

Tczew, XI 2012 r.

# Smart Metering Development



# Smart Metering Development

a. Continued cooperation with Flonidan A/S in development of *GxS line* meters

b. *UniSmart: Telemetry Module*

c. Automatic Meter Reading

- a. Walk-by and Drive-by systems
- b. Stationary systems

d. Smart Components Development

- a) Shut-Off ball Valve with stepper motor
- b) New Cable Transfer
- c) Modular design of New Metrix EU

e. New Fields for Cooperation

- a) Secure Meters Ltd.
- b) GWi

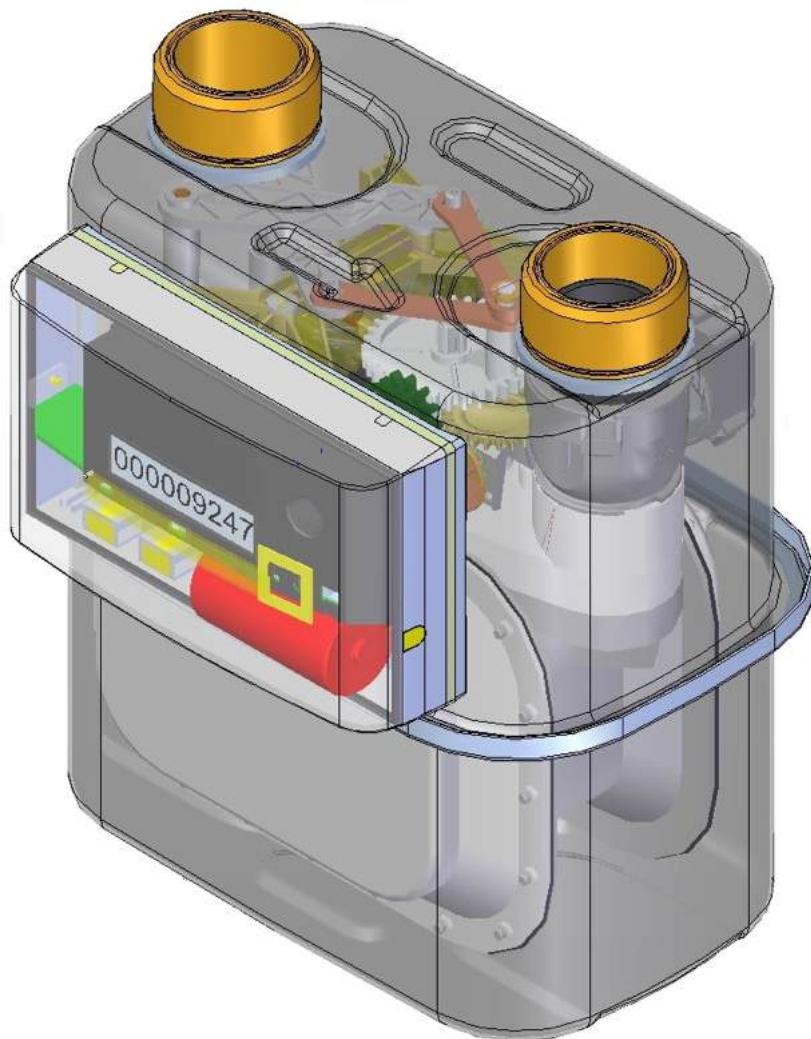
f. Metrix employee are members of:

- a) OMS workgroup
- b) prEN16314 Additional Functionalities WG





# GxS Smart Gas Meters



New Smart Meters GxS series combine all the best features and capabilities of previous models :

- Reliable, resistant to interference, optical pulse readings from measuring unit, using a Gray code wheel
- Much better metrological accuracy due to error curve correction
- Temperature compensation
- Internal shutt-off valve
- Volume and Alarms registrarion
- Remote safe reading using AES-128 encryption
- Wired/Wireless communication EN-13757

**M-Bus**

**M-Bus**  
wireless

**OMS**®

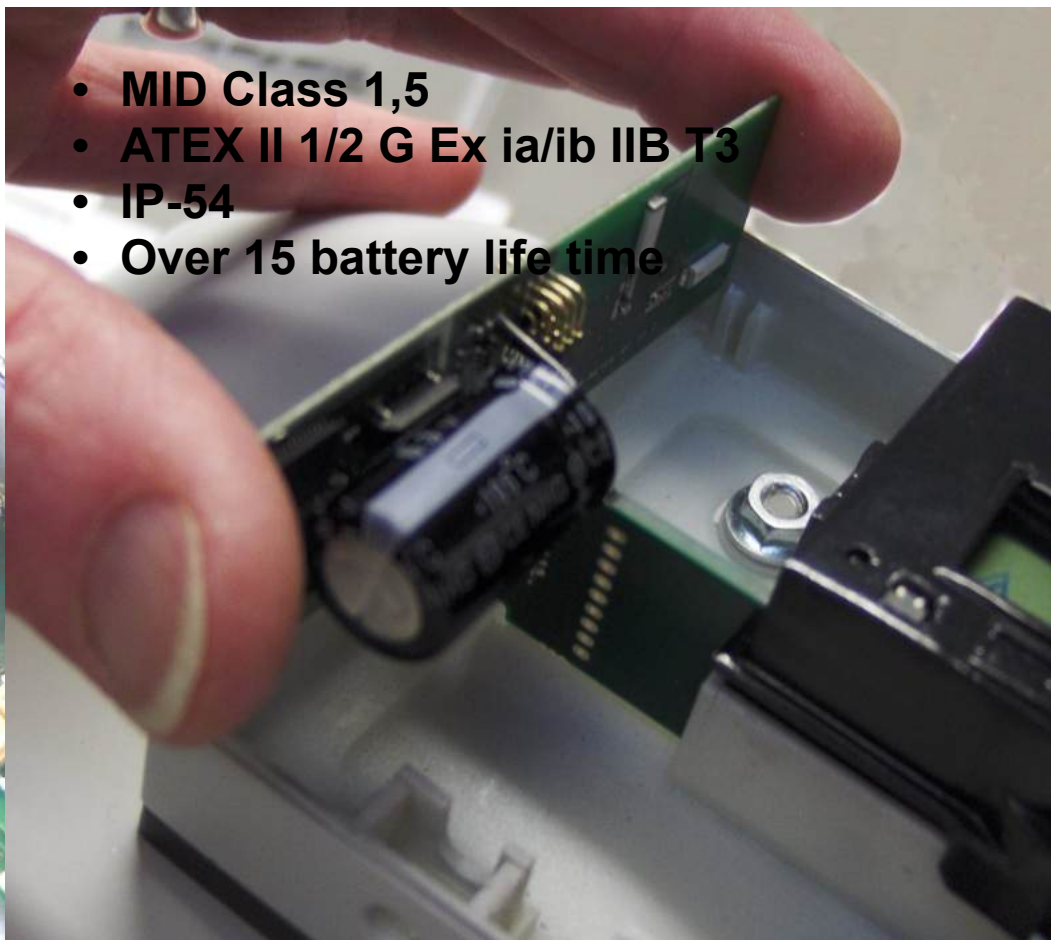
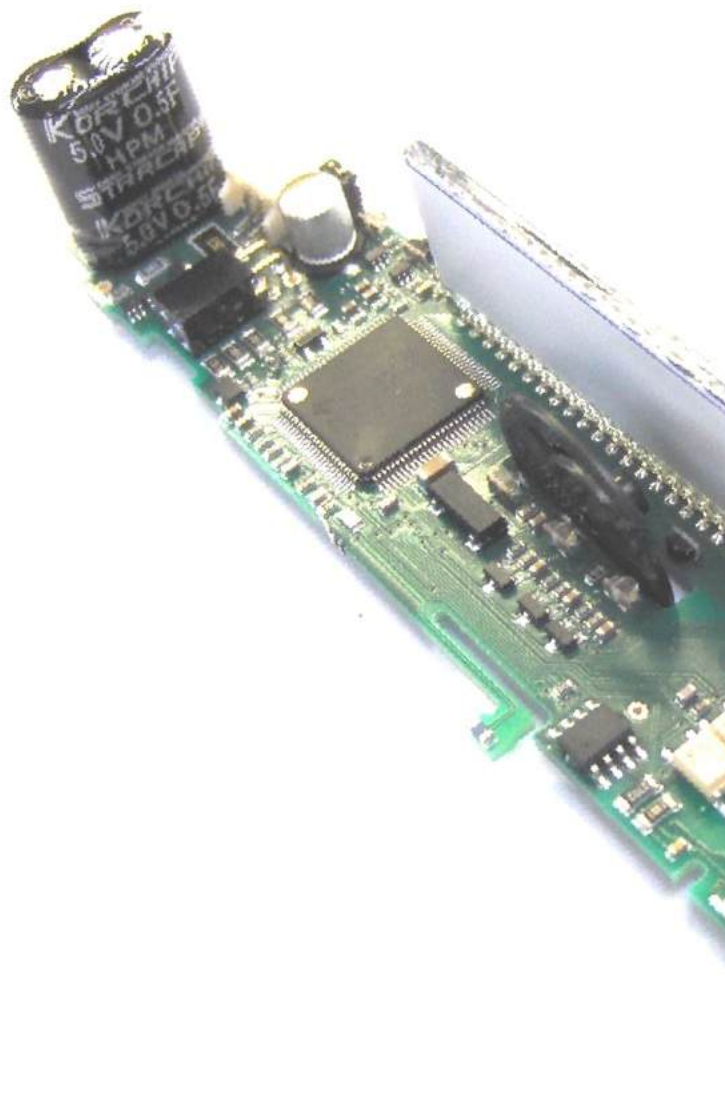
netbeheer  nederland

*NTA8130 + DSMR v.2.2/2.3/3.0*





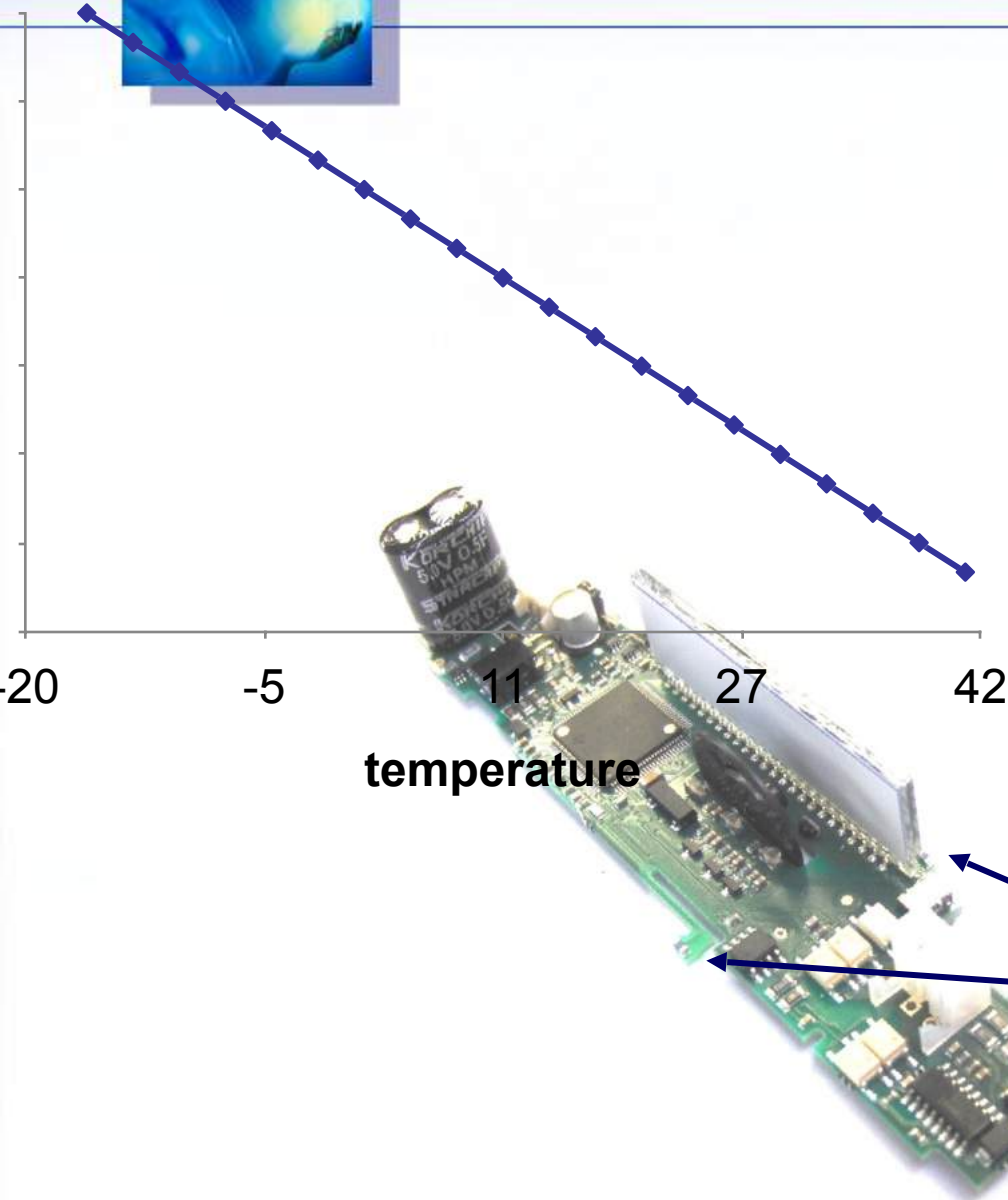
## Compact design



- MID Class 1,5
- ATEX II 1/2 G Ex ia/ib IIB T3
- IP-54
- Over 15 battery life time



# Temperature compensation



**Electronic Unit has the ability to compensate for the effect of temperature on the measurement error.**

**Temperature correction is performed in a volume of 4 points: -25, 0, +30, +55 C. Between these points, linear interpolation is used**

***Temperature sensors***



## EC-Type Examination Certificate

### Measuring Instrument Directive

**Certificate number: DK-0200-MI002-023**

Issued by FORCE Certification A/S, Denmark  
EC-notified body number 0200

In accordance with The Danish Safety Technology Authority's statutory order no. 339 of 29<sup>th</sup> March 2010 on changes to statutory order no. 436 of 16<sup>th</sup> May 2006 which implements the Directive 2004/22/EC of the European Parliament and Council of March 31<sup>st</sup>, 2004 on measuring instruments (MID).

**Issued to:** **APATOR METRIX SA**  
**ul. Piaskowa 3**  
**83-110 Tczew**  
**Poland**

Reference No.: 80.976-176/10

Type of instrument: Diaphragm Gas Meter with temperature conversion

Type designation: Uniflo G4S

Valid until: May 10, 2020

Number of pages: 6, including appendix

Date of issue: April 5, 2011

Approved by

  
Hans Falster  
Director

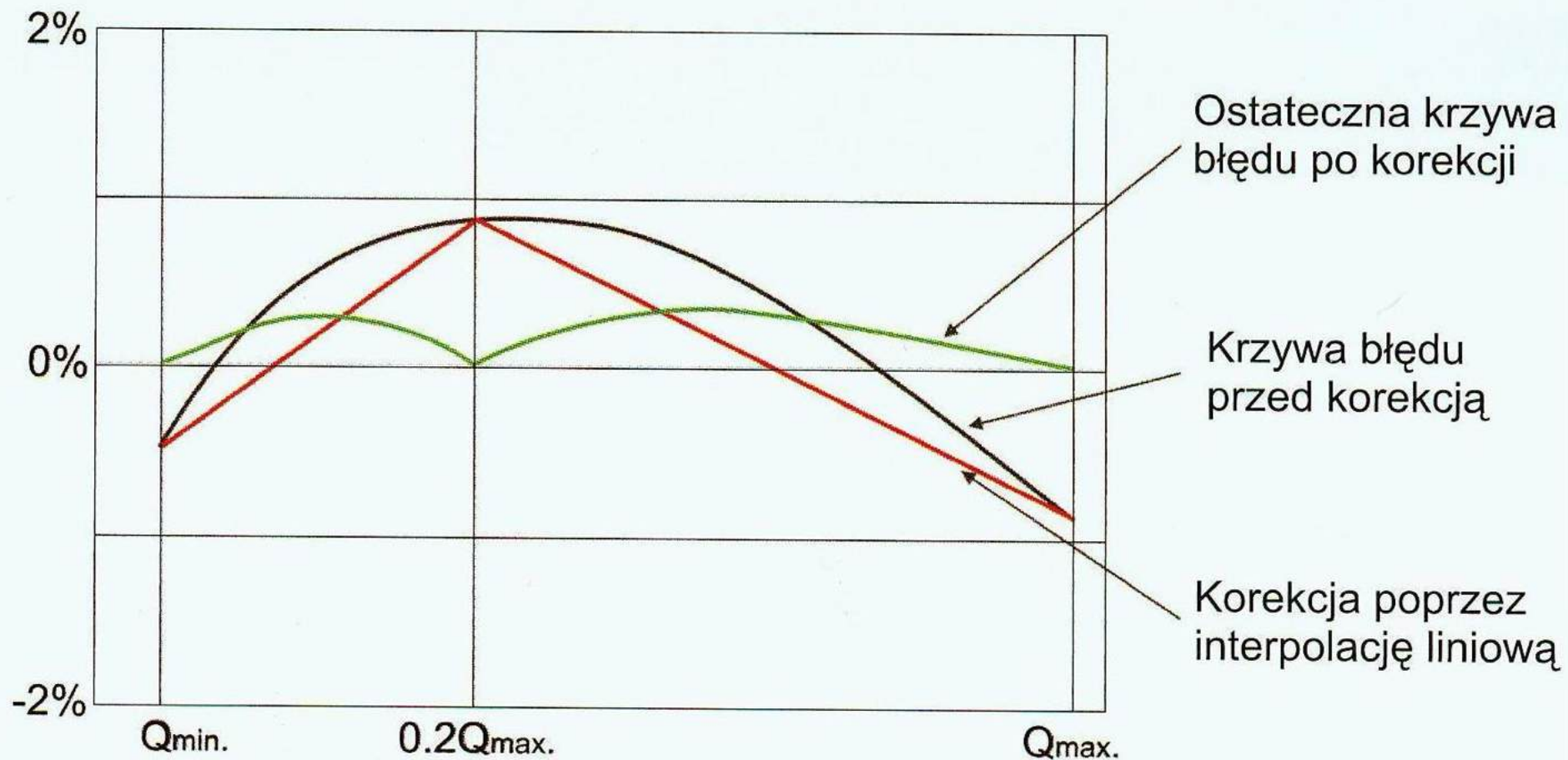
Processed by

  
Kurt Rasmussen  
Certification Manager

The conformity markings may only be affixed to the above type approved equipment. The manufacturer's Declaration of Conformity may only be issued and the notified body identification number may only be affixed on the instrument when the production/product assessment module (D or F) of the Directive is fully complied with and controlled by a written inspection agreement with a notified body.

This EC-type examination certificate may not be reproduced except in full, without written permission by FORCE

## Curve error correction



**Much better measurement accuracy**

• errors below limit  **$\pm 0,3\%$  !!!**





# Evolution instead of Revolution

From magnetic coupling...



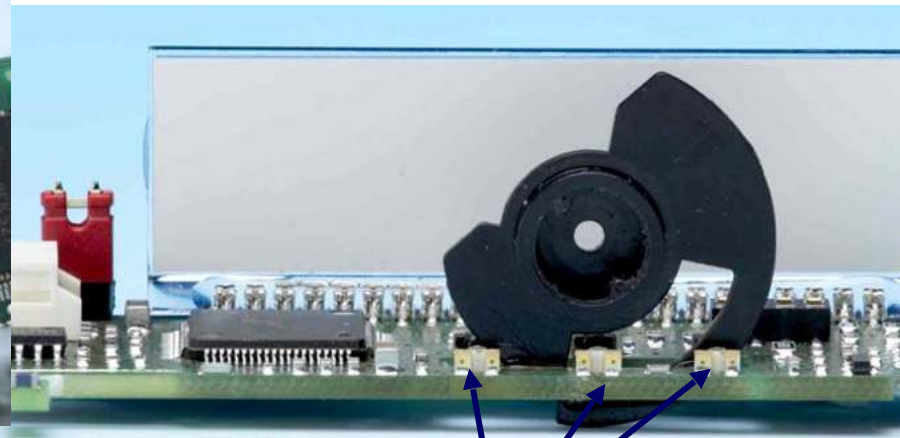
... to optical *Gray code reading*

















## Gray code wheel...

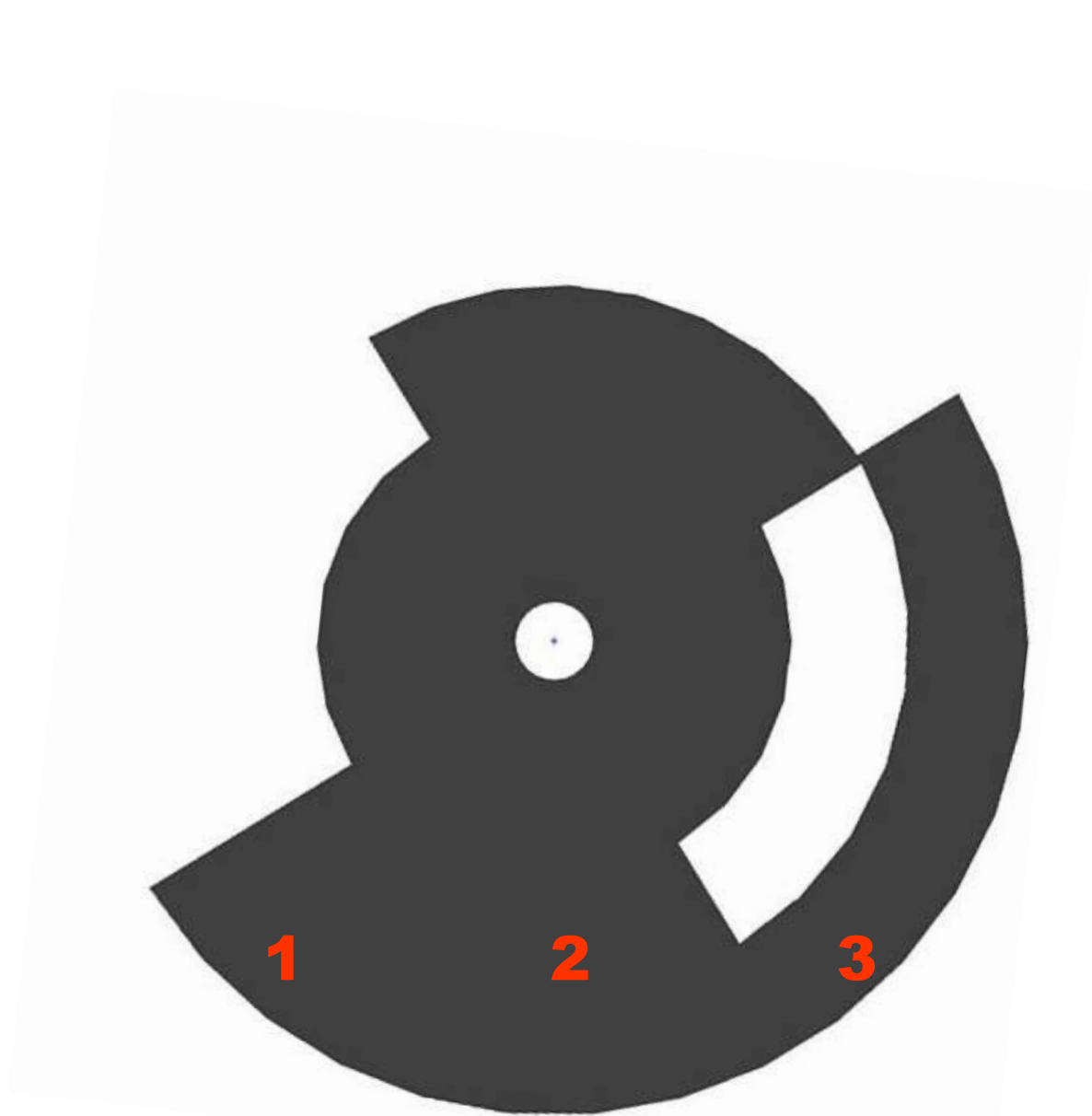
- Reliable pulse reading method use 3 optical sensors, allowing to measure with resolution of  $1/8$  rotation of measuring unit cyclic volume.
- Optical pulse reading is tamper proof against magnetic fields



*phototransistors*

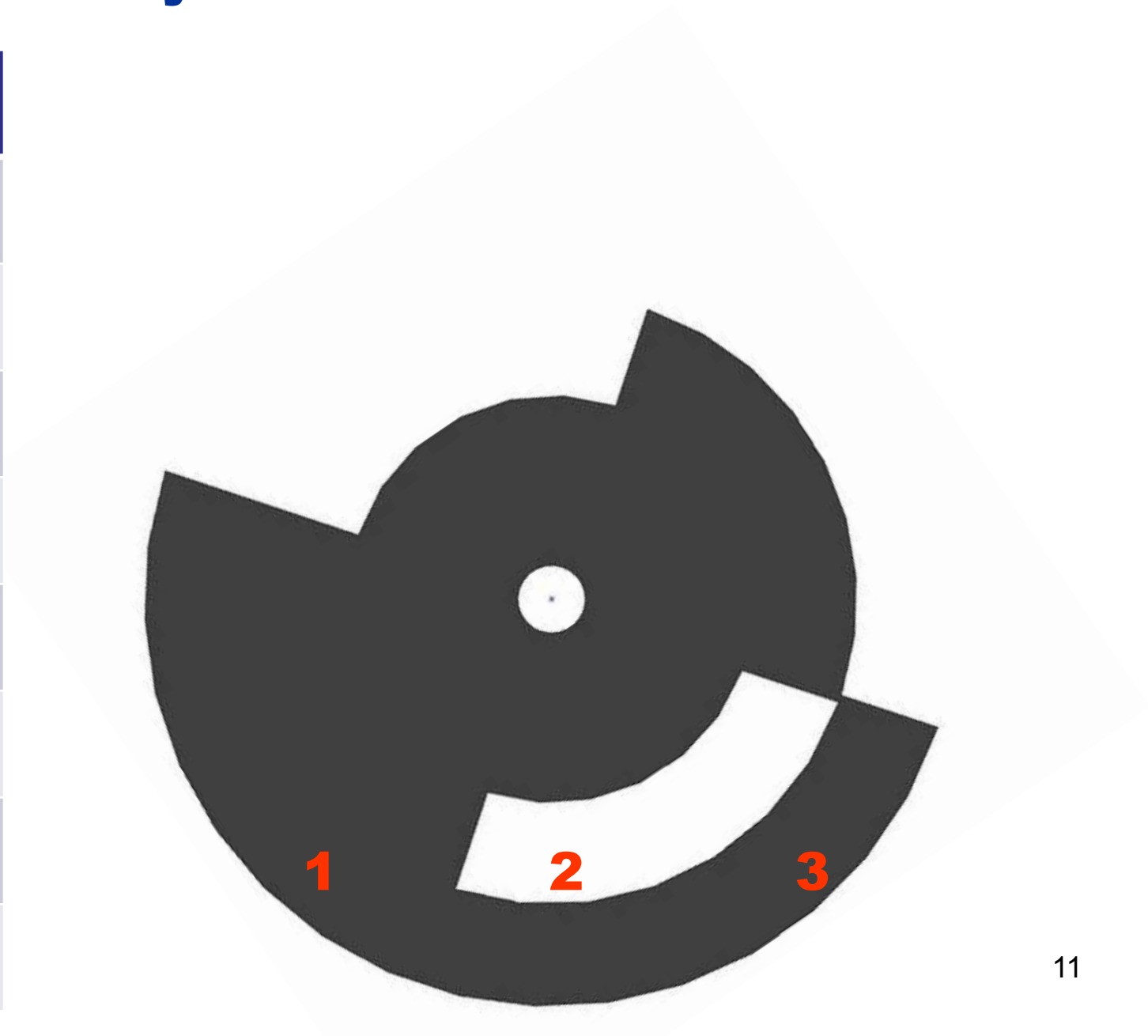
## Gray code wheel ...

1	2	3
		
		
		
		
		
		
		















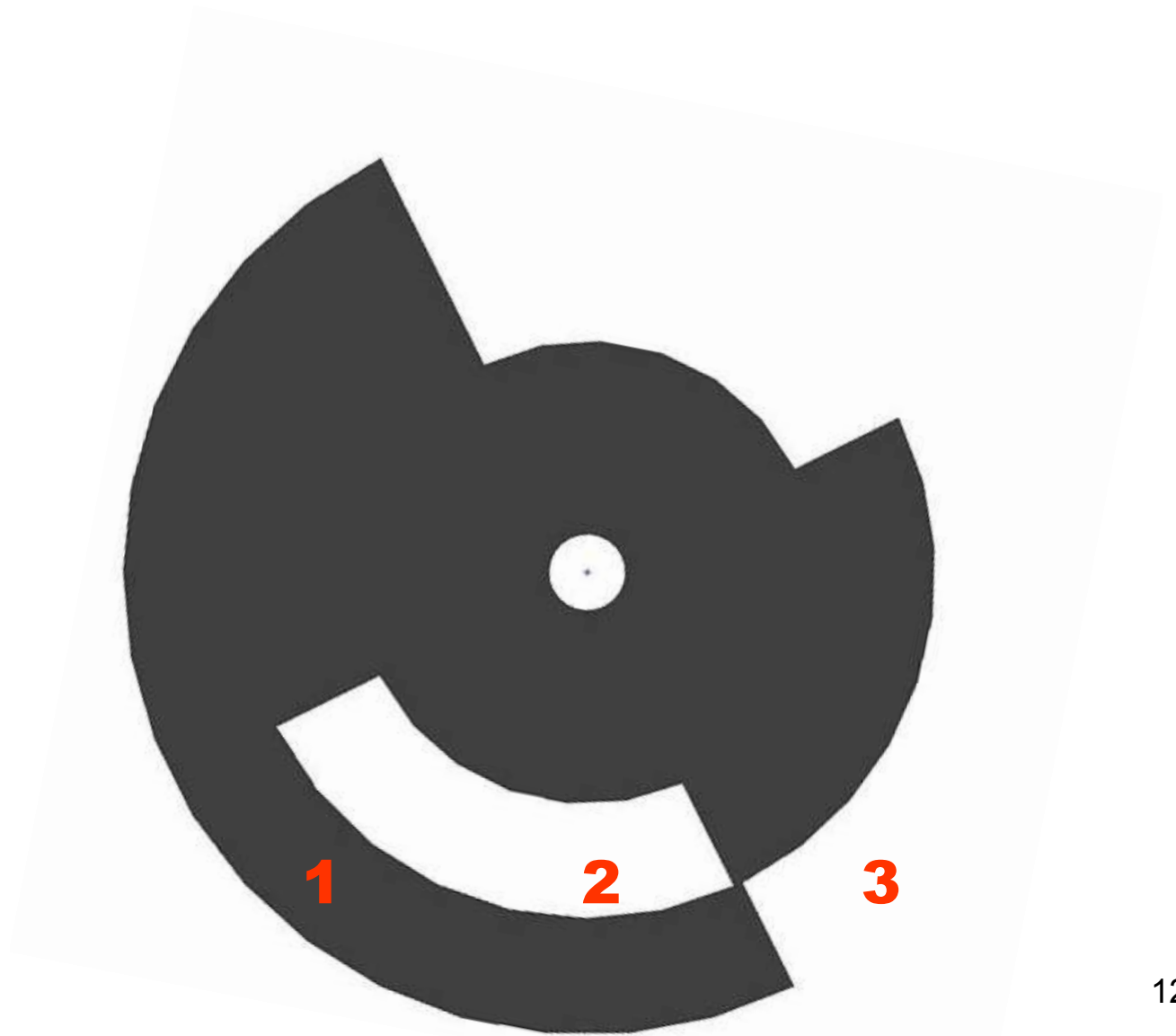
## Gray code wheel ...

1	2	3
●	●	●
●		●
●		
●	●	
	●	
		●
	●	●















## Gray code wheel ...

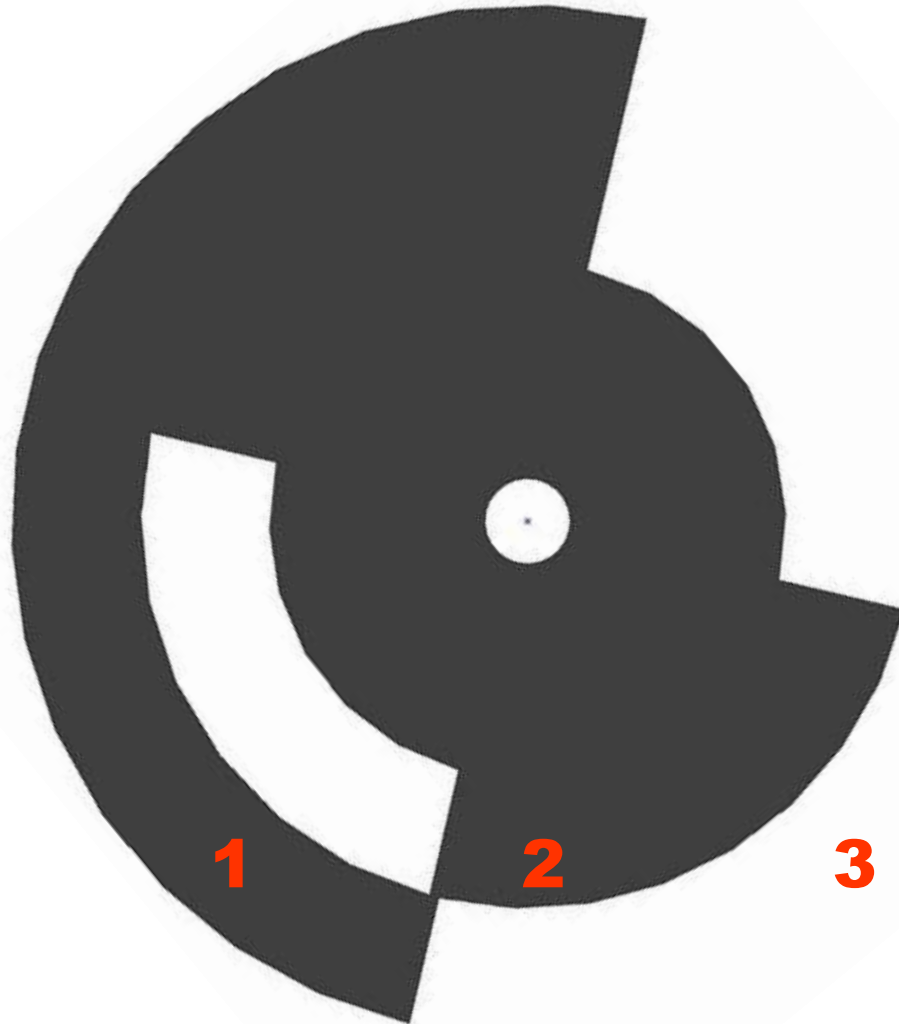
1	2	3
		
		
		
		
		
		
		





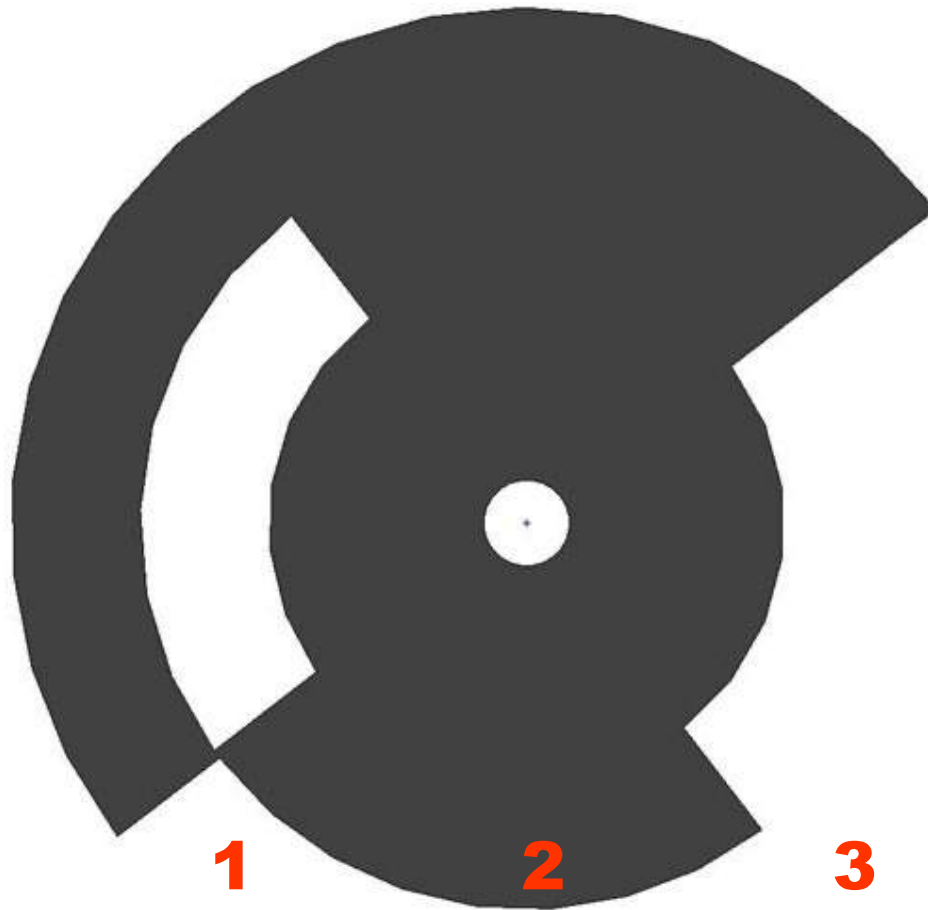
## Gray code wheel ...

1	2	3
		
		
		
		
		
		
		



## Gray code wheel ...

1	2	3
●	●	●
●		●
●		
●	●	
	●	
		●
	●	●



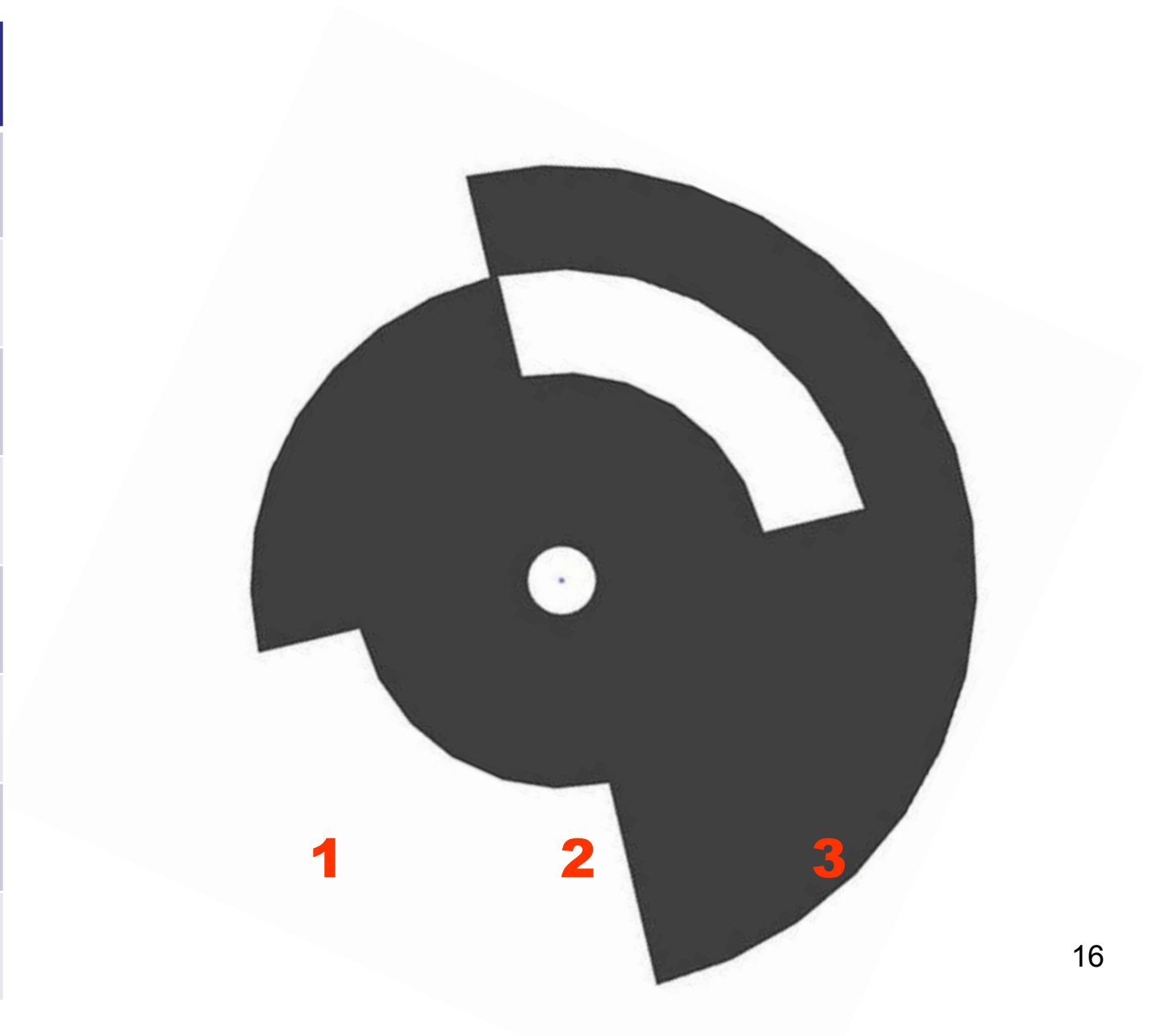
## Gray code wheel ...

1	2	3
●	●	●
●		●
●		
●	●	
	●	
		●
	●	●



## Gray code wheel ...

1	2	3
●	●	●
●		●
●		
●	●	
	●	
		●
	●	●





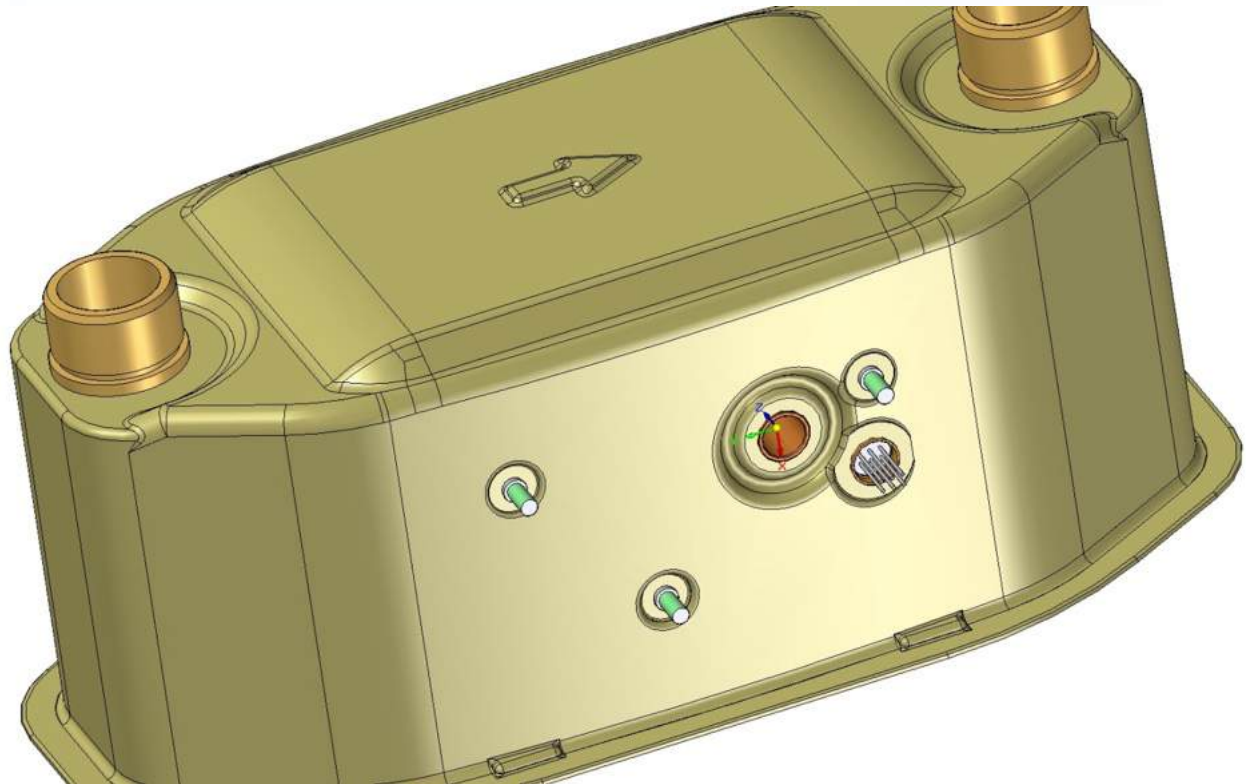
## Gray code wheel ...

1	2	3
●	●	●
●		●
●		
●	●	
	●	
		●
	●	●





## New Cable Transfer



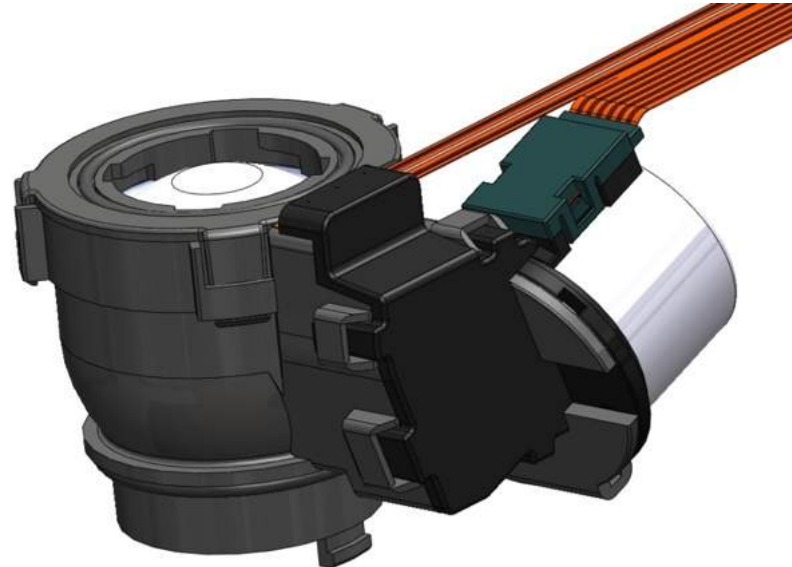
- The seals are capable of remaining hermetic after exposure to 820°C
- The leakage rate of the seal after exposure to 820°C would be better than  $1 \times 10^{-6}$  cc per sec of helium.



## **GSU shutt-off valve**

**Safe, internal, build-in new generation of ball valve:**

- **Safe open function**
- **Low pressure drop in comparison to competitive designs**
- **Two state valve position control (fully closed / fully open), confirmed by reliable microswitch designed to work in gas and oil enviroment**
- **Installation on the gas meter outlet (less contamination)**
- **Higher Intrinsically Safty - using industriy field proven stepper motor manufactured by Johnson Electric Group ®**



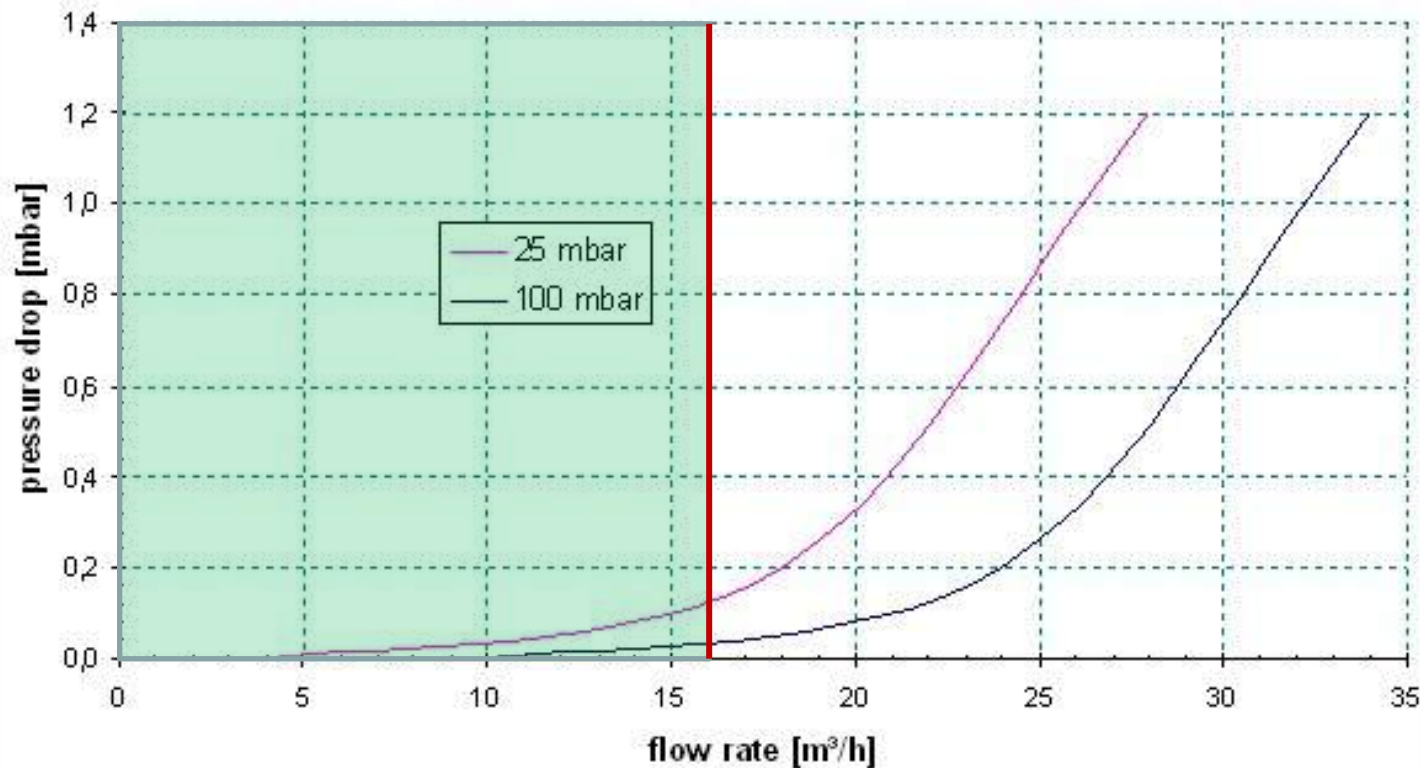


## Pressure drop

up to  $16 \frac{m^3}{h}$  (Qmax@G10)

### GSU-Prototyp

pressure drop depending on flow rate for 25 and 100mbar inlet pressure

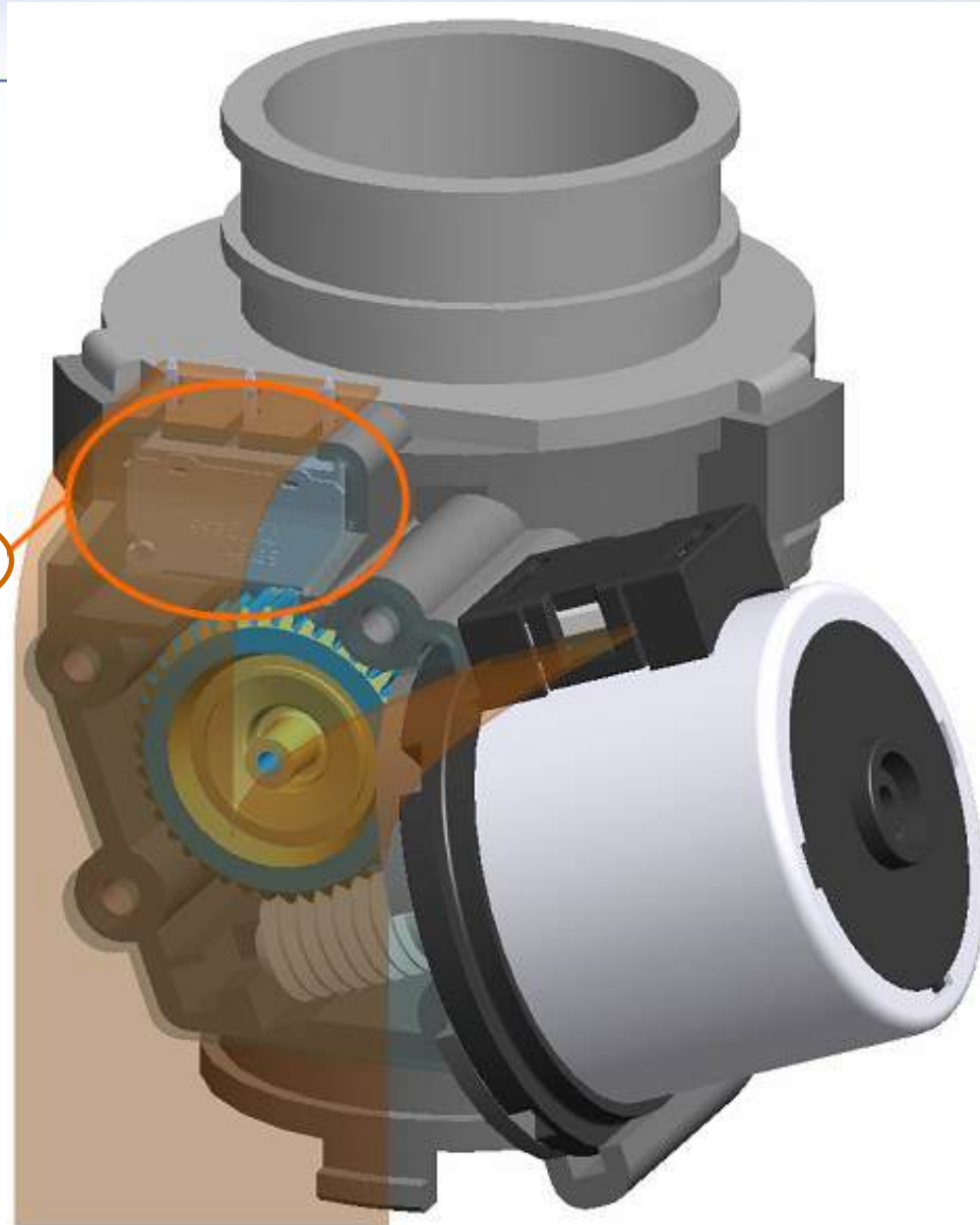






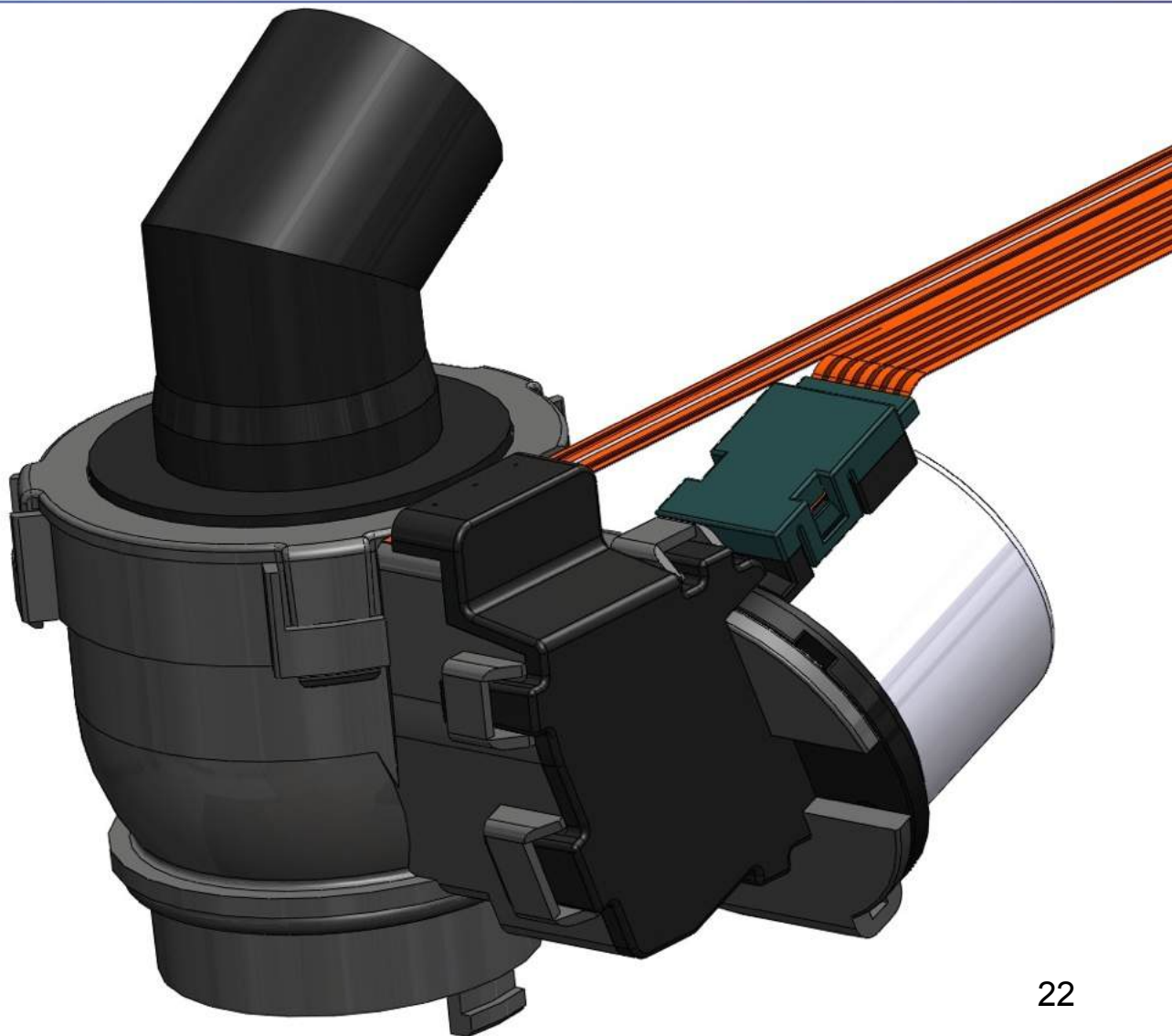
## Two state position control

**Microswitch**



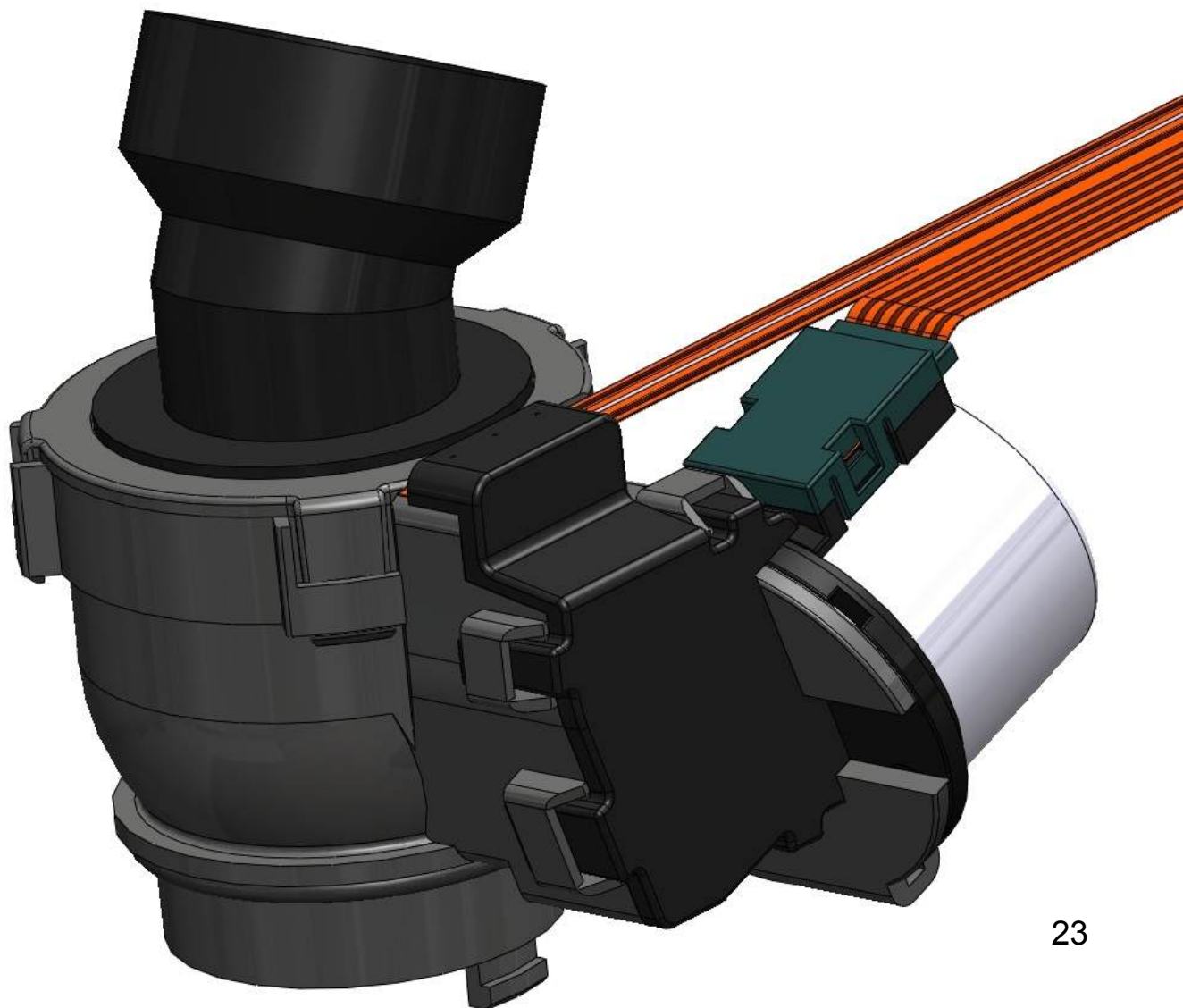


## **Modular design: UG-NL 220 mm adapter**



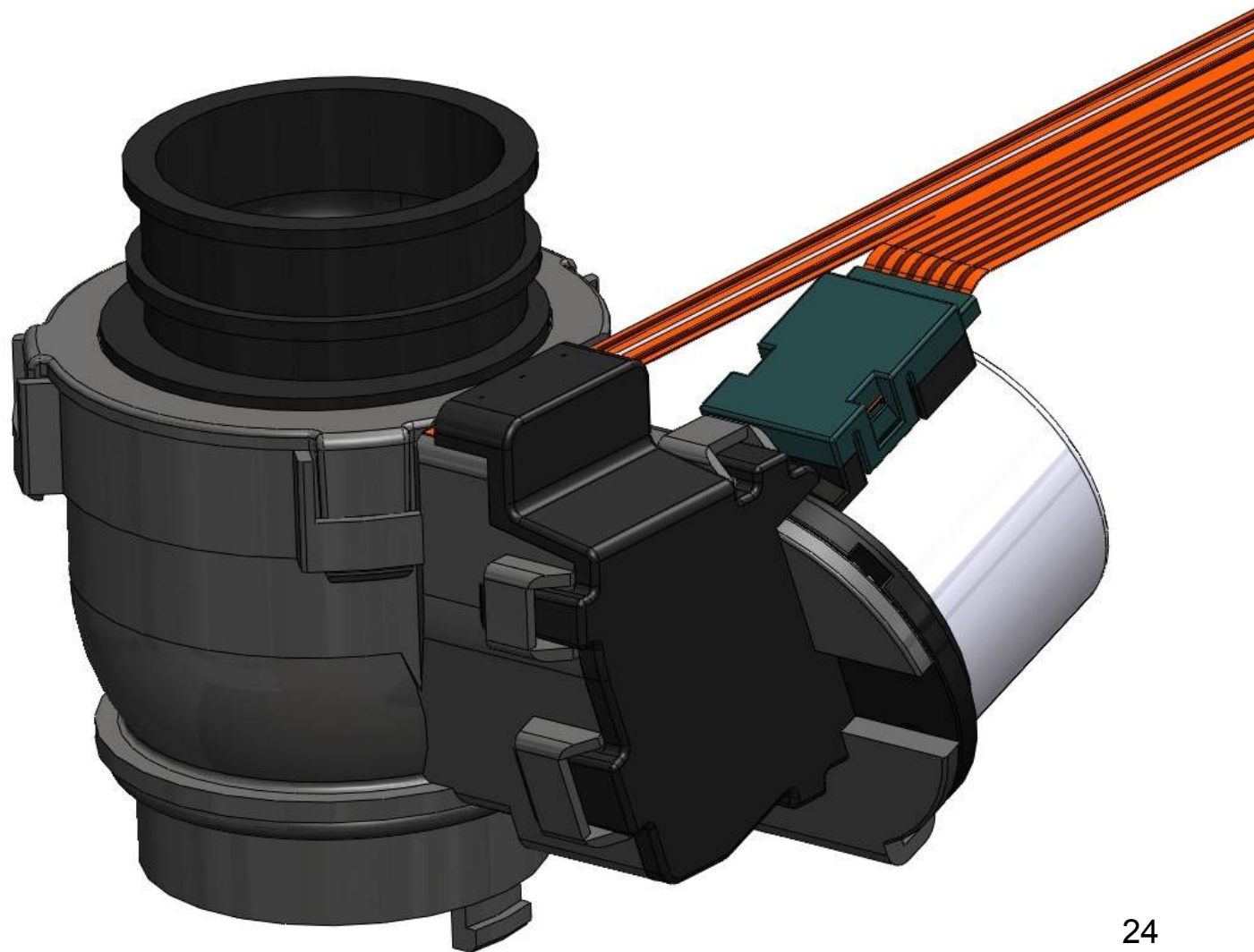


## **Modular design: UG-EN 6" (152,4 mm)**





## **Modular design: UG-F 130 mm**



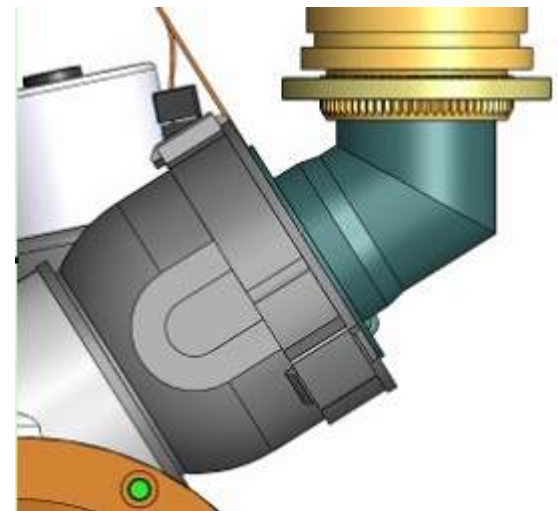
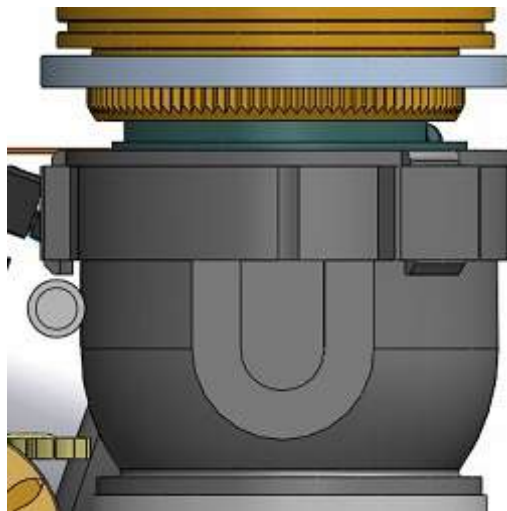
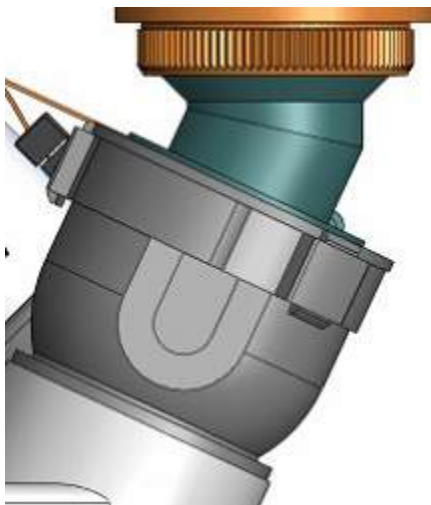




# Flexibility

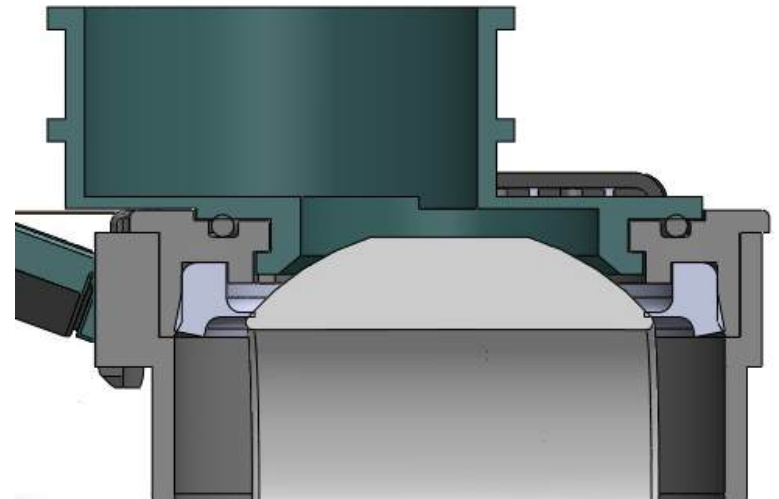
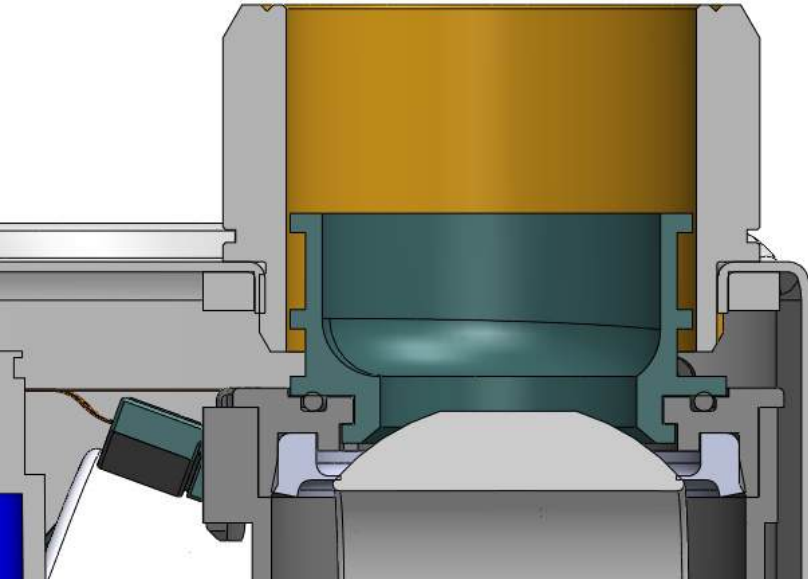
**Compatible with all UG meters**

- 1,2 dm<sup>3</sup>
- 2,2 dm<sup>3</sup>





## Design challenges

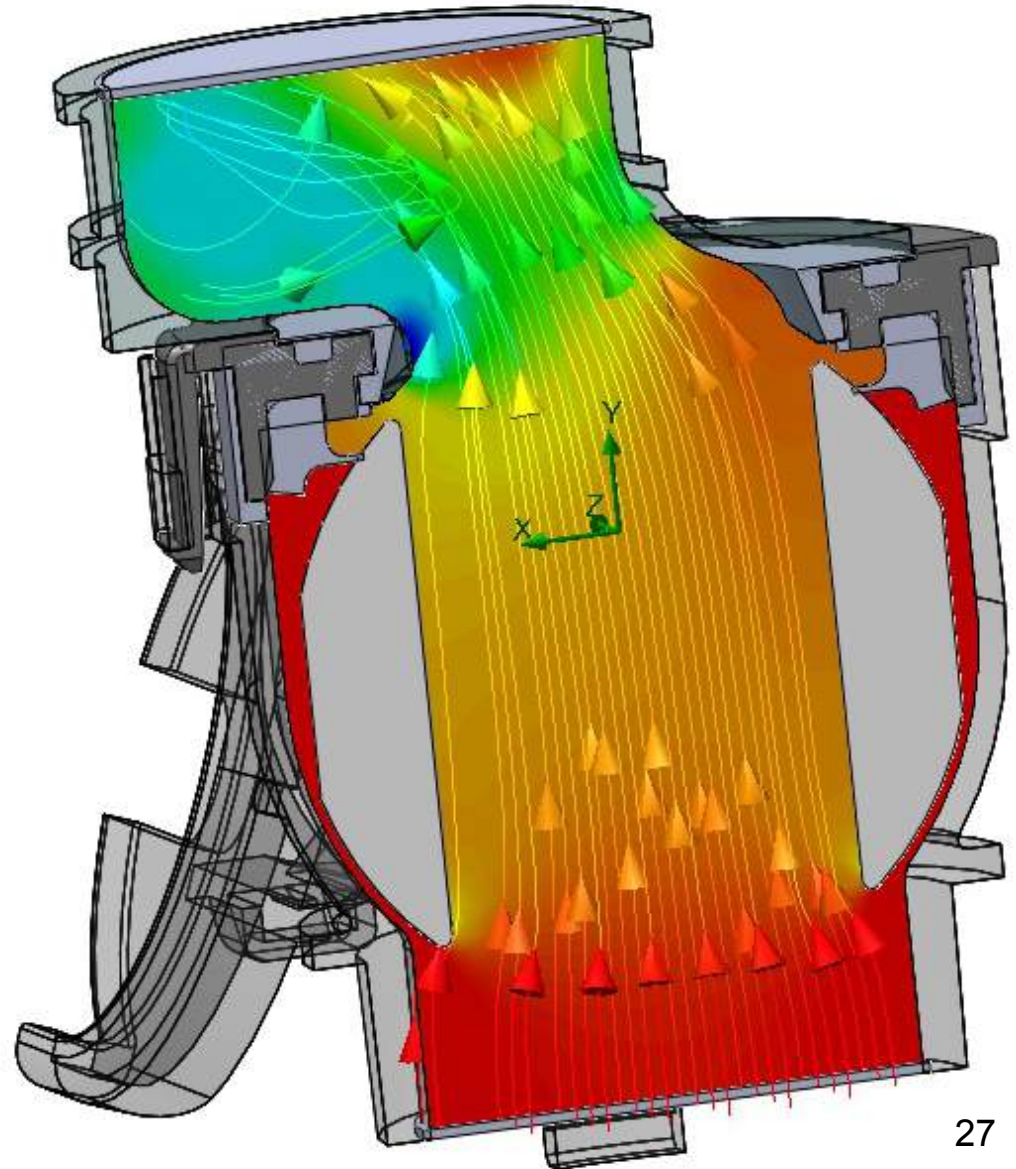
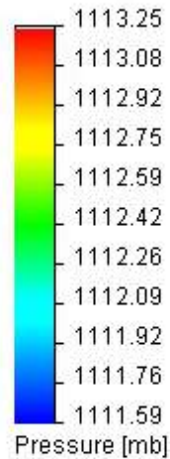


**Design optimization  
using CFD**

*Computational Fluid Dynamics*



## CFD simulations



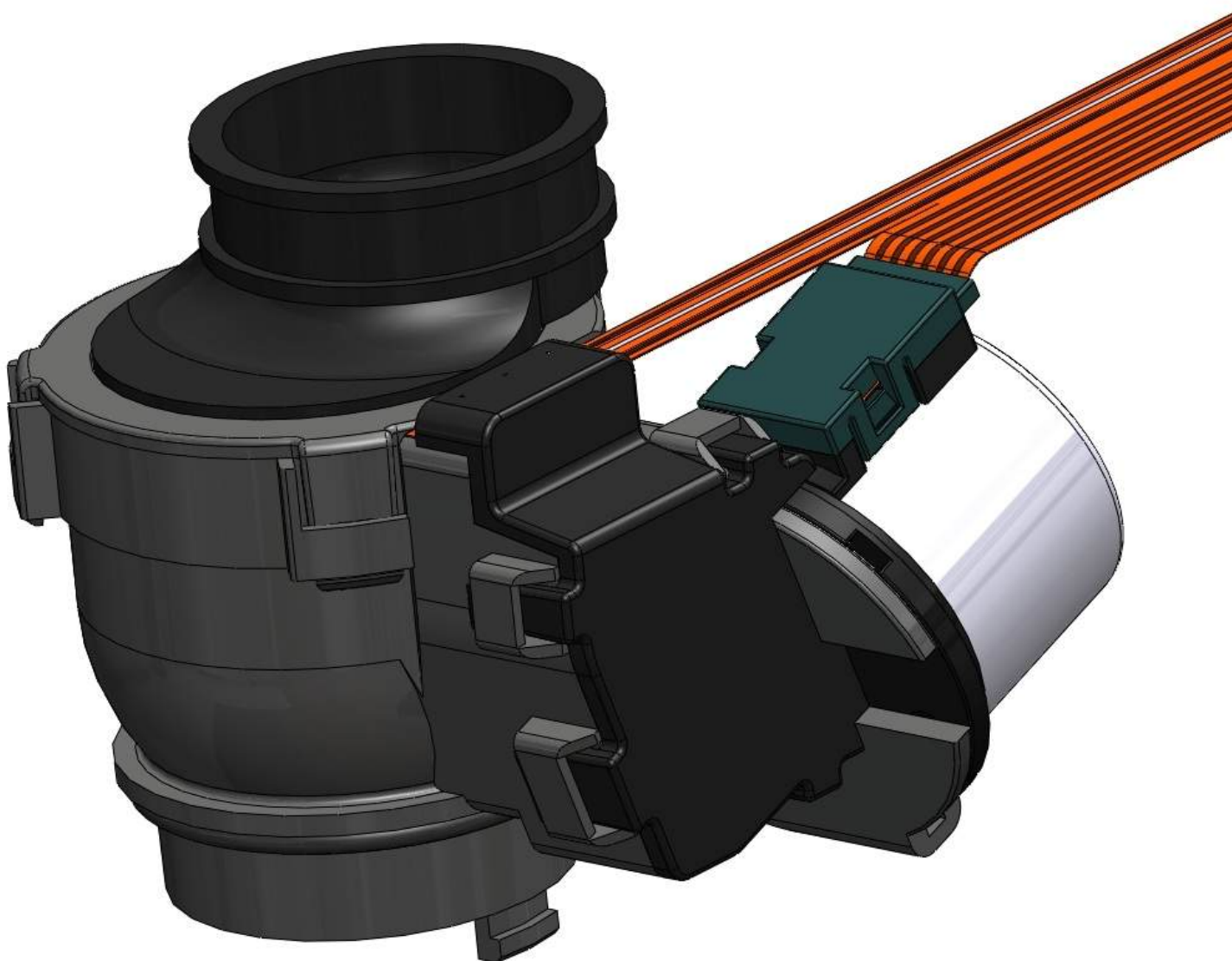
**Pressure drop  
acc. CFD ~0,2 mbar**

**Real pressure drop  
~0,15 mbar**

***Other models  
<0,05 mbar***



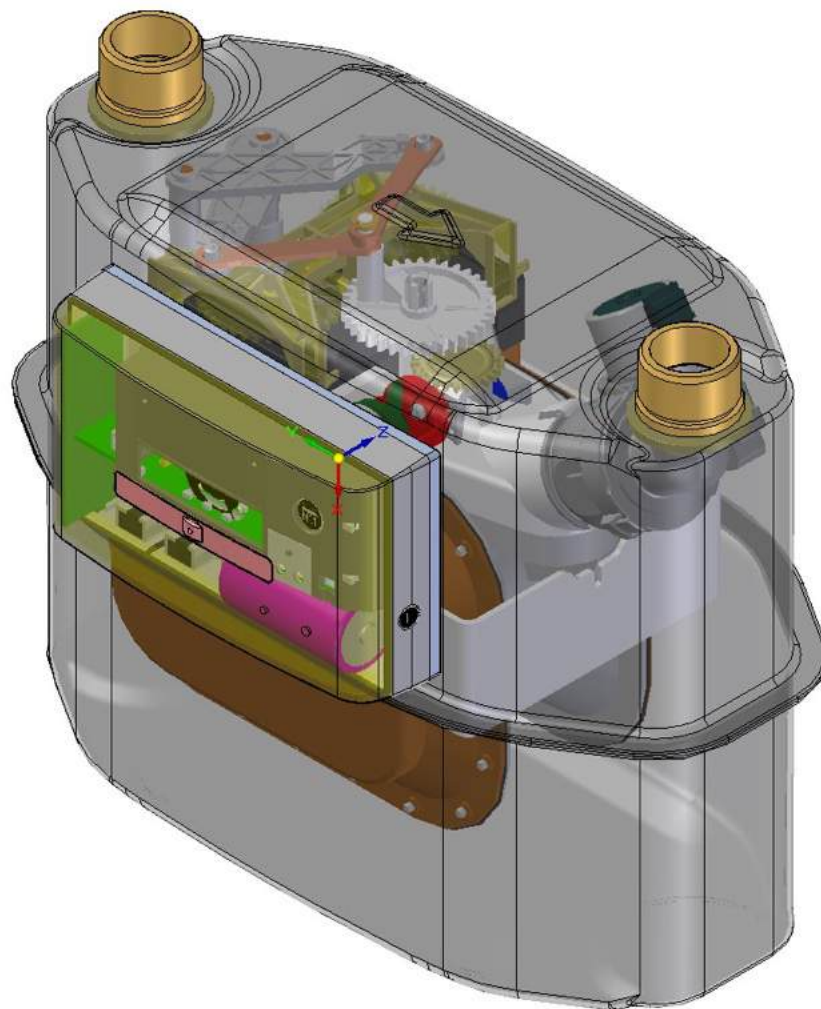
## **CFD optimized adapter of: UG-F 110 mm**





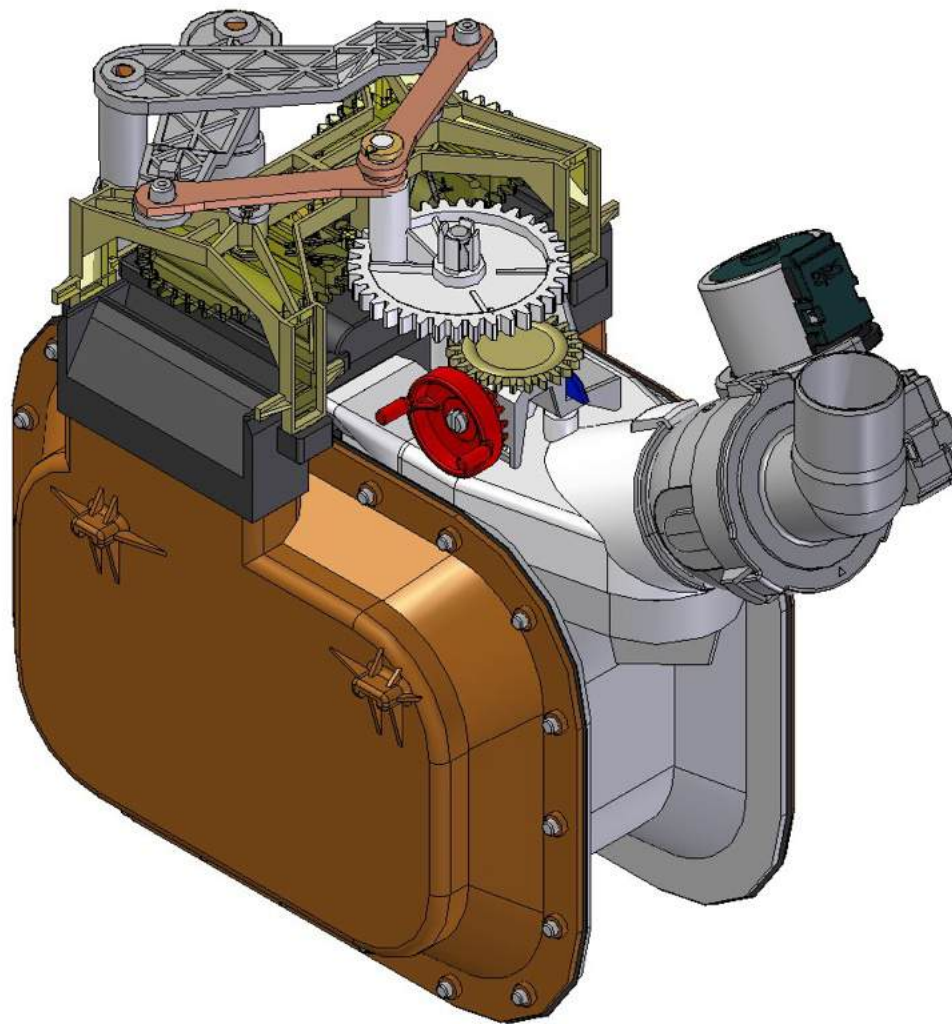


## UG-NL 220 mm





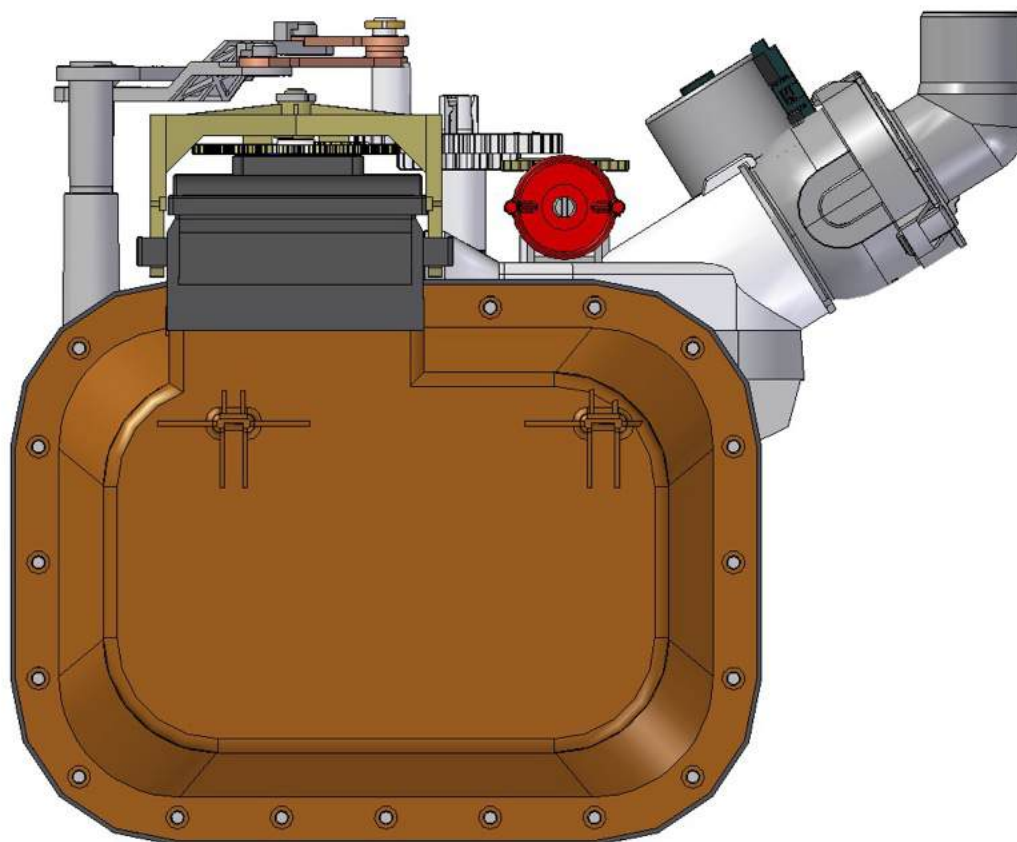
## UG-NL 220 mm





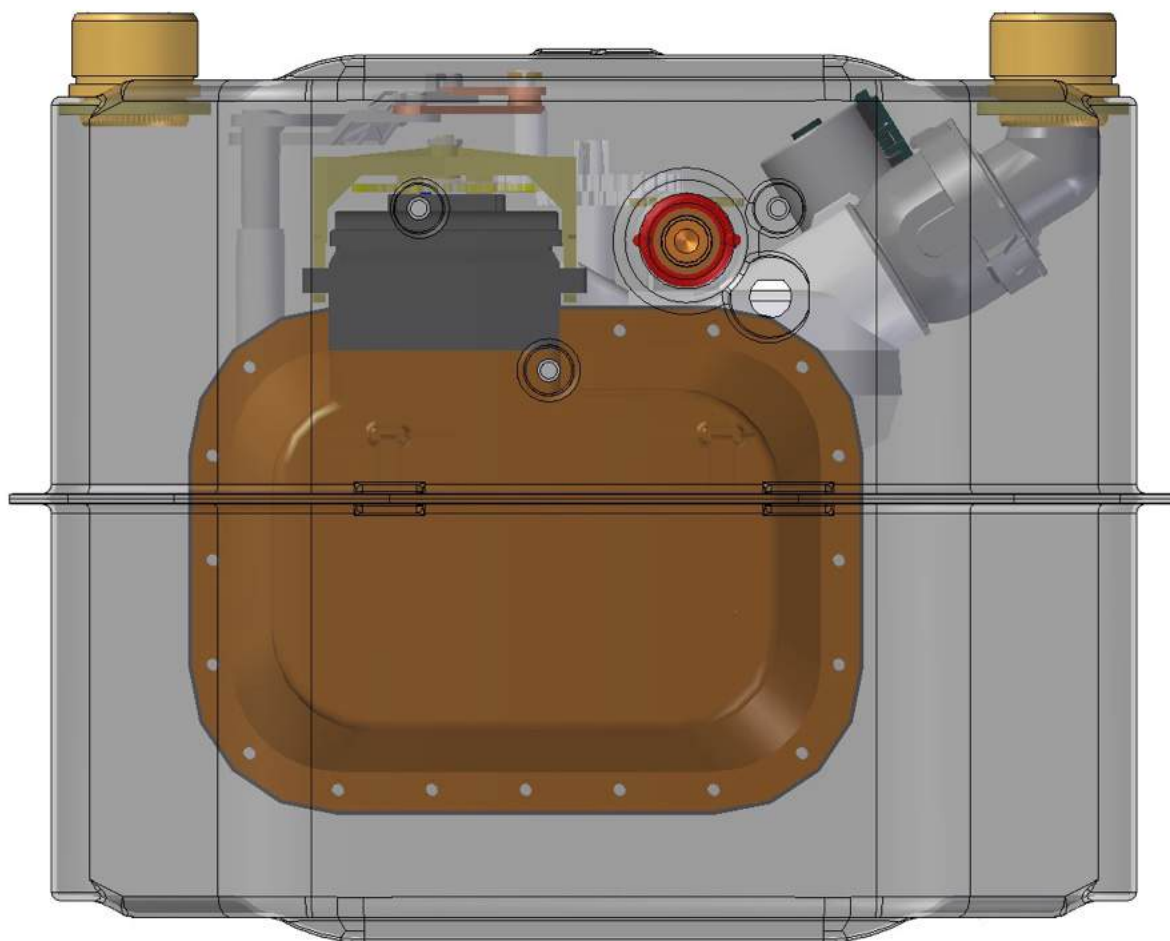


## UG-NL 220 mm



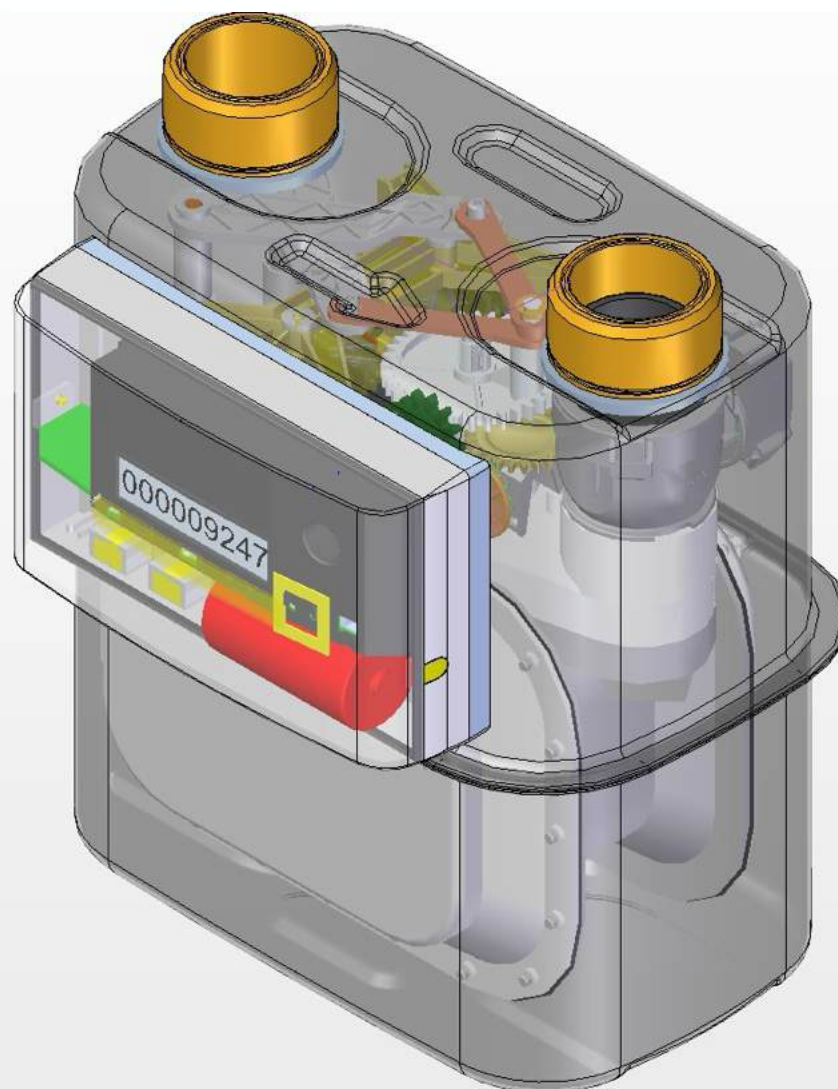


## UG-NL 220 mm



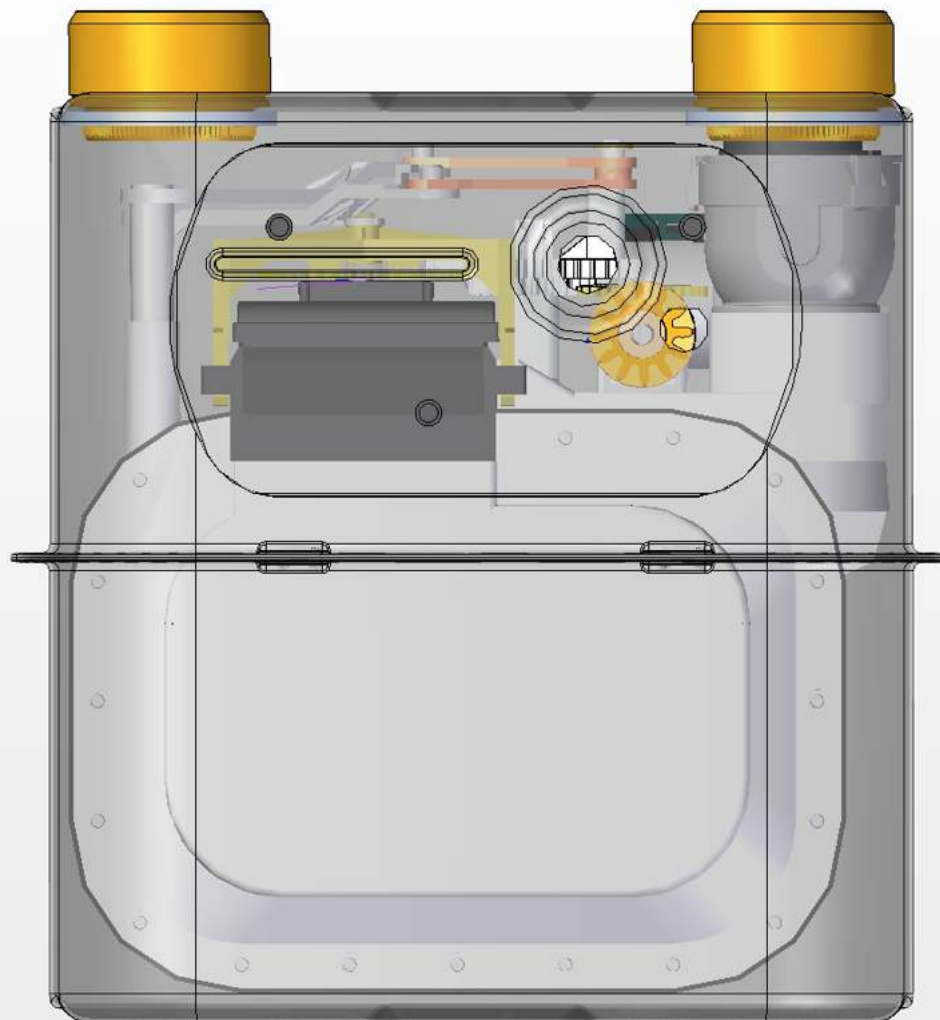


## UG-F 130 mm



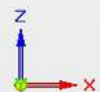
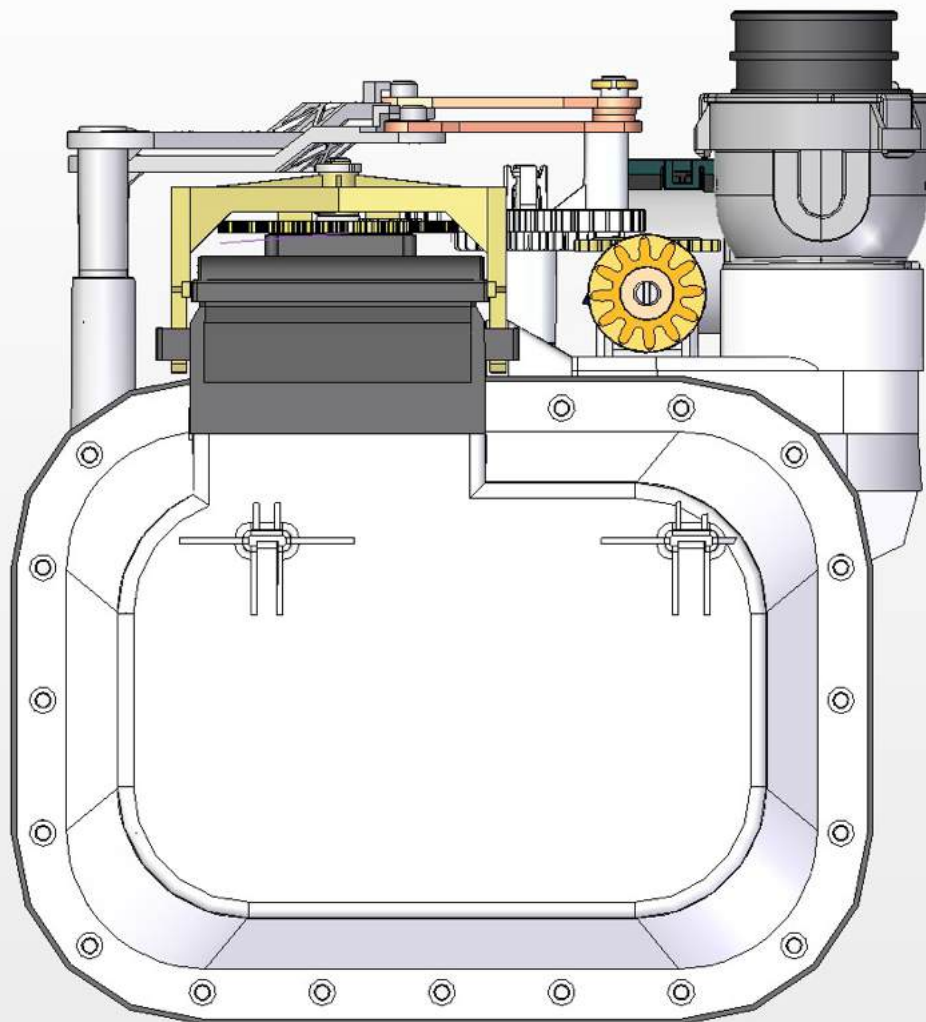


## UG-F 130 mm





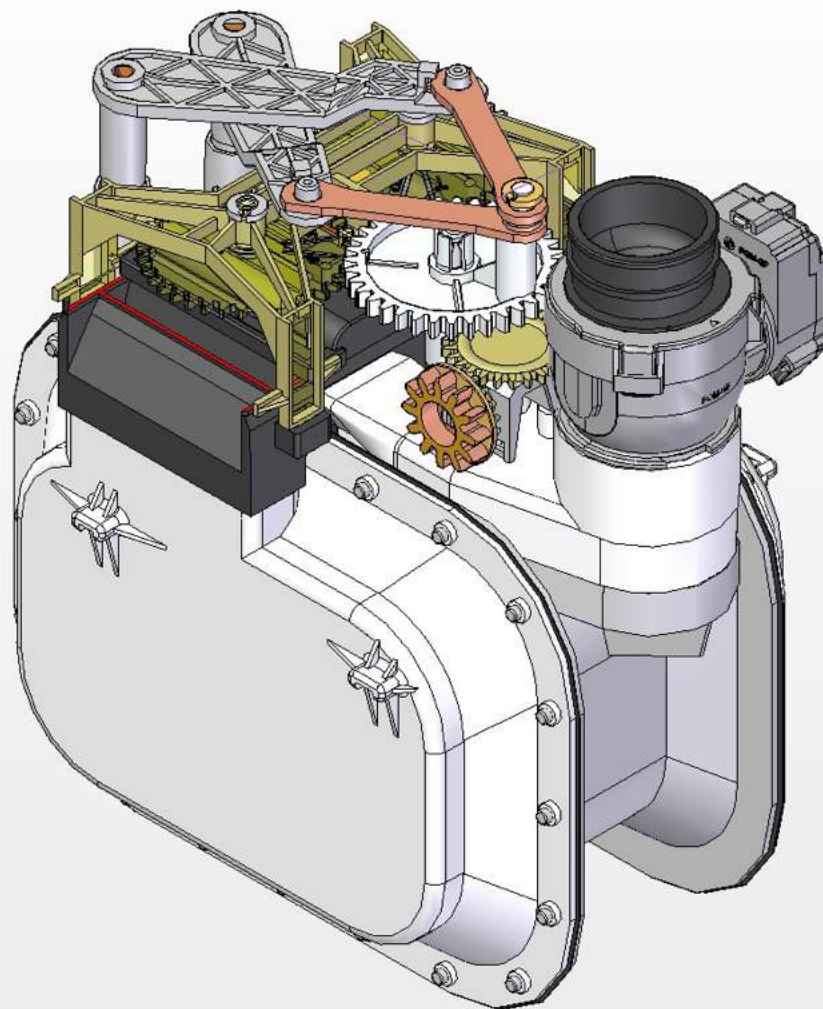
## UG-F 130 mm







## UG-F 130 mm







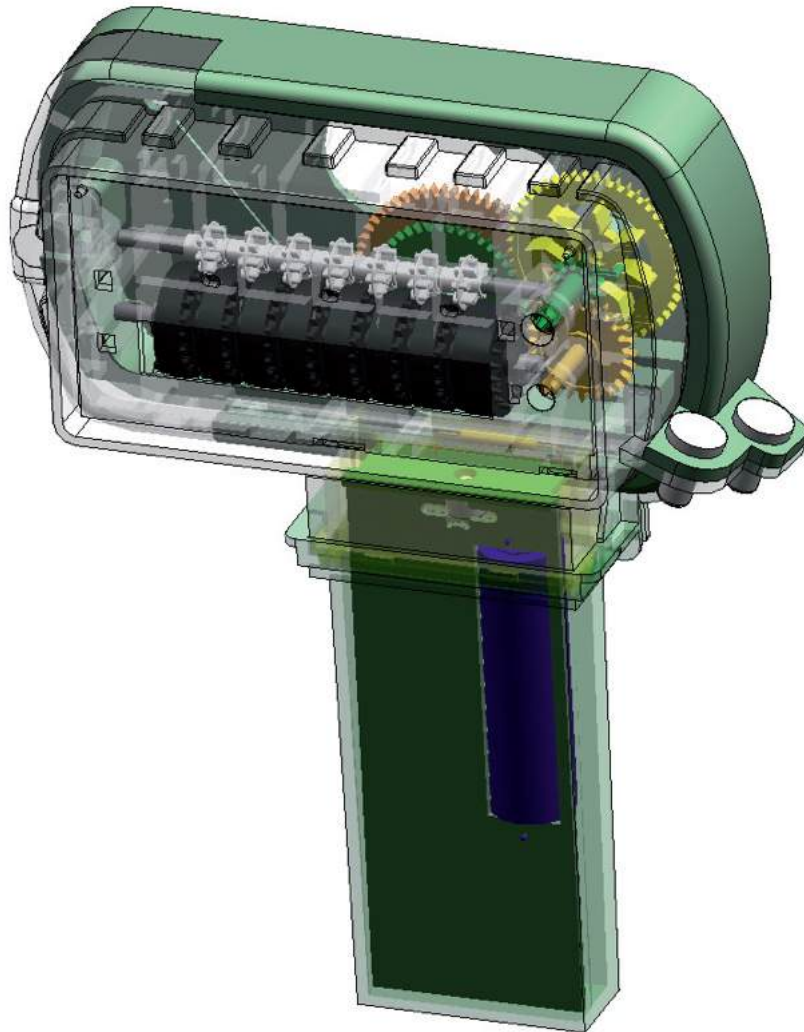
# UniSmart: telemetry module

## 1. Communication



## 2. Pulse counting

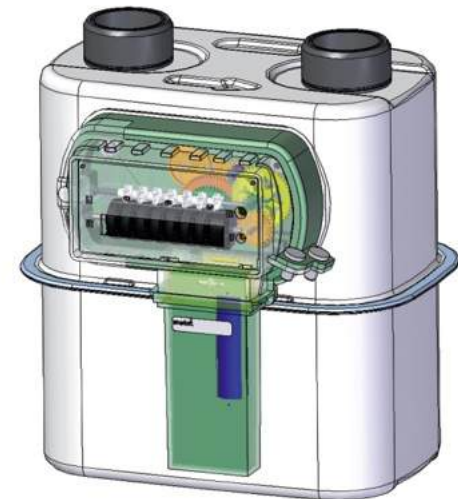
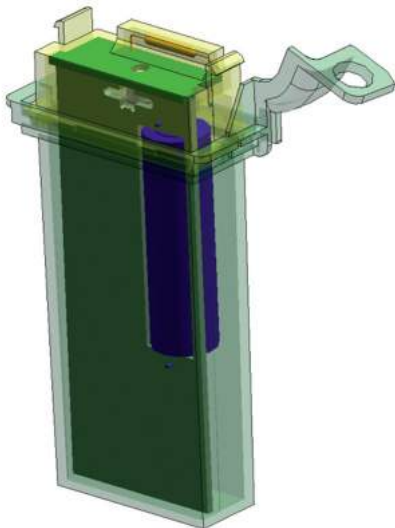
- 1 pulse = 1 full rotation of last counter roller  
(for meters G1,6 - G6 1 puls=10dm<sup>3</sup>, for  
meters G10 1 ipuls=100dm<sup>3</sup>)
- Algorithm of errors elimination such as errors  
due to mechanical vibration of rollers in  
counter.





# UniSmart: Functionality

4. The conversion of the volume pulse( $m^3$ );
5. Flows history (60-dayly, 120-monthly);
6. Alarm registers:
  - a. Interference by an external magnetic field;
  - b. Exceeding the maximum flow( $Q_{max}$ );
  - c. Lack of pulse.
7. **Bootloader** (possibility of remote firmware upgrade) **under development**  
**Datagram Encryption AES-128 acc EN13757-3:**
  - a. OMS (*with dynamic initialization vector*);
  - b. NTA (*with dynamic initialization vector*); **possible development**
  - c. NTA (*with static initialization vector*). **possible development**
8. Power supply: 1x lithium battery type AA;
9. Battery Operation 10 years



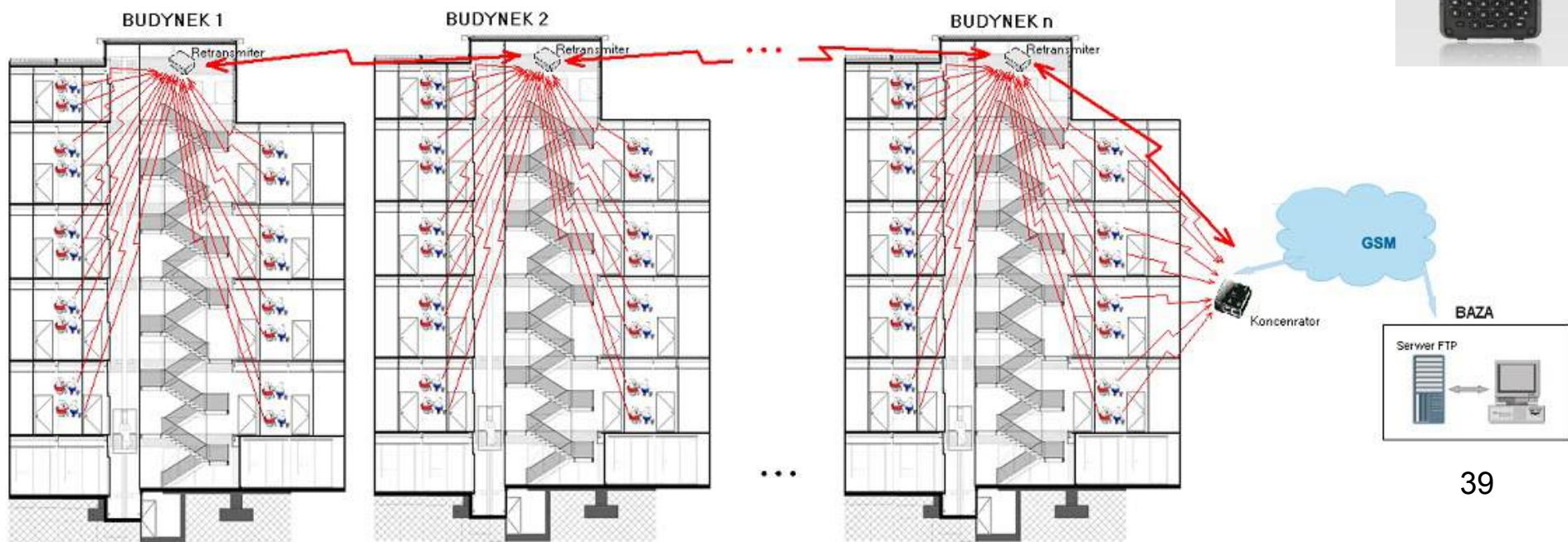


# AMR (ang. automatic meter reading)

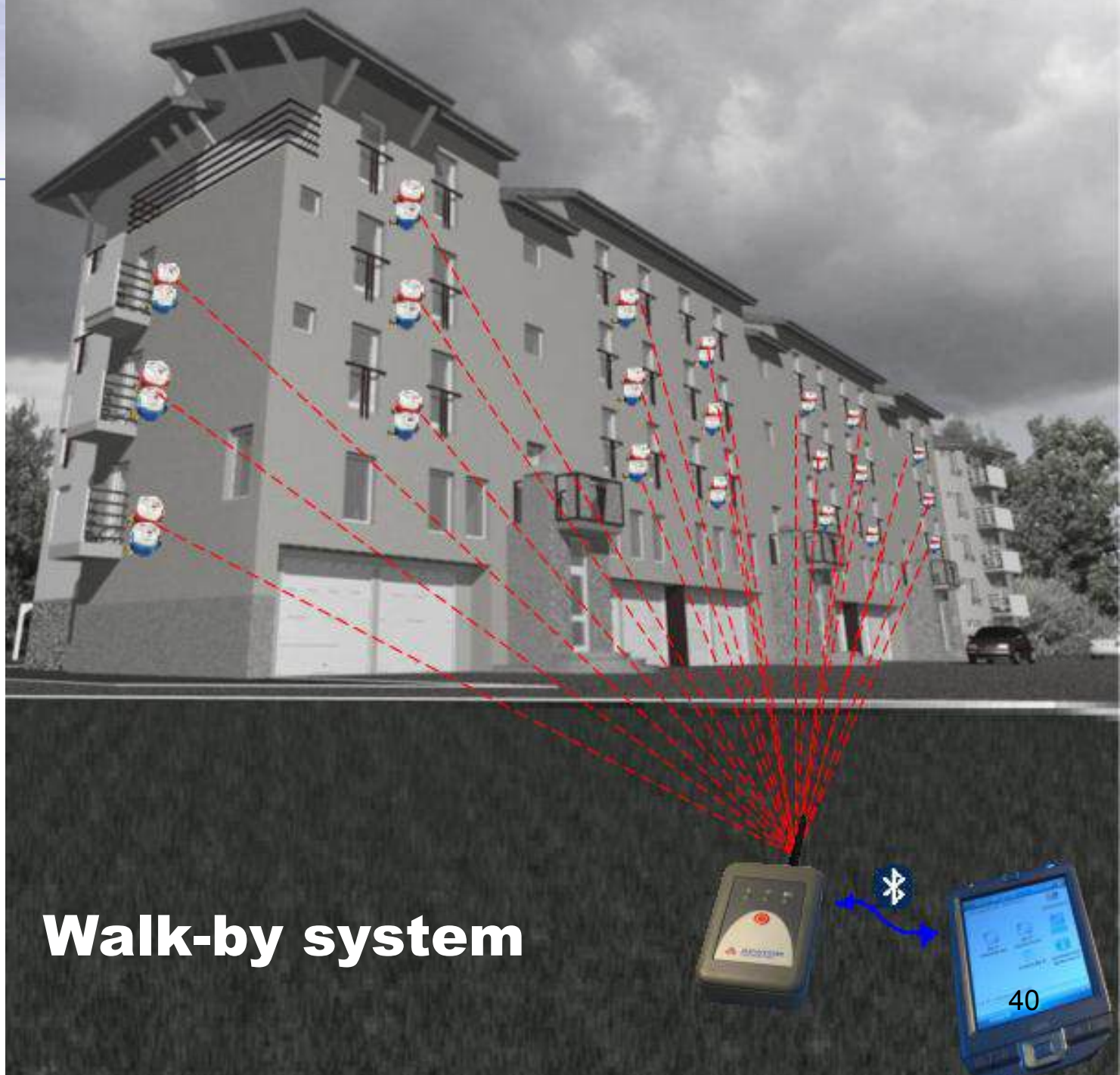
Remote reading system

Walk-by system

Stationary system









# Inkasent PDA application





# PSION Terminal

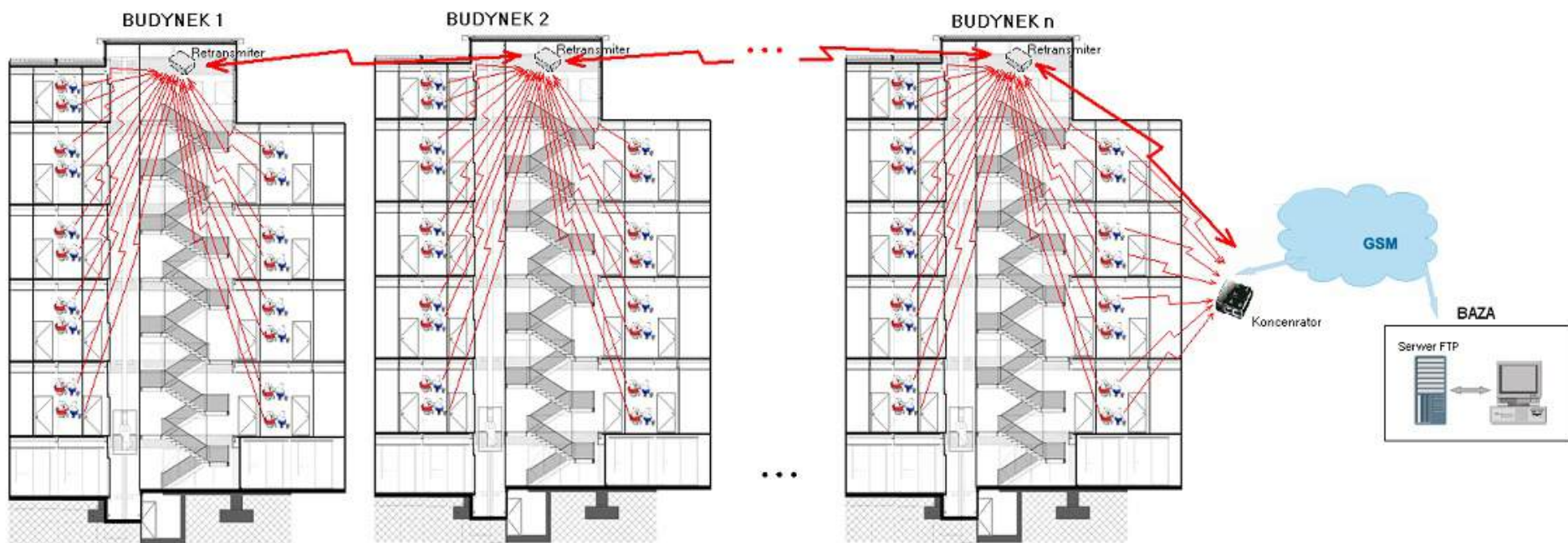


*Mobile terminal PSION WORKABOUT PRO*





# Stationary system

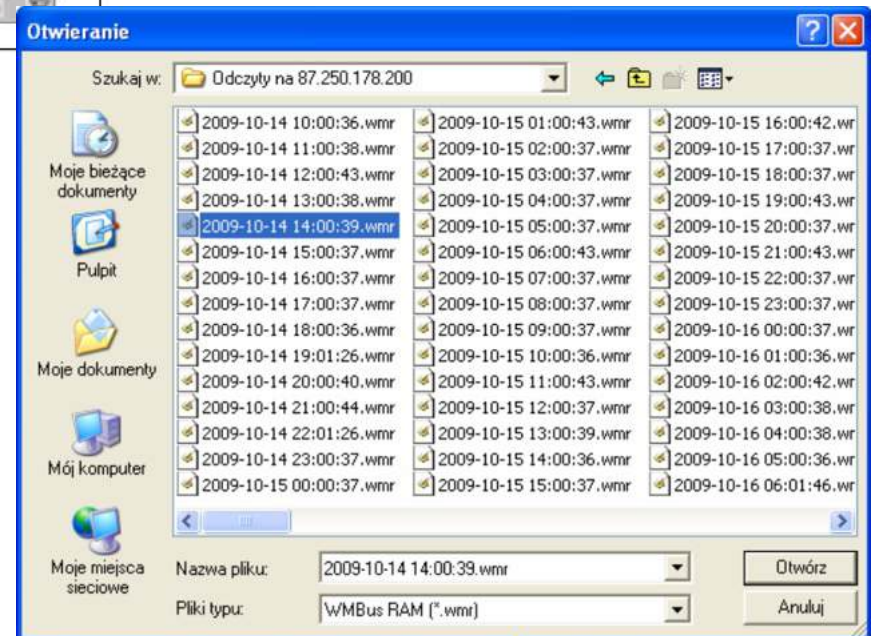
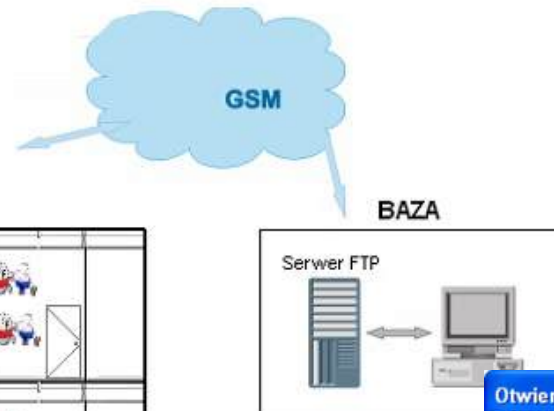
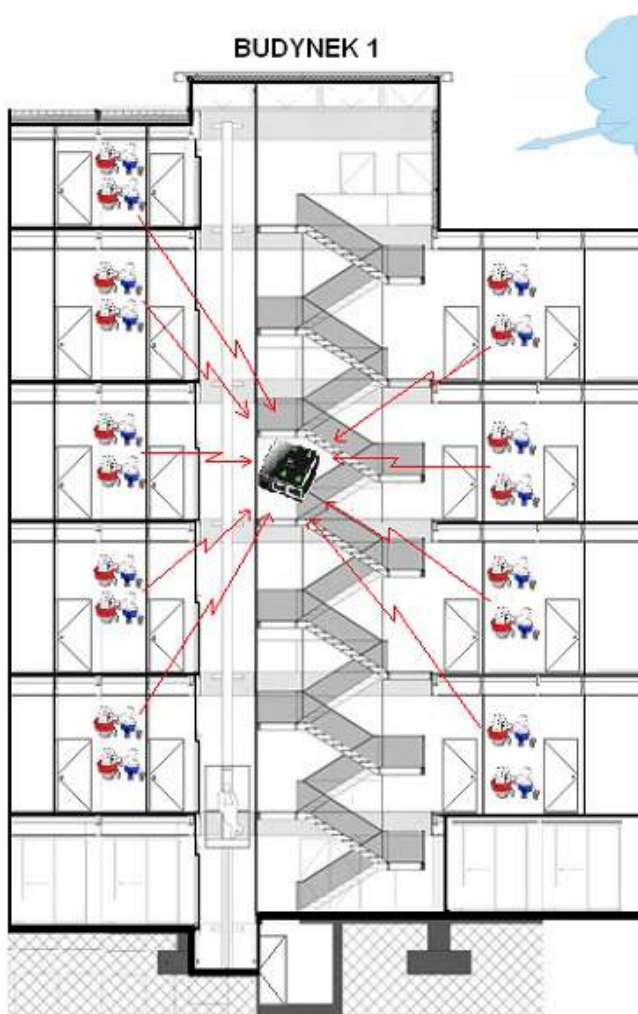




# Data Concentrator (MUC)

**under development**

- File generating \*.csv
- GSM hubs can supply with solar panels



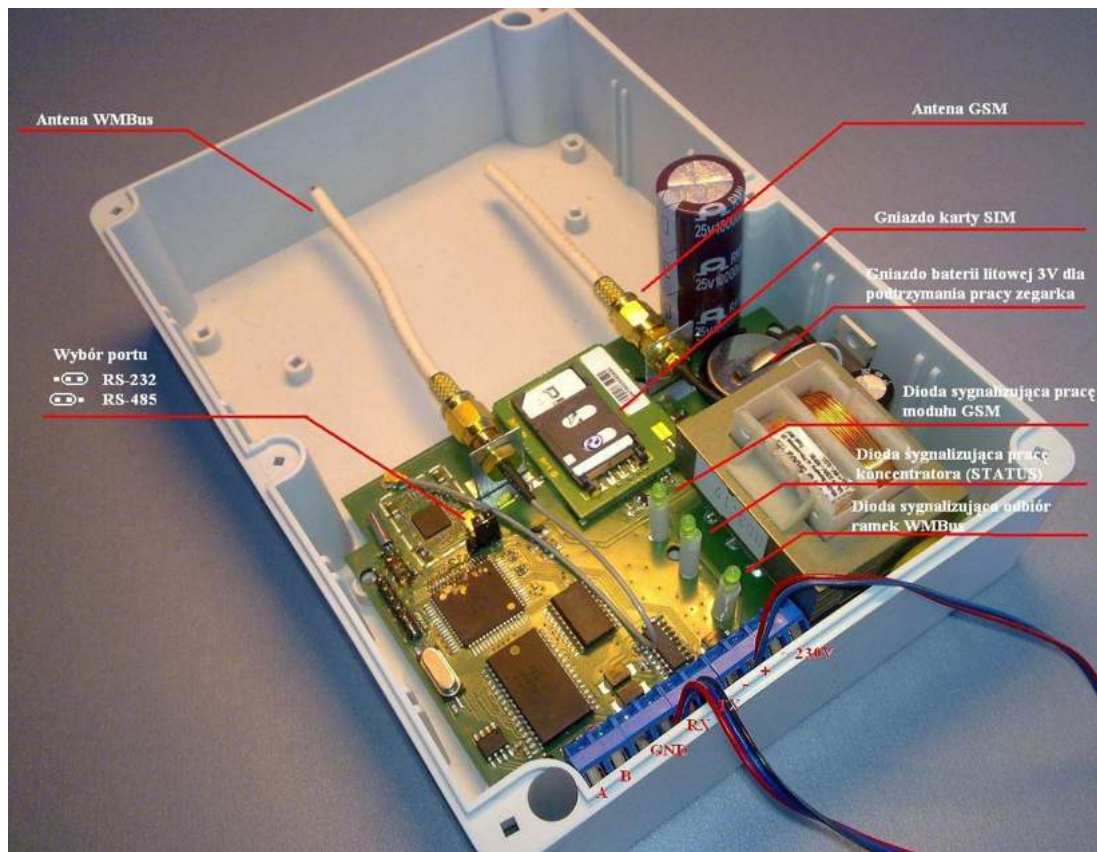


# Data Concentrator (MUC)

**under development**

## GSM Hubs:

- Power supply 230 V AC
- Solar panels power supplies







# **M-BUS retransmitter**

**under development**



## **Retransmitters**

- **Power supply 230 V AC**
- **Battery supply**



## **Pilot Instalation in: Wielkopolskiej Spółka Gazownictwa S.A.**



- [illegible]





## **Additional Functionalities Implemented during pilot instalation**

- a) Solution from Smart Gas Meter side which allows Customer to balancing the gas network system.**
- b) Interopability: Overall system has been integreated to fit both for existing aplication systems and at device level too.**
- c) We have been greatfull to receive interest from National Notified Body of Oil and Gas (INiG). Cooperation with INiG can enhance an ongoing Project**



- 1. More then 2000 GxS Smart Gas Meters**
- 2. Drive-by reading by PSION WORKABOUT PRO 3 and car roof antenas**



## Walk-by / Drive-by



**PSION WORKABOUT PRO**



**Drive-by AMR reading**





**External car roof antenna 868 Mhz**





**Terminal PSION WORKABOUT PRO 3**

# Screenshoots from mobile app



Użytkownik: Niezalogowany



Trasy



Tryb serwisowy



Logowanie



Ustawienia



Wyjście



Wybierz trasę

TEST

Pracownik

KOWALSKI JAN

☐ Skasuj odczyty

Inkasent mobile 1.0.1.3

Ok

Anuluj

# Screenshots from mobile app



TEST  
Statystyki 0:0:7

Lp	Opis	
Ulice		
1	Nakielska	0:0:3
2	Piaskowa	0:0:4



Wczytywanie trasy zakończone.

Opcje Start



TEST  
Statystyki 0:6:7

Lp	Opis	
Ulice		
1	Nakielska	0:3:3
2	Piaskowa	0:3:4






Trwa odczyt trasy ...

Opcje Stop



# Screenshots from mobile app

 **Dane odczytane**   **ok**

Gazomierz  
**Nakielska 5 A m. 5**

Nr radiowy: 105

Lokalizacja: -

Chwilowy - 12-08-03 10:37:17

Chwilowy - 12-08-03 10:37:17

Zalogowany - 12-07-31 22:00:00

12-08-03 10:37:17

Data miernika

12-08-03 10:34:00

Nr seryjny

105

Energia

0,000 kWh

Wskazania licznika

105,000 m<sup>3</sup>



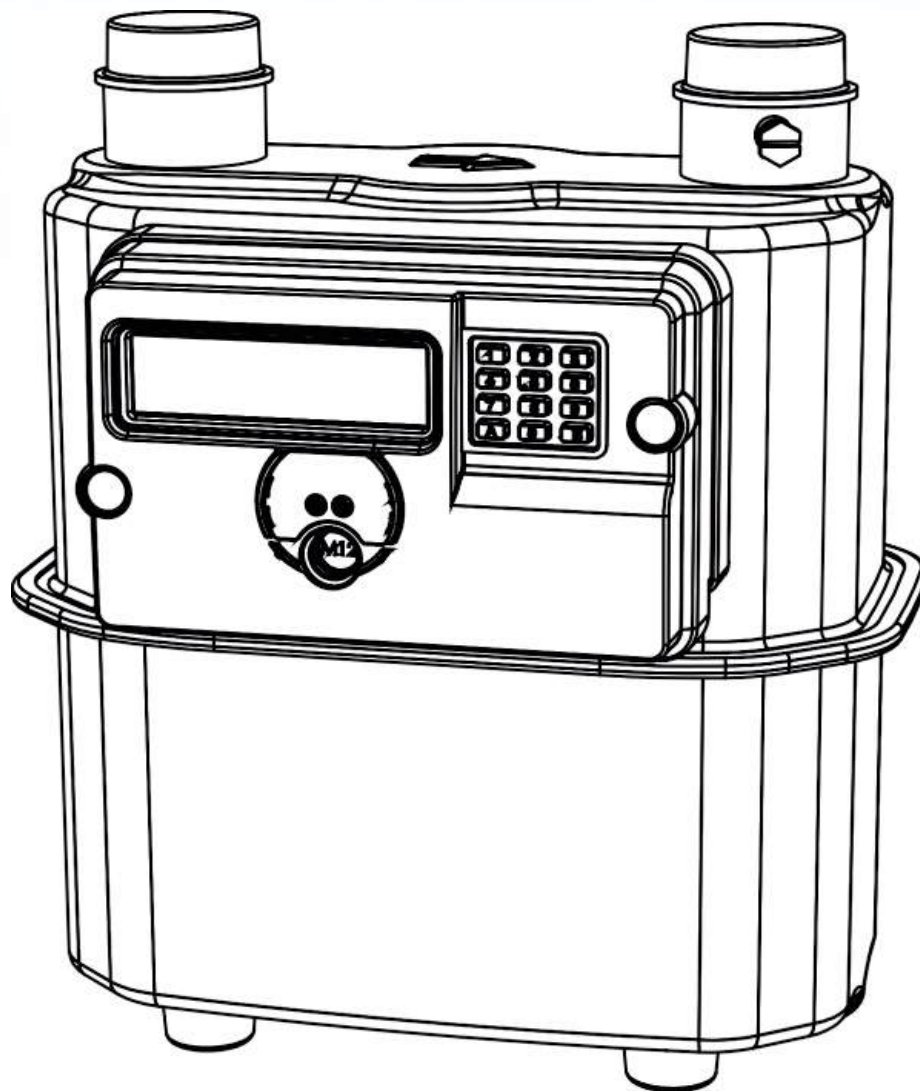




**Customer Customization**



## Prepayment ZigBee Smart Gas Meter Project



***SECURE***

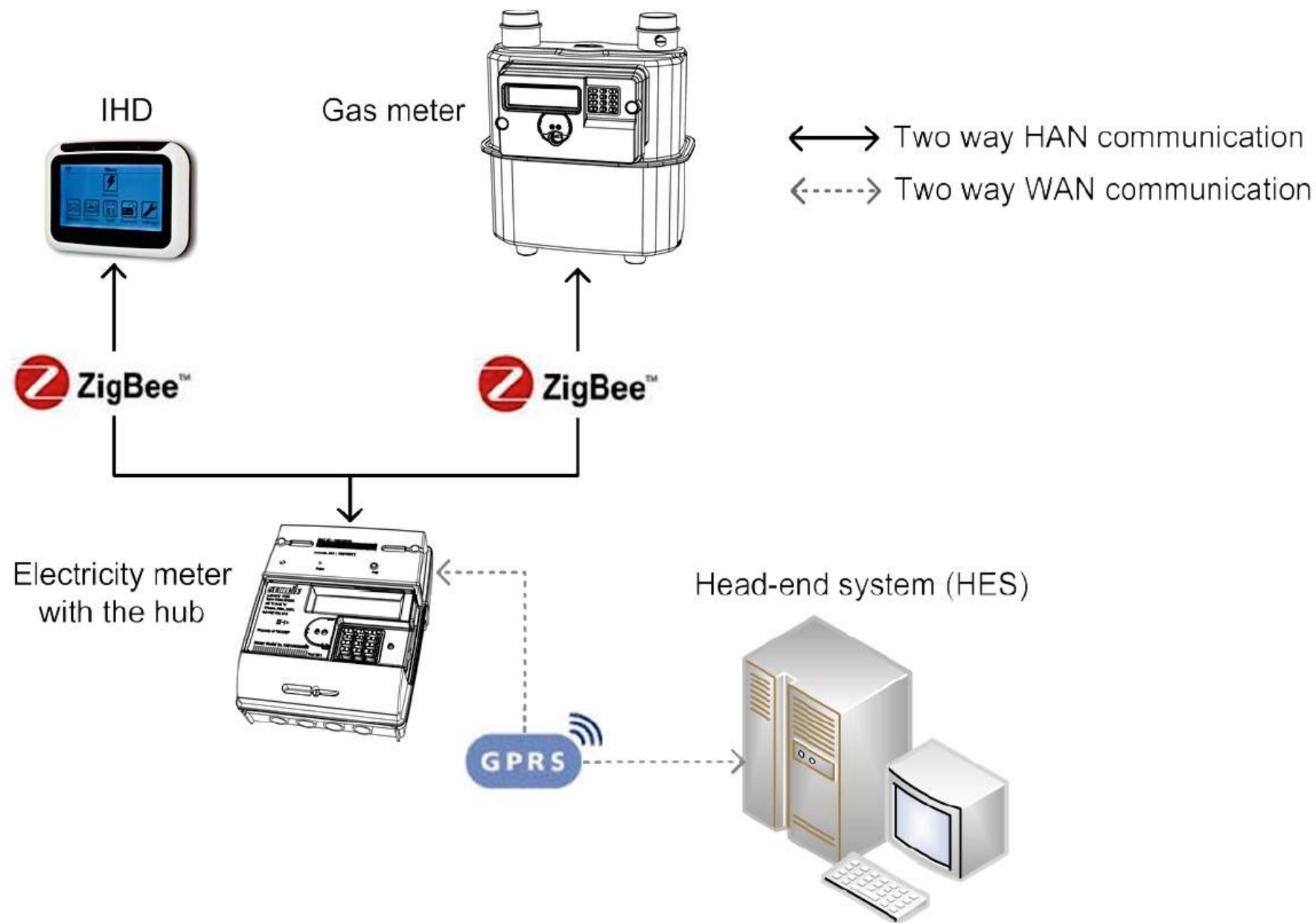


Figure 1: Two-way HAN and WAN communication



# Project database

## PROJEKTY DT 2012 Research & Development Projects 2012

LP	Priorytet	Obszar / Area	Rodzaj / Type	TEMAT/GOAL	Kierownik projektu / Project Leader	Termin / deadline [cw/year]	Status ogólny / Global status	Zaawansowanie / Progress [%]
1	Krytyczny / Critical	Smart Metering	Nowy produkt / New Product	Wdrożenie do produkcji ZAWORU ODCINAJĄCEGO GSU (Johnson Electric) dla gazomierzy UG (z przełożą), certyfikacja MID gazomierzy z tym zaworem	KOZŁOWSKI	01/2013	W trakcie / Ongoing	
2	Wysoki / High	Smart Metering	Dośkonalszenie / Development	Wdrożenie „UNISMAST”	GRUCHOWSKI	09/2012	W trakcie / Ongoing	
3	Średni / Moderate	Mechanizmy / Mechanical	Nowy produkt / New Product	Projekt UGG4 AL	SPLAWIŃSKI	05/2012	Zakończony / Accomplished	
4	Średni / Moderate	Mechanizmy / Mechanical	Nowy produkt / New Product	PROJEKT I PROTOTYPY gazomierzy i obwodów G40 ; G65; G100 (na bazie kilku baterii 6 dm3)	SPLAWIŃSKI	03/2012	Planowany / Planned	
5	Krytyczny / Critical	Smart Metering	Dośkonalszenie / Development	Wdrożenie IDENTYFIKACJI I IDENTYFIKOWALNOŚCI procesu produkcyjnego	KOZŁOWSKI	04/2012 (Maj 1)	W trakcie / Ongoing	
6	Wysoki / High	Smart Metering	Jakościowy / Quality	Wdrożenie licznika przedpłatowego SECURE	KOZŁOWSKI	01/2013	W trakcie / Ongoing	
7	Wysoki / High	Smart Metering	Dośkonalszenie / Development	System obsługi dla systemu obchodowego i uruchomienie systemu obchodowego.	KOZŁOWSKI	04/2012	Zakończony / Accomplished	
8	Średni / Moderate	Mechanizmy / Mechanical	Nowy produkt / New Product	Bateria 2,2 litra z korekcją mechaniczną	SPIEREŃKA	05/2012	W trakcie / Ongoing	
9	Wysoki / High	Mechanizmy / Mechanical	Jakościowy / Quality	Zmniejszenie odrzutów na legalizacji i ilość naprawianych gazomierzy	SPIEREŃKA	01/2012	W trakcie / Ongoing	



Thank you for your attention