



**ELIS PLZEŇ, a.s.**

## **Smartsonic**

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**multi-beam  
ultrasonic flowmeter**

**INVESTMENT OPPORTUNITY**

# Executive summary

Leading R&D company in electromagnetic and ultrasonic flow and energy meters



## Summary

**ELIS PLZEN**, R&D company, is looking for a strategic partner to invest in the acceleration and successful completion of its scientific efforts in the field of multibeam ultrasonic liquid flowmeters. The ideal investor will ensure the continuity and expansion of the business by launching (commercializing) the developed products in demanding markets.

Established in 1990, the Company is one of the leading manufacturers of electromagnetic and ultrasonic flow and energy meters.

In the field of ultrasonic flowmeters, the Company is the only manufacturer in the Czech Republic and it is also one of the very few companies in the world that have mastered the demanding technology of multi-beam and wide dimension ultrasonic flow measuring with very high accuracy.

The Company supplies its products to the water, heating, energy, chemical and food industries in around 100 countries worldwide. Product solutions are protected by several utility models.

ELIS has developed a total of 27 product lines. The most advanced prototype in development is the SMARTSONIC multi-beam ultrasonic flowmeter, which ranks among the few high-end flowmeters of its kind in the world.

ELIS has reported sales around €1 mil a year for the past several years.

## Location

The Company is situated in Pilsen (Plzeň) with production plant in Oslavany, Czech republic.



Website: <https://www.elis.cz/home>

# Research & Development

Key focus on R&D belongs to ELIS values



## Overview

*The critical part of the Company value lies within the development know-how and ownership of a wide product portfolio.*

The Company has in total developed 27 product lines, where 8 of them are top tier electromagnetic flow meters, 14 ultrasonic flow meters and 5 heat & cold energy meters.

All the products are well documented and verified in sales and technical documentation.

The uniqueness of the Company's products is demonstrated by the combination of its characteristics, where the flow meters offer wide dimension ranges that allow their applications in various environments also while maintaining very high accuracy.

The Company has also developed a line of products that are MID (Measuring Instruments Directive) and Ex (Certification of equipment intended for use in potentially explosive atmospheres) certificated, which allows application of the meters in extreme conditions.

Given the nature of the Company's focus, the Company was able to qualify and has been granted subsidies from the Czech Ministry of Industry and Trade and Technology Agency of the Czech Republic (TAČR).

Since 1995 the Company has spent around € 9,2 mil on R&D.

## R&D process

Most of the comparable companies usually develop only one or two product lines within the same technology that have successfully concluded whole invention cycle and made it to the production.

R&D costs in the Czech Republic, which are mainly formed by personnel costs, are on average notably lower (estimation 3x lower) compared to the developed countries such as USA, Germany, Great Britain, Switzerland etc. Therefore, the expected costs for recreating a similar portfolio of certified products would be higher in such countries.

Apart from the continuous development and improvements of the existing products, the Company also utilizes new technologies for further advancement in the field of flow metering.

The most important development project being finalized at the moment is the development of a **new generation of modular multi-beam ultrasonic liquid flowmeters of the SMARTSONIC** series using 1 to 8 ultrasonic beams for measurement according to the application requirements.



### Smartsonic – INTENTION

Based on 25 years of experience in the development, production and sales of more than 10,000 ultrasonic liquid flowmeters of larger dimensions, mainly in the DN32 - DN1200 range, the management of ELIS PLZEŇ a.s. decided in 2016 to invest in the development of a new generation of multi-beam ultrasonic flowmeters that can be used to measure the flow and consumption of liquids and gases.

Our decision was driven by the knowledge that the ultrasonic principle of flow measurement is extremely promising. Newly developed integrated circuits, which guarantee the measurement of very short times with extremely high accuracy, make it possible to implement ultrasonic flowmeters in a wide range of dimensions with a measuring range greater than  $R = 1000$ . According to the requirements of each application (measurement accuracy, resistance to hydraulic disturbances), it is possible to implement appropriate multi-beam flowmeters.

This technical progress has inspired us to develop a completely new generation of ultrasonic flowmeters, characterized in particular by a universal system solution, which allows the implementation of multi-beam ultrasonic flowmeters for liquids for various applications, meeting the following characteristics and standard technical parameters:

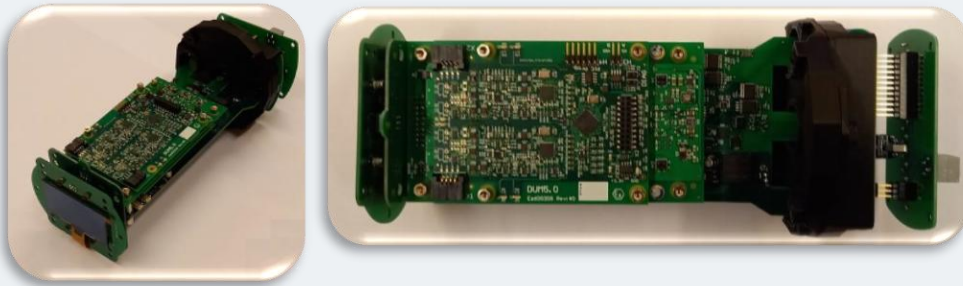
Supply voltage	24V AC/DC
Dimension range	DN32 to DN1200
Number of ultrasonic beams used	1 to 8
Velocity of the measured medium	0 to 10 m/s
Temperature of the measured medium	-40° C to 150° C
Pressure of the measured medium	PN6 to PN250
Kinematic viscosity of the measured medium	0.1 to 400 cSt
Ambient temperature	-40° C to 60° C
Environment	normal, with explosion hazard
Measurement accuracy	1 - beam flow meter ± 1.0%
	3 - beam flow meter ± 0.4%
	5 - beam flow meter ± 0.25%
	8 - beam flow meter ± 0.15%
Electrical outputs	pulse, frequency, current 4 to 20 mA
Electrical inputs	binary, current 4 to 20 mA
Communication	RS485 - Modbus RTU
Measuring range according to OIML 49 /EN ISO 4064	$R > 1000$
Design	compact, separate
Protection	IP67
Certifications	CE, MID, OIML, ATEX, IECEx

## Smartsonic – CURRENT STATE OF DEVELOPMENT

### Hardware

A modular, universal hardware has been developed and verified that enables the realization of 1 to 8 beam liquid flowmeters. New optimized ultrasonic probes and sensor body manufacturing concepts have also been developed for different dimensions, number of ultrasonic beams used and required applications.

- **electronics** - the latest integrated processors, special IO for measuring very short times and other electronic circuits including the latest component base, exclusively with multi-layer printed circuits and SMD assembly were used.



- **Ultrasonic probes** are one of the most important elements of ultrasonic flowmeters. They were developed and optimized as part of the SMARTSONIC development project using many years of experience in the development and production of ultrasonic flowmeters.

The standard version is designed for a maximum medium temperature of 150°C, for higher temperatures it is possible to use developed probes up to a medium temperature of 200°C.



### Firmware

basic firmware has been developed, which enables the implementation of 1 to 8 beam flowmeters in the range of dimensions DN32 - DN1200.

### Software

The FLOSET software has been developed to set the required parameters of the evaluation electronics and to calibrate complete flowmeters at the test station via MODBUS RTU communication

### Prototype Functional Samples

In order to verify the required functions, characteristics and parameters of the developed flowmeters, 2 pieces of prototype functional samples with the following dimensions were designed and manufactured:

- 3-beam flow meter, DN100, type SMARTSONIC SC 4131
- 5-beam flow meter, DN200, type SMARTSONIC SC 6151

# Research & Development

R&D output nearing production - Smartsonic



## Smartsonic – PROTOTYPES TEST DESCRIPTION

A series of tests and measurements were carried out on prototype samples of 3 and 5 beam flowmeters in prototype design of DN100 and DN200 dimensions. All tests were performed on **our own metrologically certified GS 1500/32-800 test bench** with the following parameters:

Dimensions range	DN32 to DN800
Test flow range	0.05 to 2000 m <sup>3</sup> /h
Measuring liquid temperature range	10°C to 30°C
Primary standards	2 pcs of Mettler Toledo scales, range 12,000 kg and 300 kg
Secondary standards	4 pcs of electromagnetic flow meters FLONET FN2015.1



We focused on the tests that should verify the most important parameters of the tested flowmeters **SMARTSONIC SC 4131** - DN100 and **SC 6151** - DN200:

1. Measurement error as a function of flow rate
2. Measurement range as a function of the maximum permissible measurement error
3. Measurement repeatability

**Each measurement was repeated 10 times at each flow rate to ensure maximum objectivity of the measurement results.**

SC 4131 - DN100 (3-beam)



SC 6151- DN200 (5-beam)



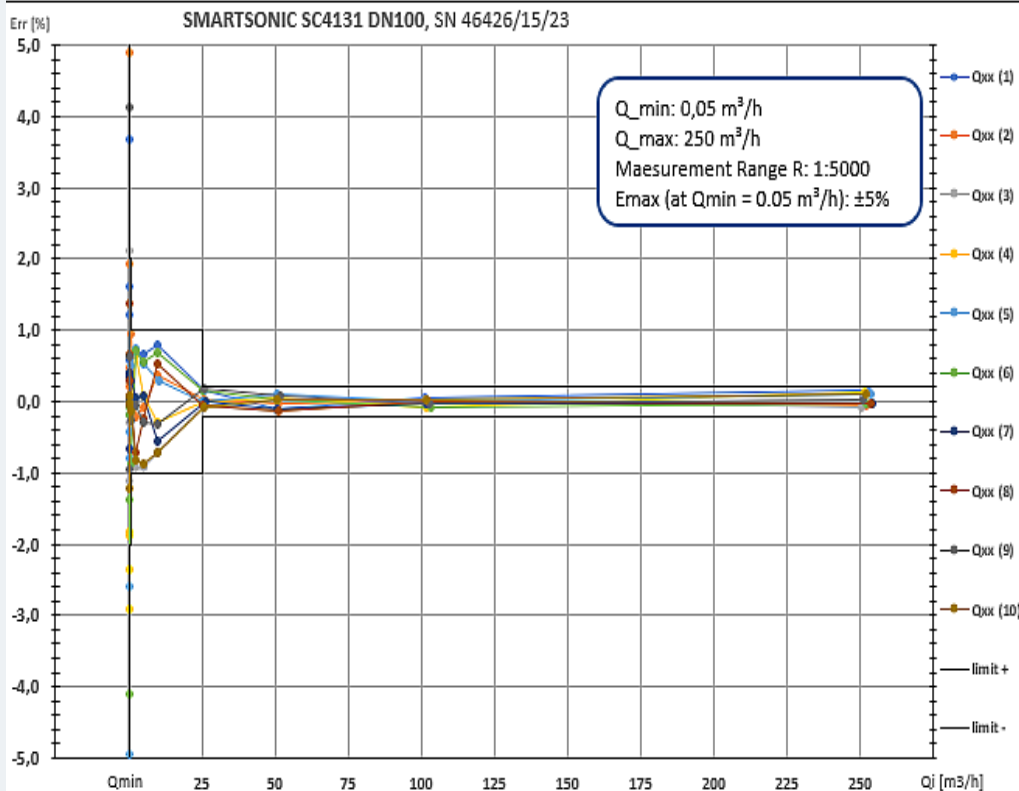


## Smartsonic – PROTOTYPE TEST RESULTS

### SMARTSONIC SC 4131- DN100 (3-beam)

#### 1. Measurement error as a function of flow rate:

Measurement error as a function of flow rate



#### 2. Measurement range as a function of the maximum permissible measurement error:

##### Measuring range R:

$R > 100$  for  $E_{max} \pm 0,5\%$  at flow rate  $Q_{min} = 2,8 \text{ m}^3/\text{h}$

$R > 250$  for  $E_{max} \pm 1\%$  at flow rate  $Q_{min} = 1 \text{ m}^3/\text{h}$

$R > 1000$  for  $E_{max} \pm 2\%$  at flow rate  $Q_{min} = 0.25 \text{ m}^3/\text{h}$

$R > 5000$  for  $E_{max} \pm 5\%$  at flow rate  $Q_{min} = 0.05 \text{ m}^3/\text{h}$

- $R$  – measurement range  $Q_{max}/Q_{min}$
- $E_{max}$  – permissible maximum measurement error in the measurement range  $R$

#### 3. Measurement repeatability:

**Repeability: 0,1%**

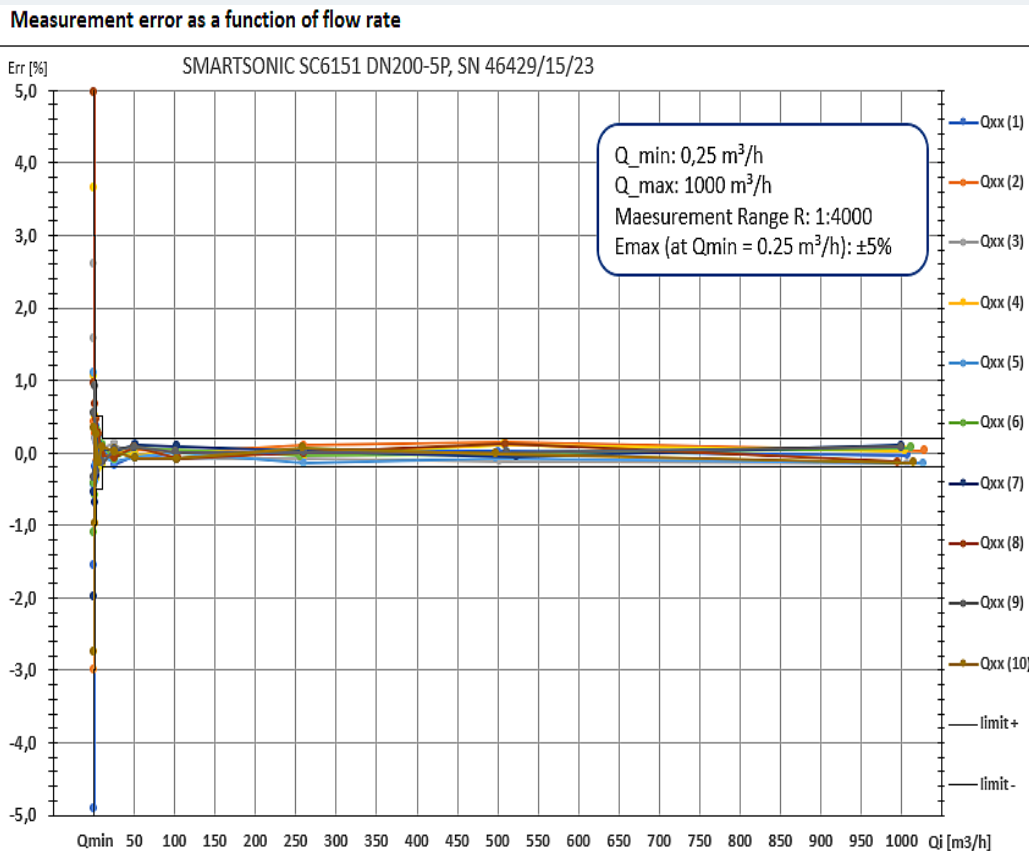
- Repeatability measured under a constant set of reference conditions



## Smartsonic – PROTOTYPE TEST RESULTS

### SMARTSONIC SC 6151- DN200 (5-beam)

#### 1. Measurement error as a function of flow rate:



#### 2. Measurement range as a function of the maximum permissible measurement error:

##### Measuring range R:

- R > 100 for Emax ± 0,2% at flow rate Qmin = 10 m<sup>3</sup>/h
- R > 400 for Emax ± 0,5% at flow rate Qmin = 2,5 m<sup>3</sup>/h
- R ≥ 1000 for Emax ± 1% at flow rate Qmin = 1 m<sup>3</sup>/h
- R ≥ 2000 for Emax ± 3% at flow rate Qmin = 0.5 m<sup>3</sup>/h
- R ≥ 4000 for Emax ± 5% at flow rate Qmin = 0.25 m<sup>3</sup>/h

- R – measurement range Qmax/Qmin
- Emax – permissible maximum measurement error in the measurement range R

#### 3. Measurement repeatability:

**Repeatability: 0,04%**

- Repeatability measured under a constant set of reference conditions

#### Main conclusions of the performed tests:

The conducted tests show that the developed flow measurement system achieves top technical parameters. In comparison with standard flowmeters, it is mainly a matter of achieving very high measurement accuracy in a wide range of measured flows.



# Research & Development

R&D output nearing production - Smartsonic



## Smartsonic – FURTHER STEPS

### Expected Further Steps to Complete the SMARTSONIC Development Project resulting from prototype testing:

1. Implement recommended documentation changes
2. Complete selected firmware and software features
3. Propose final flowmeter design and construction
4. Complete production documentation
5. Prepare commercial and technical documentation
6. Production of flowmeters for certification purposes (CE, ATEX, MID, OIML, IECEx, PED)
7. Certifications



In order to speed up the process, successfully complete the development and launch (commercialize) the products, **ELIS PLZEN is looking for a business partner who is interested in expanding its product portfolio with SMARTSONIC multi-beam ultrasonic flowmeters**, either through the purchase of a license or some other mutually agreed form of commercial and technical cooperation. In either case, the business partner could receive complete production, commercial and technical documentation, including relevant rights to the entire SMARTSONIC flowmeters.

### The expected procedure for preparing a contractual relationship could be as follows:

1. Signing of the NDA
2. Submission of a draft "Technical Specifications" (hereinafter TS)
3. Discussion and mutual approval of the TS
4. Technical and financial offer
5. Drafting of the contract
6. Signing of the contract

**INVESTMENT OPPORTUNITY**

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**ELIS PLZEŇ, a.s.**



**30+ YEARS**

DEVELOPMENT  
OF OUR OWN KNOW-HOW



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