data sheet 03.28).

For power supply values between 5 and 28 Volts, the output signal level can be linearly interpolated for the first approximation.

Output Socket: The pin configuration of the 5-pin output socket is shown on data sheet 03.28. These pin numbers are equivalent to the numbers shown in the diagram of the photo sensor on data sheet 03.28.

Use with Drum-type Gas Meters:

Drum-type gas meters are volumetric gas meters. That means, that they are measuring gas volume precisely. When the Pulse Generator is used with drum-type gas meters for recording the gas flow, it is possible for the respective Voltage Output curve (line) to be slightly wavy, even when gas flow is constant. This is (unpreventably) caused by the type of construction of the measuring drum: the drum consists of four separate chambers, which are closed and opened in sequence. The previous chamber **has to be** closed **before** the next chamber will open.

This compulsory measurement is the reason for the high measuring accuracy. However, each closing also causes a little build-up of pressure at the inside of a chamber. The surface tension creates an additional pressure increase during emerging of a chamber (water highest surface tension, oil: lower, CalRix lowest). The resulting pressure increase causes a small reduction in the rotational speed of the measuring drum. This is barely visible to the eye but is documented precisely by a computer/transcriber. Thus, the slightly wavy output line at constant input flow documents the **true** flow through the gas meter.

Performance Data:

Gas Meter [Type]	Pulses per Revolution* [P/R]	Gas Flow per Revolution* [ltr/R]	Resolution [ltr/Pulse]	Pulses per Liter [Pulse/ltr]	Maximum Pulse Frequency [Pulse/min]
TG 01	not applicable				
TG 05	200	0.5	0.0025	400	400
TG 1	200	1.0	0.005	200	400
TG 3	200	3.0	0.015	66.7	400
TG 5	200	5.0	0.025	40	400
TG 10	200	10	0.05	20	400
TG 20	200	20	0.1	10	467
TG 25	200	25	0.125	8	933
TG 50	200	50	0.25	4	1,200
BG 4	200	10	0.05	20	2,000
BG 6	200	20	0.1	10	1,667
BG 10	200	50	0.25	4	1,067
BG 16	200	100	0.5	2	833
BG 40	200	100	0.5	2	2,167
BG 100	200	100	0.5	2	2,167

* TG types: Revolution of measuring drum
(= revolution of large needle of dial plate)
BG types: Revolution of large needle of dial plate

Temperature range:

- 0 to +55°C
- At higher temperatures the Pulse Generator can be cooled by flushing the counter mechanism casing with room air. Necessary equipment: Optional connection nozzle at counter mechanism casing.

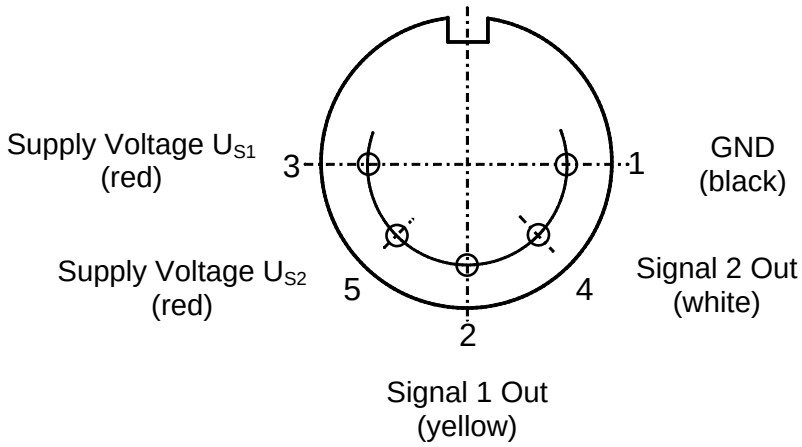
Dimensions of encoding disc:

	TG05 to TG50 BG
Diameter:	144
Slit width:	1.0
Bar width:	1.2

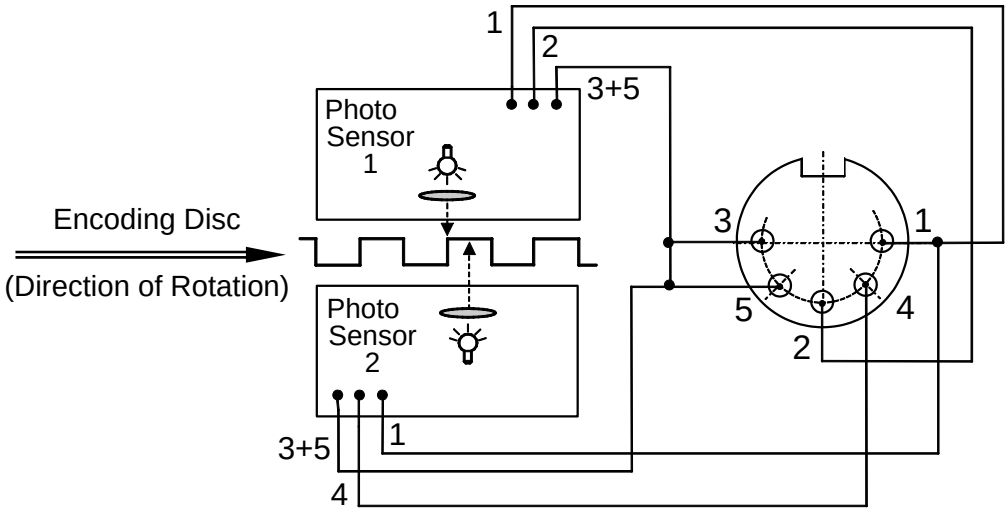
Electrical Data:

Supply Voltage U_S		5 – 28	V DC
Supply Current Us = 5 V:		< 2	mA
Us = 28 V:		< 4	mA
Voltage Output Us = 5 V, no load:	high level	4.95	V
Us = 5 V, load I_{Source} 4.7 mA:	high level	3.56	V
Us = 5 V, no load:	low level	0.01	V
Us = 5 V, load I_{Sink} 7 mA:	low level	1.05	V
Voltage Output Us = 28 V, no load:	high level	26.8	V
Us = 28 V, load I_{Source} 7 mA:	high level	26.5	V
Us = 28 V, no load:	low level	0.01	V
Us = 28 V, load I_{Sink} 7 mA:	low level	1.2	V
Current Output Us = 5 V:	source	4.7	mA
Us = 28 V:	source	7	mA
Us = 5-28 V:	sink	7	mA
Operating frequency photo diode		0 – 500	Hz

Pin configuration of the Output Socket:
(View to **plug-side** of the socket)



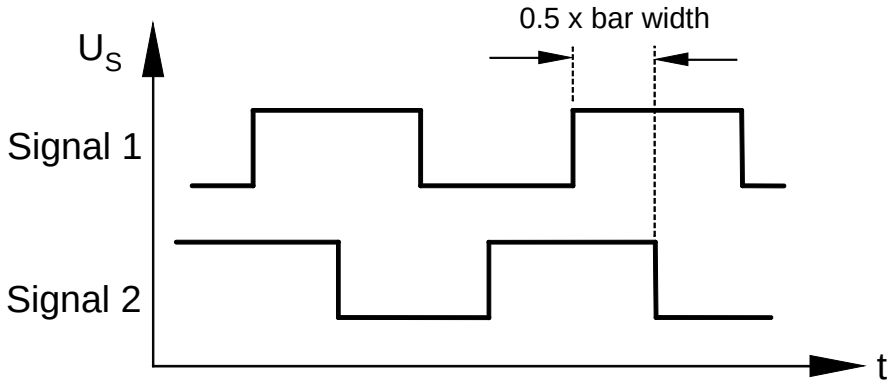
Internal wiring:



	Pin No.	Function	Lead Colour
Photo Sensor 1	3+5	Supply Voltage U_{S1} + U_{S2}	red
	2	Signal 1 Out	yellow
	1	Ground	black
Photo Sensor 2	3+5	Supply Voltage U_{S1} + U_{S2}	red
	4	Signal 2 Out	white
	1	Ground	black

Attention: The mini plugs of the cables which connect the leads from the sensor to the output socket **must not** be exchanged. (The yellow lead of signal 1 must be on the sensor side showing to the meter drum, the white lead of signal 2 must show to dial face.) Furthermore, the plugs **must** be put onto the pins of the sensor in the shown position. Especially the red leads must be connected to the pin close to the corner of the sensor casing. **Otherwise the sensor will be destroyed!**

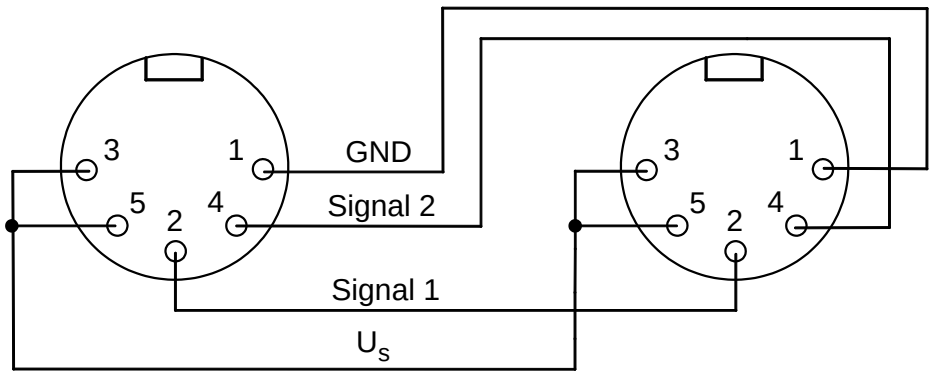
Signal Output:



Connection of the Pulse Generator
to the "Electronic Display Unit" EDU 32 FP (optional accessory)**:**

The Pulse Generator can be connected to the optional accessory "Electronic Display Unit" (V 5.0 or higher) by means of the 5-pin connection cord, which is supplied in conjunction with the Electronic Display Unit. The **maximum possible length** of the connection cable is **10 m** (unshielded cable) or **100 m** (shielded cable). The Electronic Display Unit contains the power supply for the photo sensor as well as the evaluation circuit/logic which enables the direct readout of the measured volume [ltr] and flow rate [ltr/h].

Wiring of the Pulse Generator to the EDU socket
(view to **plug-side** of the sockets):



Pulse Generator Output Socket EDU Input Socket

The measurement results displayed by the Electronic Display Unit can be transmitted to a computer via the standard-type interface RS 232 (refer to chapter 4 "Electronic Display Unit", par. 7.3, as well). Additionally, the value of the flow rate can be transmitted to an analog measurement device via the standard-type analog output (0-1 Volt or 4-20 mA).

Set-up of EDU:

- Programming of sensor type: Select sensor type “PG V4.0”
  (please refer to the EDU Operation Instructions par. 6.2.4 as well)
- Programming of slit disc / encoding disc: Select “2 x 200 Pulses/Rev”
  (please refer to the EDU Operation Instructions par. 6.2.5 as well)

Quick reference:

- 500 pulses per revolution of measuring drum
- For use with TG05 to TG50, BG4 to BG100
- Uni-directional
- Not applicable for ex-proof areas

Application: The Pulse Generator for **RITTER** gas meters is a rotary encoder for pulse output. It can be used to transfer the measured gas volume for remote display and/or data processing (calculation of flow rate, data transfer via RS232) to the accessory EDU 32 or to an external measuring system / PC. In the latter case, the external system must provide the power supply for the photo sensor as well as the evaluation circuit/logic which enables the direct readout of the measured volume and flow rate. For connection to an external system, please refer to the electrical data on page 03.34 and the wiring diagram on page 03.34.

Components: The Pulse Generator is located within the housing of the counter mechanism of the Gas Meter (behind the dial plate) and it consists of the following components:
- Optical encoding film disc
- Sensor unit with integrated infra-red photo sensor and LED operating indicator
- Round, 5-pin output socket (180°, DIN 41524)

Description: The measuring drum of drum-type meters and the measuring unit of bellow-type meters are coupled 1:1 to the slit disc via a magnetic coupling. The optical encoding bars of the film disc rotate through the U-shaped photo sensor, thereby interrupting the light beam of the photo diode intermittently. Thus, the photo interrupter converts the revolution of the measuring drum into a sequence of pulses. The number of pulses represents the **volume of gas** which has passed through the Gas Meter, depending on the respective resolution (see table on page 03.33). The frequency of the sequence of pulses is a measure of the rotational speed of the measuring drum and thereby a measure of the **flow rate** of the gas.

For operation of the photo sensor, an external electric power supply in the range of 5-28 Volts DC is required. More electrical data are stated on the data sheet 03.34. The output signal is a rectangular pulse, whereby the pulse level (= min./max. voltage of the signal) depends on the power supply voltage and current load (please refer to the table on data sheet 03.34).

For power supply values between 5 and 28 Volts, the output signal level can be linearly interpolated for the first approximation.

Output Socket: The pin configuration of the 5-pin output socket is shown on data sheet 03.34.

Use with Drum-type Gas Meters:

Drum-type gas meters are volumetric gas meters. That means, that they are measuring gas volume precisely. When the Pulse Generator is used with drum-type gas meters for recording the gas flow, it is possible for the respective Voltage Output curve (line) to be slightly wavy, even when gas flow is constant. This is (unpreventably) caused by the type of construction of the measuring drum: the drum consists of four separate chambers, which are closed and opened in sequence. The previous chamber **has to be** closed **before** the next chamber will open.

This compulsory measurement is the reason for the high measuring accuracy. However, each closing also causes a little build-up of pressure at the inside of a chamber. The surface tension creates an additional pressure increase during emerging of a chamber (water highest surface tension, oil: lower, CalRix lowest). The resulting pressure increase causes a small reduction in the rotational speed of the measuring drum. This is barely visible to the eye but is documented precisely by a computer/transcriber. Thus, the slightly wavy output line at constant input flow documents the **true** flow through the gas meter.

Performance Data:

Gas Meter	Pulses per Revolution*	Gas Flow per Revolution*	Resolution	Pulses per Liter	Maximum Pulse Frequency
[Type]	[P/R]	[ltr/R]	[ltr/Pulse]	[Pulse/ltr]	[Pulse/min]
TG 01	not applicable				
TG 05	500	0.5	0.001	1,000.0	1,000
TG 1	500	1.0	0.002	500.0	1,000
TG 3	500	3.0	0.006	166.7	1,000
TG 5	500	5.0	0.010	100.0	1,000
TG 10	500	10	0.020	50.0	1,000
TG 20	500	20	0.040	25.0	1,167
TG 25	500	25	0.050	20.0	2,333
TG 50	500	50	0.100	10.0	3,000
BG 4	500	10	0.020	50.0	5,000
BG 6	500	20	0.040	25.0	4,167
BG 10	500	50	0.100	10.0	2,667
BG 16	500	100	0.200	5.0	2,083
BG 40	500	100	0.200	5.0	5,417
BG 100	500	100	0.200	5.0	13,333

* TG types: Revolution of measuring drum
(= revolution of large Needle of dial plate)
BG types: Revolution of large Needle of dial plate

Temperature range:

- 0 to +55°C
- At higher temperatures the Pulse Generator can be cooled by flushing the counter mechanism casing with room air. Necessary equipment: Optional connection nozzle at counter mechanism casing.

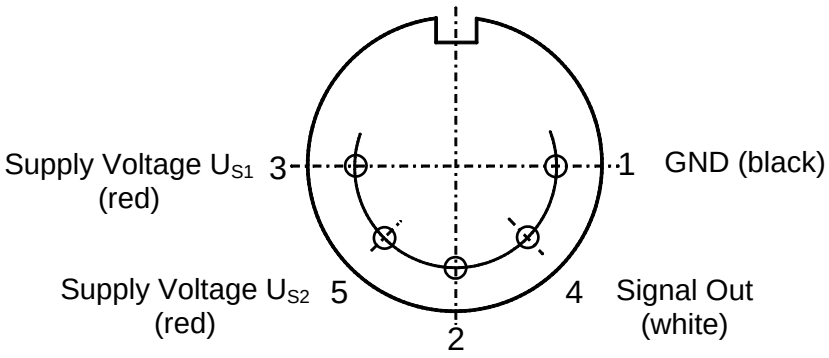
Dimensions of encoding disc:

	TG05 to TG50 BG
Diameter:	144
Slit width:	1.0
Bar width:	1.2

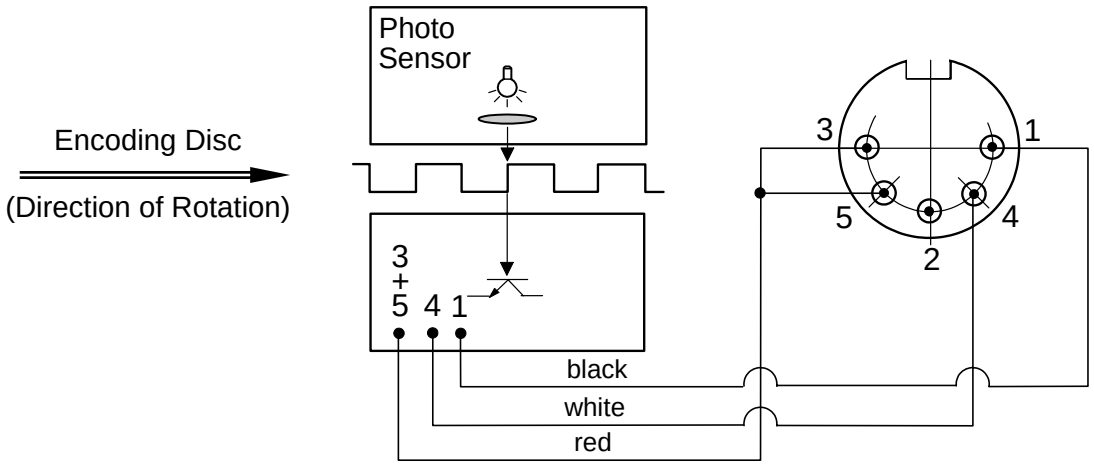
Electrical Data:

Supply Voltage U_S		5 – 28	V DC
Supply Current Us = 5 V:		< 2	mA
Us = 28 V:		< 4	mA
Voltage Output Us = 5 V, no load:	high level	4.95	V
Us = 5 V, load I_{Source} 4.7 mA:	high level	3.56	V
Us = 5 V, no load:	low level	0.01	V
Us = 5 V, load I_{Sink}7 mA:	low level	1.05	V
Voltage Output Us = 28 V, no load:	high level	26.8	V
Us = 28 V, load I_{Source} 7 mA:	high level	26.5	V
Us = 28 V, no load:	low level	0.01	V
Us = 28 V, load I_{Sink} 7 mA:	low level	1.2	V
Current Output Us = 5 V:	source	4.7	mA
Us = 28 V:	source	7	mA
Us = 5-28 V:	sink	7	mA
Operating frequency photo diode		0 – 500	Hz

Pin configuration of the Output Socket:
(View to **plug-side** of the socket)



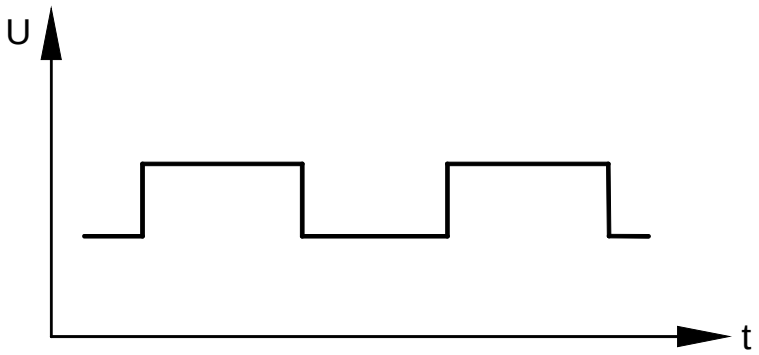
Internal wiring:



	Pin No.	Function	Lead Colour
Photo Sensor	3+5	Supply Voltage U_{S1} + U_{S2}	red
	4	Signal Out	white
	1	Ground	black

Attention: The mini plug of the cable which connect the sensor and the output socket **must** be mounted to the sensor in the shown position. Especially the red leads must be connected to the pin close to the corner of the sensor casing. **Otherwise the sensor will be destroyed!**

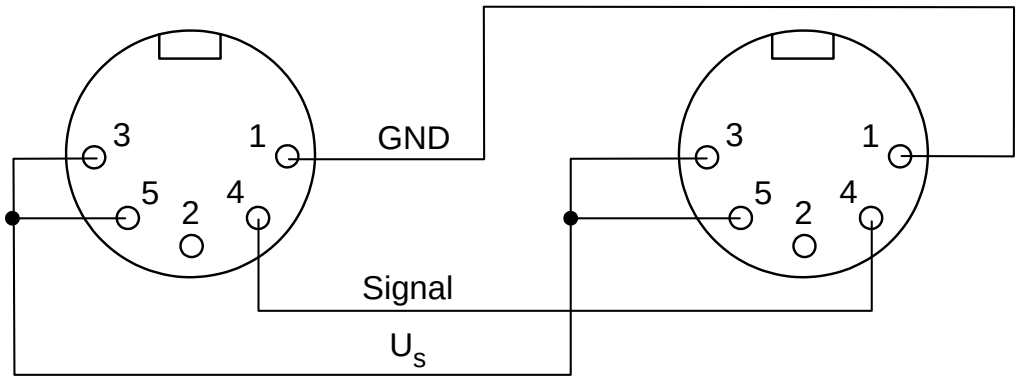
Signal Output:



Connection of "Electronic Display Unit" EDU 32 FP (optional accessory**) to the Pulse Generator:**

The Pulse Generator can be connected to the optional accessory "Electronic Display Unit" (V 5.0 or higher) by means of the 5-pin connection cord, which is supplied in conjunction with the Electronic Display Unit. The **maximum possible length** of the connection cable is **10 m** (unshielded cable) or **100 m** (shielded cable). The Electronic Display Unit contains the power supply for the photo sensor as well as the evaluation circuit/logic which enables the direct readout of the measured volume [ltr] and flow rate [ltr/h].

Wiring of the Pulse Generator to the EDU socket
(view to **plug-side** of the sockets):



The measurement results displayed by the Electronic Display Unit can be transmitted to a computer via the standard-type interface RS 232 (refer to chapter 4 "Electronic Display Unit" as well). Additionally, the value of the flow rate can be transmitted to an analog measurement device via the standard-type analog output (0-1 Volt or 4-20 mA).

Set-up of EDU:

- Programming of sensor type: Select sensor type “PG V4.1”
  (please refer to the EDU Operation Instructions par. 6.2.4 as well)
- Programming of slit disc / encoding disc: Select “500 Pulses/Rev”
  (please refer to the EDU Operation Instructions par. 6.2.5 as well)

Quick reference:

- 50 pulses per revolution of measuring drum
- For use with TG01 version V4.x
- Uni-directional
- Applicable for ex-proof areas with explosion-proof output socket only (option) [5]

Application: The Pulse Generator for **RITTER** gas meters is a rotary encoder for pulse output. It can be used to transfer the recorded data (quantity of measured gas volume [ltr]) to the accessory EDU 32 or to an external measuring instrument (PC, transcriber). In the latter case, the external system must provide the power supply for the photo sensor as well as the evaluation circuit/logic which enables the direct readout of the measured volume and flow rate. For connection to an external system, please refer to the pin connection on page 03.38 and the electrical data on page 03.39.

Please note: The Pulse Generator provides a currency signal, not a voltage signal. In order to read the signal by an external data acquisition system, it is therefore necessary in general to use a terminal amplifier with a power supply of 10-30 VDC.

Use in ex-proof areas[5]: The gas meter must be equipped with a 3-pin explosion-proof output socket instead of the standard DIN 5-pin output socket (please specify when ordering).

For use in **ex-proof areas** an external switch amplifier for galvanic decoupling of the power supply (by the EDU) has to be installed between Pulse Generator (gas meter) and the EDU.

For selection of the gas meter model to be used in ex-proof areas: See footnote.

Equipment: The Pulse Generator is located within the meter casing and it consists of the following components:

- Sensor: Inductive proximity switch

Device category 2G:	For use in hazardous areas with gas, vapour, and mist
Directive conformity:	94/9/EG
Ignition protection:	"Intrinsic safety"
EC Type Examination Certificate:	PTB 00 ATEX 2048 X,
Ex identification:	II 2G Eex ia IIC T6.

- Socket:

Standard equipment:	DIN 5-pin output socket
EX- equipment:	3-pin EX-proof output socket

Description: The inductive sensor converts the revolution of the measuring drum into a sequence of pulses. The number of pulses represents the **volume of gas** which has passed through the Gas Meter, depending on the resolution (see "Performance Data" on page 03.38). The frequency of the sequence of pulses is a measure of the rotational speed of the measuring drum and thereby a measure of the **flow rate** of the gas.

[5] Please note: According to European laws (EC directive 94/9/EC), the gas meter, in which the Pulse Generator is built into, must be certified ("ATEX" Declaration of Conformity) if and when used in ex-proof areas. This Declaration of Conformity is available for all meter models made out of PE-el (model no. 8).

For operation of the inductive sensor, an external electric power supply with 5 Volts DC is required. More electrical data are stated on the data sheet 03.39. The output signal is a rectangular current signal with min. / max. level of 1 mA / 3 mA.

Output Socket: The pin connections of the output sockets is shown on page 03.38.

Use with Drum-type Gas Meters (general):

Drum-type gas meters are volumetric gas meters. That means, that they are measuring gas volume precisely. When the Pulse Generator is used with drum-type gas meters for recording the gas flow, it is possible for the respective Voltage Output curve (line) to be slightly wavy, even when gas flow is constant. This is (unpreventably) caused by the type of construction of the measuring drum: the drum consists of four separate chambers, which are closed and opened in sequence. The previous chamber **has to be** closed **before** the next chamber will open.

This compulsory measurement is the reason for the high measuring accuracy. However, each closing also causes a little build-up of pressure at the inside of a chamber. The surface tension creates an additional pressure increase during emerging of a chamber (water highest surface tension, oil: lower, CalRix lowest). The resulting pressure increase causes a small reduction in the rotational speed of the measuring drum. This is barely visible to the eye but is documented precisely by a computer/transcriber. Thus, the slightly wavy output line at constant input flow documents the **true** flow through the gas meter.

Performance Data:

Pulses per Revolution*	50	Pulse/Rev
Gas Volume per Revolution	0.1	[ltr/Rev]
Resolution	0.002	[ltr/Pulse]
Pulses per Liter	500	[Pulse/ltr]
Maximum Pulse Frequency	250	[Pulse/min]
Output signal	Current signal	

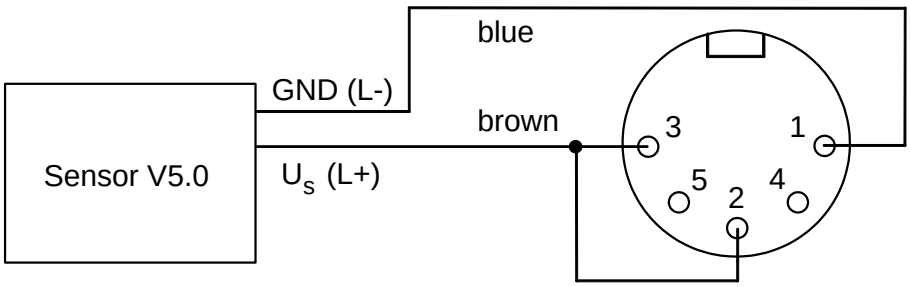
* Revolution of measuring drum

Temperature range:

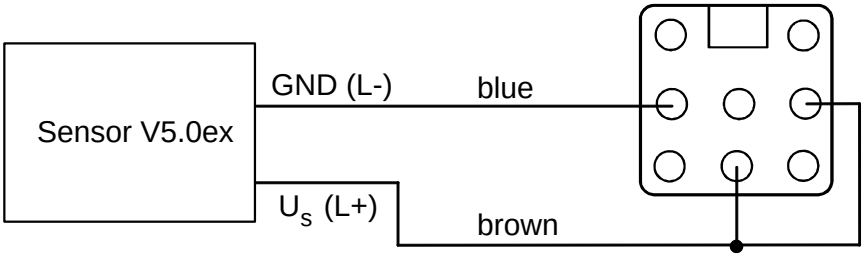
- -25°C to +100°C
- **But:** Mind the minimal/maximal working temperature of gas meter casing and drum

Pin configuration of the Output Socket
(View to **plug-side** of the (female) socket) **:**

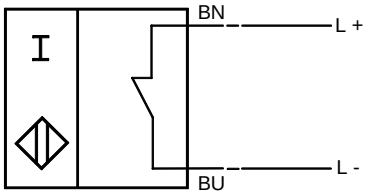
Standard version:



EX-proof version:



Standard symbol, connection:



Technical Data of sensor:

Switching element function	NAMUR NC	
Installation	embaddable	
Nominal voltage U_0	8	V
Current consumption:		
Measuring plate not detected	1	mA
Measuring plate detected	3	mA
Max. switching frequency f	5000	Hz
Self inductance L_i	50	µH
Self capacitance C_i	71	nF
EMC to	EN 60947-5-2	
In compliance with	EN 50227	
Protection to IEC 60529	IP67	

Operating temperature	-25 – +70	°C
Connection	0.2 m, PVC cable	
Conductor cross section	0,14 mm^2	
Housing material	Stainless steel	
Sensing face	PBT	
Device category	2G	

Connection of "Electronic Display Unit" EDU 32 FP (optional accessory) **to the Pulse Generator:**

The Pulse Generator can be connected to the optional accessory "Electronic Display Unit" (V 5.0 or higher) by means of the 3-pin connection cord, which is supplied in conjunction with the Electronic Display Unit. The Electronic Display Unit contains the power supply for the inductive sensor as well as the evaluation circuit/logic which enables the direct readout of the measured volume [ltr] and flow rate [ltr/h].

The measurement results displayed by the Electronic Display Unit can be transmitted to a computer via the standard-type interface RS 232 (refer to chapter 4 "Electronic Display Unit" as well). Additionally, the value of the flow rate can be transmitted to an analog measurement device via the standard-type analog output (0-1 Volt or 4-20 mA).

For use in **ex-proof areas** an external switch amplifier for galvanic decoupling of the power supply (by the EDU) has to be installed between Pulse Generator (gas meter) and the EDU.

Set-up of EDU:

- Programming of sensor type (please refer to the EDU Operation Instructions par. 6.2.4 as well):
  With EDU versions V4.x and lower: Select sensor type “PG V2.0Ex”
  With EDU versions V5.x and higher: Select sensor type “PG V5.0”
- Programming of slit disc / encoding disc: Select “50 Pulses/Rev”