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Annex No 10

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Investor: **Fertilizers Research Institute**

Project / task: **High Pressure Techniques Laboratory equipment with the modern infrastructure**

Title development: **High Pressure Techniques Laboratory Apparatus for testing high-pressure micronization**

Title document: **Technical specifications for purchase Specification**

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1. Subject of the order

The contract is for supply of complete factory-new testing apparatus for micronization of plant metabolites in carbon dioxide under high pressure.

2. Assumptions

Apparatus should:

- *enable to study processes of micronization and drying type Ress / GAS,*
- *enable to carry out the extraction process of solid products,*
- *have a computerized data acquisition system with computer,*
- *meet the following operating conditions:*
 - *max. operating pressure CO₂ 50 MPa,*
 - *max. operating temperature 200 °C,*
 - *max. flow CO₂ 30 l/h.*

3. Specification

The equipment should include the following elements

3.1. Spray column

- *Max. operating pressure CO₂ 50 MPa*
- *Max. operating temperature 200 °C*
- *Capacity ok. 6,4 dm³*
- *Scope :*
- *Threaded quick opening closures, measurement of internal temperature, heating with PID temperature control and insulation, 12 pressure connections (including one at the bottom and top of the column), optical windows, collecting basket for powder*
- *Materials: AISI 316 Ti*

3.2. Mass Flowmeter CO₂ with digital display of:

- *Actual mass flow,*
- *Total circulated mass,*
- *Temperature,*
- *Fluid density.*


3.3. Separator

- Max. operating pressure CO₂ 10 MPa*
- Max. operating temperature 60 °C*
- Capacity ok. 1,2 dm³*

Scope separator :

Threaded quick opening closures, measurement of internal temperature, heating jacket and insulation, optical windows, automatic level control, dip tube with diffuser

Materials: AISI 316 Ti

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3.4. **Stirring vessel**

Max. operating pressure CO₂ 50 MPa
Max. operating temperature 200 °C
Capacity ok. 1 dm³
Basket insert ok. 600 ml
Filter elements installed on both ends

Scope of vessel :

Threaded quick opening closures, measurement of internal temperature, heating with PID temperature control and insulation, adjustable speed stirrer, optical windows, automatic level control.

Materials: AISI 316 Ti

3.5. **Storage tank with condenser, sub-cooler and refrigeration unit**

Capacity 10 litre
Max. operating pressure 100 bar,
Operating temperature od -10 C do 20 °C

3.6. **Diaphragm pump CO₂**

Capacity 30 l/h
Max. operating pressure 500 bar

3.7. **Heat exchanger**

Max. operating pressure 500 bar
Max. operating temperature 200 °C

3.8. **Liquid product pump**

Max. operating pressure 600 bar

3.9. **Double wall tube heat exchanger**

Max. operating pressure 500 bar
Max. operating temperature 200 °C


3.10. **Pressure controllers with digital displays and triggered control valve systems in the spray column (position 1) and stirring tank (position 3).**

3.11. **Temperature controls:**

- in the spray column,
- in the stirring vessel ,
- in the heat exchanger ,
- In the condenser,
- in the separator.

3.12. **PLC control with integrated Batch Documentation**

3.13. **Piping: complete**

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3.14. **Wiring: complete**

3.15. **Safety:**

- 5 burst disc assemblies,
- Thermo contractors,
- Pressure limiter in controller.

4. **Technical requirements and regulations and standards**

Object of the contract must comply with existing legislation in the EU, especially concerning safety and environmental protection.

5. **Other requirements**

The Supplier should:

- a) ensure training of 2 people


6. **Scope of delivery**

Delivery of the Apparatus (incl. insurance and carriage) to Buyers legal address includes:

- Complete apparatus described in item 3
- Start-up of the apparatus
- Spare parts for two years operation
- Assembly, operating and maintenance instruction in polish or english version (one paper and one electronic version)
- Pressure test certificates
- Guaranty documentation for the Apparatus or the structural parts
- PID diagrams for the Apparatus
- Spare parts list with codes for commission
- Atypical tools for service.

7. **Guarantee**

- min. 12 months from start-up,
- each item which cannot fulfil technical requirements with respect to construction solutions, materials used and performance will be replaced by the Supplier with a new fault free item on cost of the Supplier.

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8. Scope of technical offer

Technical offer should contain:

- *Complete technical information incl. parts of the Apparatus,*
- *Assembly diagram and dimensions*
- *list of accessories that are not within the scope of delivery,*
- *information on the training and service*
- *Supplier guarranty*