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Specification for coulometric device for the determination of moisture in insulating oils for transformers.

- **Part I. Technical specifications.**
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Part I. Technical requirements

The required system will be suitable for the totally automated measurement of water content in transformer oil by the coulometric Karl Fischer method in combination with a Karl Fischer Oven or Vaporiser for sample preparation. The purpose of this is the decrease of used reagents (Coulomat Anolyte and Catholyte) for economic (lower cost per analysis) and environmental reasons (decrease of dangerous waste).

1. Technical Specifications.

The system should be consisted of the followings:

A. One KARL FISCHER COULOMETER, suitable for samples with low water content such as transformer oils, with the following specifications:

- 1.1. Determination range: 10 µg up to 200 mg H₂O.
- 1.2. Resolution: 0,1 µg H₂O.
- 1.3. Reproducibility better than 0.3%.
- 1.4. It should have integrated color display with real time curve display, in which are also displayed the quantity of titrated water in µg versus time and other parameters for programming and measurement (sample size, coulometer speed, time of measurement, sample ID, etc.). PC should not be required for normal operation.
- 1.5. It should have a magnetic stirrer for controlling the stirring speed.
- 1.6. It should have a pump for removing old reagents and adding fresh solution.
- 1.7. It should give results in % w/w., ppm, mg, µg, mg/L and other units that user should require. The formulas for the result should be freely programmable by the user.
- 1.8. It should have at least one USB port for data transfer and for connection with PC, balance, printer, barcode reader or PC keyboard. Also one Ethernet port and ability for direct LIMS connection. Finally it should be able to accept older devices that have only serial port.
- 1.9. The results should be generated directly to pdf format as reports and then saved to USB memory stick or transferred to PC or printer.
- 1.10. It should be conformed with G.L.P. practice and print based on that.
- 1.11. It should continuously display the reagent in µg/min that are required for keeping the cell dry (DRIFT).
- 1.12. Recalculation of the results after the end of the analysis.
- 1.13. It should be connected to a Karl Fischer Oven or Vaporiser for taking away the sample's water and transfer it in the measurement cell with the help of dry air or noble gas.
- 1.14. It should be able to be connected with an oven autosampler with at least 10 samples tray.
- 1.15. It should give to the user information like number of measurements, life time of reagent and alert him for the exchange of the reagent.
- 1.16. The user should be able to add on the desktop at least 10 favorite methods for direct execution.

- 1.17. It should be the last model of the manufacturer.
- 1.18. Ready for operation at 220V/50Hz.

To be accompanied by:

- 1.19. Generator electrode necessarily without diaphragm in order that only anolyte is necessary and not catholyte and to be more easy for handling and cleaning.
- 1.20. Measurement electrode from Pt.
- 1.21. One coulometric cell, magnetic stirring bars, silicone sleeves, cap, molecular sieve and in general all necessary accessories for normal operation.
- 1.22. Reagents (Coulomat anolyte, standard) for the first measurements.
- 1.23. Software for data transfer, storage and re-evaluation.

B. One Karl Fischer Oven or Vaporiser, with the following specifications:

- 1.24. It should be suitable for samples with very low water content like transformer oils (<50 ppm). For this the sample should be inserted in vials and with the double syringe method the water is transferred to the measuring cell with the help of noble gas or dry air.
- 1.25. It should have temperature range at least from 50 up to 250 °C.
- 1.26. It should have a temperature accuracy of ± 3 °C.
- 1.27. It should be able to be connected to Karl Fischer Coulometers as well Volumeter Titrators.
- 1.28. The tube that transfers the water from the device to the coulometer cell should be heated at above 50 °C in order to avoid condensations inside the tube.
- 1.29. It should have an integrated pump with a flow at least from 10 up to 150 ml/min.
- 1.30. It should be accompanied with all necessary accessories for normal operation (tubes, molecular sieve, double syringe, etc).
- 1.31. It should be accompanied with 100 vials with the smallest possible volume so there are not areas filled with air and possibly moisture that can affect the result, 100 cups and one tool for sealing the vials.
- 1.32. Ready for operation at 220V/50Hz.

Part II : Special requirements.

- 2.1. The instrument must be the most recent model of the manufacturer.
- 2.2. Manufacturer must be recognized worldwide and in Greece with proven experience on installing similar systems. It must be submitted for review a list of similar devices installed in Greece.
- 2.3. The supplier should fully install the system in the laboratory of ADMHE A.E./ DSSM/ TES/ YP. XHMEIO, Agias Annis 70, Aigaleo.
- 2.4. The supplier must prove that the system works well in not more than one month from the data of arrival of the system in ADMHE A.E./ DSSM/ TES/ YP. XHMEIO, Agias Annis 70, Aigaleo.

2.5. It must prove that the device works well checked for precision(standards) and repeatability of the method to sufficient number of oil samples (at least 5 samples) .

2.6. The supplier and the manufacturer must have ISO 9001.

2.7. The supplier has to install, fully operate the device and train the lab personnel on system operation.

2.8. It must be provided two (2) years of warranty.

The warranty will cover each failure outsided from the usual instrument failures and it will cover the work hours and the spare parts.

2.9. The supplier must undertake to supply spare parts for five years at least, within a period of 2 months from the data of request.

2.10. The supplier must provide manuals which fully describe the operation of the system with detailed instructions for service and repairs in case of operational failure.

2.11. Payment will be made after the successful installation and inspection of the system and it will begin the period of guarantee.

This guarantee will be covered with a supplier's bank draft corresponding to 10% of the total cost of the system and which will be returned to the supplier after two years of successful operation of the system.

Part III : Data to be supplied with the offer.

3.1. Description of the proposed device.

3.2. Description of the proposed method.

3.3. Leaflets (with pictures) in which all the technical characteristics of the device will be described.

3.4. The supplier must include in his technical offer a list of customers (name, addresses, telephones) which use the offered device in Greece or worldwide.

3.5. A list of spare parts .This list should not include prices.

However, the same list with the price of the spare parts must be included in the financial offer. The prices of the spare parts will not be taken into account the evaluation of the offer.

3.6. All the above mentioned specifications must be replied line by line by the bidder,

on pain of exclusion, and must be proved clearly in the manufacturer's brochures and data sheets.

Part IV : Additional requirements.

4.1. In case of a non-accurate translation , the Greek text of the specification will prevail.

4.2. In case of discordance between technical/special requirements and general requirements, the technical/special requirements will prevail.