

NOVASULF™ TL4000

ON-LINE LOW-LEVEL TOTAL SULPHUR DETERMINATION IN AUTOMOTIVE HEATING FUELS (GASOLINE, DIESEL)

The presence of high levels of sulphur in Automotive/ Heating fuels causes, after combustion, the production of SO₂ (Acid rain).

Governmental legislation is being enacted world-wide to reduce sulphur in Automotive/Heating fuels.

15 years ago, the accepted sulphur level was around 2%. Today, the accepted level is around 15ppm for low sulphur diesel.

As a result, refineries will have to add new hydro treating capacity and revamp existing units to meet new demands.

These low sulphur levels require an analyser with high sensitivity able to measure the actual levels and the future low levels.

OPERATING PRINCIPLE:

Using the NOVASULF™ TL4000, the resulting H₂S is measured by judging the increase in colour density from the formation of lead sulphide on the tape. By using a single optical sensor, temperature (zero) drift is eliminated, as it is confined to any ambient temperature changes occurring during an average of a few seconds up to a few minutes, depending on the range of the instrument. Built-in fail-safe circuits eliminate virtually all false alarms in the event of analyser malfunction they warn against hydrogen failure, furnace temperature failure, LED failure, optical sensor failure, power failure, tape breakage, out of tape, or motor failure. These messages are clearly indicated on the display. The built-in keyboard enables the user to program the analyser from the control room using the 4-20mA or RS.232 loop.

Since the patented catalytic element is self-regenerating and due to the high hydrogenation and cracking properties of this element, there is absolutely no need of manual or automatic regeneration of the furnace. No carbon build-up occurs in normal operation, even in the case of heavy hydrocarbon applications such as benzene, toluene and naphtha, where full catalytic conversion can be achieved at 650°C, compared to 1300°C with a conventional thermal cracking conversion.

This new concept of catalytic conversion, coupled with the field-proven NOVASULF™ H₂S analyser, makes the TL4000 the most state-of-the-art process Total Sulphur Analyser available today.



MAIN FEATURES:

- Compliant with ASTM Standard D4045
- Designed for process on-line analysis and to be installed in hazardous areas, covered by the appropriate ATEX certificates: EEx d[ia] IIC T4
- Use of a volumetric pump instead of an injection valve, resulting in a better injection stability and long-term operation without maintenance.
- Wide Rangeability
- Microprocessor Electronics

STANDARD SPECIFICATIONS

| | | | | | | | | | | |
|--------------------------------------|--|---|--|-----------------------|--------------------------------------|------------|-----------------------|-----------------------|--------------------------|---|
| - Principles | : Conversion of Sulphur compounds in Hydrogen sulphide (reduction in presence of Hydrogen). Detection of the resulting H ₂ S by colorimetry. (Speed of coloration of a lead acetate impregnated tape. Specific to H ₂ S without interferences with other substances). | | | | | | | | | |
| - Application | : For Liquid Hydrocarbons up to C15 and above depending on the required range. | | | | | | | | | |
| - Measuring method | : ASTM D 4045 | | | | | | | | | |
| - Detector | : Single photo-detector acting as measure and reference. | | | | | | | | | |
| - Electronic | : Microprocessed. | | | | | | | | | |
| - Range unit | : PPM by volume - PPM by weight - mg/Nm ³ - % V - selectable | | | | | | | | | |
| - Measuring rangeability | : 0-500 PPB up to 0-100%, <u>to be stated</u> | | | | | | | | | |
| - Sensitivity | : 1% of range | | | | | | | | | |
| - Response time | : Between 30 seconds and 8 minutes, depending on the range. Low ranges require longer response times. | | | | | | | | | |
| - Linearity | : ± 2% of the calibration full scale. | | | | | | | | | |
| - Reproducibility | : ± 2% of the calibration full scale. | | | | | | | | | |
| - Accuracy | : ± 2% of the calibration full scale. | | | | | | | | | |
| - Zero drift | : None due to single photo-detector technique. | | | | | | | | | |
| - Process alarm | : 1 programmable with the built-in keyboard potential free relay contacts 3 A, 220 V in N.O. or N.C. <u>to be stated</u> - Relay coil normally not energised or energised <u>to be stated</u> For more alarms, see options. | | | | | | | | | |
| - Fail alarm | : 1 programmable, potential free solid state relay contacts 3 A, 220 V in N.O. or N.C. <u>to be stated</u> - Relay coil normally not energised or energised <u>to be stated</u> For dedicated alarms, see options. | | | | | | | | | |
| - Power supply | : 110/230 VAC ±10 % - 50/60 Hz to be stated. | | | | | | | | | |
| - Power consumption | : 1,000 VA on 230 VAC. | | | | | | | | | |
| - RFI protection | : IEC 8013 Level 3 (CE Mark). | | | | | | | | | |
| - Analog output | : 4-20 mA, Self powered, isolated, 600 Ohms maximum loop load. | | | | | | | | | |
| - Digital output | : RS 232 C, 9600 bauds/s | | | | | | | | | |
| - Modem output | : See options. | | | | | | | | | |
| - Keyboard | : Built-in (Front panel). | | | | | | | | | |
| - Display | : LCD alphanumeric 2 lines, 32 characters, (16 per line). First line for sulphur concentration. | | | | | | | | | |
| - Conversion furnace | : Filament coil up to 1100°C or Ceramic fed with carbon up to 1400°C. | | | | | | | | | |
| - Reaction tube | : Quartz up to 1100°C. - Ceramic above 1100°C. | | | | | | | | | |
| - Type of conversion | : Pyrolysis or Catalytic - Depending the application (catalytic element optional) | | | | | | | | | |
| - Conversion furnace temperature | : Adjustable between 600 and 1400°C by means of the built-in temperature controller. | | | | | | | | | |
| - Sensing tape | : Lead acetate impregnated. | | | | | | | | | |
| - Tape life | : Between 14 and 40 days. Per roll depending on the application. Keyboard adjustable life span | | | | | | | | | |
| - Storage life | : 5 to 7 years minimum. Under sealed envelop | | | | | | | | | |
| - Humidifier | : 5 % acetic acid in distilled water 5 to 15 cc per week consumption. | | | | | | | | | |
| - Sample inlet pressure | : 4-10 bara | | | | | | | | | |
| - Sample flow rate | : 3 microliter up to 20 cc/min | | | | | | | | | |
| - Sample temperature | : -5°C up to + 60°C (liquid phase) | | | | | | | | | |
| - Sample injection | : Liquid injection valve/pump. Adjustable injection flow rate through the keyboard. | | | | | | | | | |
| - Hydrogen inlet pressure | : 4-10 bara | | | | | | | | | |
| - Hydrogen flow rate | : 200 up to 500 cc/min adjustable. | | | | | | | | | |
| - Hydrogen/Nitrogen fail | : Instrument equipped with a shut off valve closing the sample inlet in case of H ₂ fail in order to avoid carbon build-up in the furnace. Another valve is used to stop the H ₂ in case of N ₂ fail (regeneration mode only). | | | | | | | | | |
| - Nitrogen inlet pressure | : 4-10 bara | | | | | | | | | |
| - Nitrogen flow rate | : 200 cc/min <u>during regeneration cycle only.</u> | | | | | | | | | |
| - Instrument Air inlet pressure | : 4-10 bara | | | | | | | | | |
| - Instrument Air flow rate | : 200 cc/min <u>during regeneration cycle only.</u> | | | | | | | | | |
| - Vent | : To atmosphere NO BACK PRESSURE OR VACUUM ALLOWED. | | | | | | | | | |
| - Regeneration System | : In case of excess sample without H ₂ in the furnace, carbon build-up appears in the reaction tube affecting the accuracy of the analysis. In this case, a regeneration cycle starts with the following sequences : <table border="0" style="margin-left: 20px;"> <tr> <td>• Stop sample and H₂</td> <td>• Flow Air/O₂ to burn the carbon</td> <td>• Stop N₂</td> </tr> <tr> <td>• Flow Nitrogen to purge the system.</td> <td>• Stop Air</td> <td>• Flow H₂</td> </tr> <tr> <td>• Stop N₂</td> <td>• Flow Nitrogen to purge</td> <td>• Flow sample back to normal operation.</td> </tr> </table> | • Stop sample and H ₂ | • Flow Air/O ₂ to burn the carbon | • Stop N ₂ | • Flow Nitrogen to purge the system. | • Stop Air | • Flow H ₂ | • Stop N ₂ | • Flow Nitrogen to purge | • Flow sample back to normal operation. |
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| • Stop N ₂ | • Flow Nitrogen to purge | • Flow sample back to normal operation. | | | | | | | | |
| - Area classification | : General purpose for TL 1000 / TL 2000 Models. – EEx d[ia] IIC T4 ATEX for TL 4000. INERIS certified for -20°C up to +60°C ambient temperature. | | | | | | | | | |
| - Ambient working temperature | : -2°C up to 50°C. 5°C temperature stability required for optimum operation. | | | | | | | | | |
| - Storage temperature | : -15°C up to 55°C - 95 % R.H. | | | | | | | | | |
| - Material | : All components, in contact with the sample, are compatible with sulphur. | | | | | | | | | |
| - Connections | : 1/4" NPT Female bulkhead unions. | | | | | | | | | |