

Micro-set

Prover sphere detector



KROHNE

▶ *achieve more*

- ▶ Enhanced repeatability in excess of API Chapter 4, for greater control on metering accuracy
- ▶ Quick change-out and no need to re-calibrate your prover
- ▶ One model fits all prover pipes from 3 – 36 inches
- ▶ Stainless steel wetted parts make the Micro-set suitable for most products



Micro-set Prover Sphere Detector

No matter how precisely you engineer your prover - and very few in the world can reach our quality - it's the sphere detection that determines the accuracy.

Micro-set has all the features you need:

- ▶ Proven accuracy & reliability
- ▶ Repeatable for the lifetime of the detector
- ▶ Robust, durable and hard-wearing
- ▶ In service all around the world for over 25 years.

Micro-set Prover Sphere Detector

Micro-set meter prover sphere detectors have shown themselves repeatable and reliable on NGL, butane, propane, refined petroleum products and crude oil. The detectors have performed well on hot, heavy, waxy crude oil and special flushing ports can be incorporated to enable cleaning during shut-down in extreme circumstances.



Retrofit model for replacing other types of detector

KROHNE can manufacture special Micro-set sphere detectors to suit your application. Given detailed dimensional information regarding your existing sphere detector boss KROHNE design a retro-fit adaptor to suit. The Micro-set design is then tailored to suit the retro-fit adaptor and the existing detector boss.

The period from receipt of purchase order and detailed information to despatch from KROHNE can be as little as 5 working weeks.



Designed to perform beyond existing limitations

Technical description

The Micro-set meter prover sphere detector was originally designed and developed to satisfy a requirement for a 3" ball prover for butane and propane, a requirement which no existing proprietary unit could meet at the time.

The Micro-set sphere detector is a mechanically activated position sensor for signalling the passage of a meter prover sphere. The unit is bolted to the prover loop pipe by means of a mounting boss, this allows the Micro-set plunger to protrude through the pipe wall and the prover sphere depresses the plunger as it passes.

The plunger is fitted with magnets which actuate an encapsulated reed assembly; this switch contact accurately signals the sphere position within the prover.

A distinct advantage of the Micro-set sphere detector is its ability to be calibrated on a universal setting fixture. This ensures detectors can be interchanged without significantly changing the prover base volume; so no need to re-calibrate the prover.

The Micro-set is available in two standard designs, ANSI 600 rated and ANSI 1500 rated. The ANSI 1500 rated model although functionally identical to the ANSI 600 model is physically larger to enable it to withstand the higher pressure forces experienced in service.



Calibration tests

Any Micro-set sphere detector that is set correctly using the same setting fixture can be exchanged in a pipe prover without significantly changing the base volume. Calibration tests undertaken by SGS, the international calibration specialists, on a four detector 10" prover loop produced the following results.

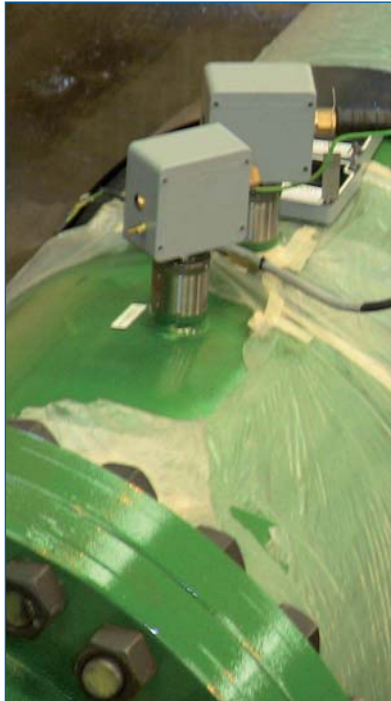
| Test No. | Description of cross-over tests | Flow Rate Litres/min | Base Volume SI Litres | Repeatability |
|----------|---|----------------------|-----------------------|---------------|
| 1 | Detectors A and B preset prior to calibration runs, to establish the initial base volume. | 350 | 1727.732 | + 0.0025% |
| 2 | Detectors A and B removed. Detector A replaced by detector B and a new detector C substituted in the previous position of detector B. | 350 | 1727.833 | + 0.007% |
| 3 | As Test 2, but at a reduced flow rate. | 200 | 1727.725 | + 0.0015% |
| 4 | Detector C replaced by detector A from Test 1 | 350 | 1727.716 | + 0.0045% |

The total spread of results from the four tests was only 0.0068%.



KROHNE Oil & Gas is an ISO 9001 certified company. We guarantee the highest possible quality.

Proven options ensure reliable results under all circumstances



The vast majority of detectors supplied are of standard design however there are two optional design enhancements that may be incorporated into both the ANSI 600 and ANSI 1500 models where application conditions are particularly onerous.

In situ cleaning/flushing option

Where the flowing product is a crude oil with a high wax and/or sediment content there is the possibility that the build up of surface deposits within the detector body may prevent proper operation of the detector. Typically the movement of the plunger may be restricted potentially compromising repeatability or even causing the plunger to jam thus damaging the prover sphere. The addition of a removable flushing plug allows the detector to be internally cleaned without removing it from the prover.

PEEK Bushes for dry/low lubricity applications

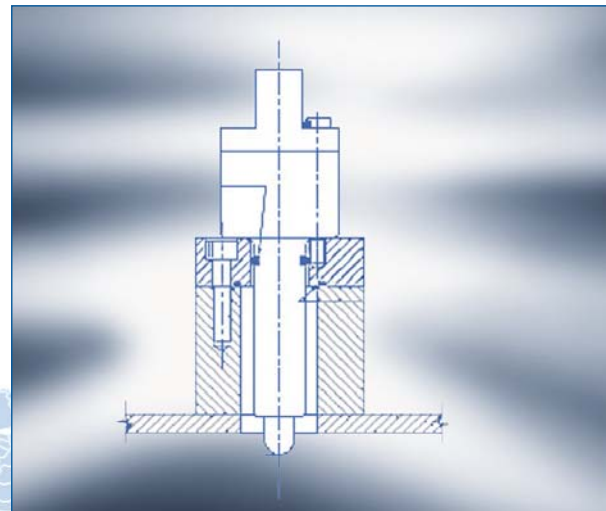
Some products such as liquefied gases (Propane and Butane) exhibit no natural lubrication and are classified as "dry" products. For continuous use in these conditions the addition of dry running bearings as an interface between the plunger and lower body surfaces is desirable. Peek bushes are incorporated in the detector assembly when new or can be fitted to an existing standard detector.

Modernise your existing prover

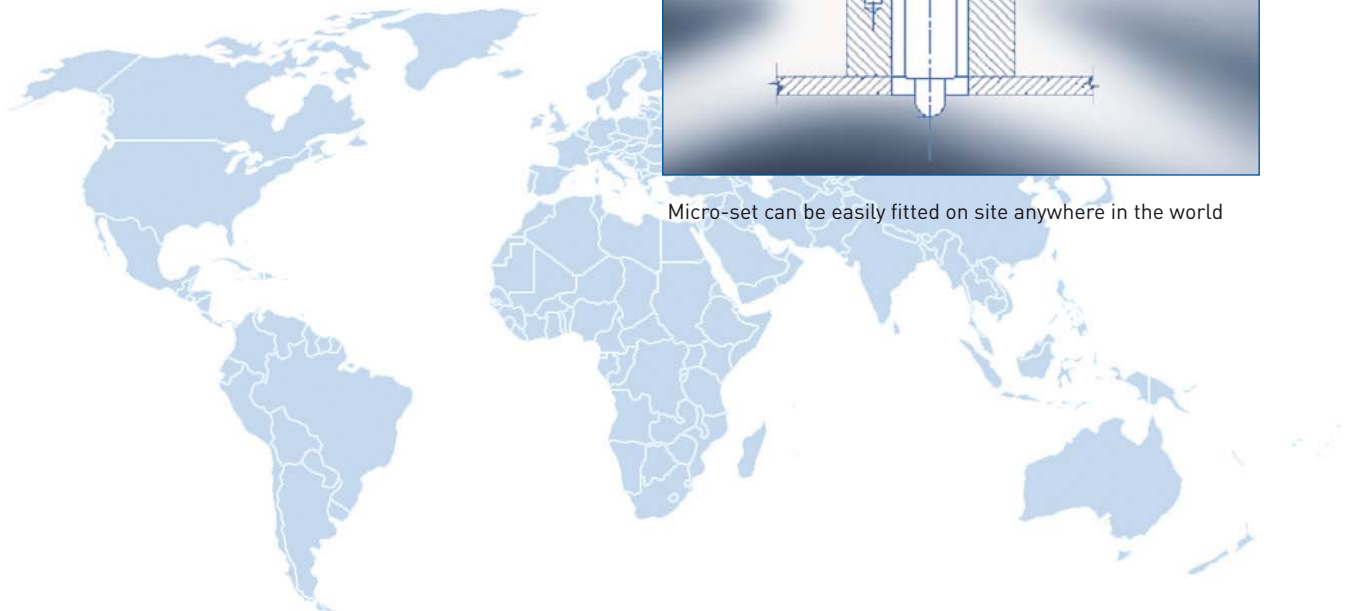
Retrofits

The Micro-set may be mounted on an existing prover which has been fitted with mounting bosses for other detector types. To achieve this, the Micro-set may be supplied with an extended plunger and modified body to aid the direct replacement of the existing detector type.

Alternatively the Micro-set can be fitted with an extended plunger and an adaptor.





Micro-set can be easily fitted on site anywhere in the world



ATEX Approval

The Micro-set Sphere Detector is certified EExd IIB T6 and is suitable for use in hazardous areas.

1 EC TYPE-EXAMINATION CERTIFICATE

2 Equipment intended for use in Potentially Explosive Atmospheres Directive 94/9/EC

3 Certificate Number: **Sira 03ATEX1127X** Issue: **2**

4 Equipment: **MSDI Micro-Set Sphere Detector**

5 Applicant: **KROHNE Oil & Gas (UK) Ltd.**

6 Address: **70 Carwood Road
Sheffield
South Yorkshire
S4 7SD
UK**

7 This equipment and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

8 Sira Certification Service, notified body number 0518 in accordance with Article 9 of Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment intended for use in potentially explosive atmospheres given in Annex II to the Directive.


The examination and test results are recorded in the confidential reports listed in Section 14.2.

9 Compliance with the Essential Health and Safety Requirements, with the exception of those listed in the schedule to this certificate, has been assured by compliance with the following documents:
EN 50014:1997 (amendments A1 and A2)
EN 50018:2000


10 If the sign 'X' is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

11 This EC type-examination certificate relates only to the design and construction of the specified equipment. If applicable, further requirements of this Directive apply to the manufacture and supply of this equipment.

12 The marking of the equipment shall include the following:



II 2 G
EEx d IIB T6 (Ta = -40°C to +60°C)



C Ellaby
Certification Officer

Project Number **51A18800**
C. Index **13**



This certificate and its schedules may only be reproduced in its entirety and without change.

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Form 9400 Issue 1

SCHEDULE

EC TYPE-EXAMINATION CERTIFICATE **Sira 03ATEX1127X**
Issue 2

13 DESCRIPTION OF EQUIPMENT

The MSDI Micro-Set Sphere Detector comprises a detector tube containing an encapsulated reed switch, which is rated up to 2 A at 250 V d.c. The detector tube is fitted into a housing, which comprises four main components; a lower detector housing, detector plunger, spring and top housing. The lower detector housing connects to the associated pipe wall and the top housing connects to a suitably certified terminal enclosure. The lower and top housings are secured together by two M8 x 25 hexagonal socket head screws. The detector plunger and spring are contained within the interface between the lower and top housings. The movement of detector plunger over the detector tube operates the reed switch.

Variation 1
This variation introduced the following change:
l. The change of company name from Skeltonhall Limited to Skeltonhall Systems Limited.

Variation 2
This variation introduced the following change:
l. The change of company name from Skeltonhall Systems Limited to KROHNE Oil & Gas (UK) Ltd.

14 DESCRIPTIVE DOCUMENTS

14.1 Drawings
Refer to Certificate Annex.

14.2 Associated Sira Reports and Certificate History

| Issue | Date | Report No. | Comment |
|-------|----------------|------------|--|
| 0 | 5 June 2003 | RS1A9253A | The release of prime certificate. |
| 1 | 16 May 2007 | RS1A16585A | This Issue covers the following changes: <ul style="list-style-type: none"> All previously issued certification was rationalised into a single certificate, Issue 1. Issue 0 referenced above is only intended to reflect the history of the previous certification and has not been issued as documents in this format. The introduction of Variation 1. |
| 2 | 15 August 2008 | RS1A18800A | The introduction of Variation 2. |

15 SPECIAL CONDITIONS FOR SAFE USE (denoted by X after the certificate number)

15.1 The product shall be terminated with a suitable enclosure that has been certified by a notified body and provides protection for the free end of the permanently connected, un-terminated cable.

15.1 The product shall be earthed in accordance with the latest edition of EN 50014.

16 ESSENTIAL HEALTH AND SAFETY REQUIREMENTS OF ANNEX II (EHSRs)

The relevant EHSRs that are not addressed by the standards listed in this certificate have been identified and individually assessed in the reports listed in Section 14.2.

17 CONDITIONS OF CERTIFICATION

17.1 The use of this certificate is subject to the Regulations Applicable to Holders of Sira Certificates.

17.2 Holders of EC type-examination certificates are required to comply with the production control requirements defined in Article 8 of directive 94/9/EC.

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Form 9400 Issue 1

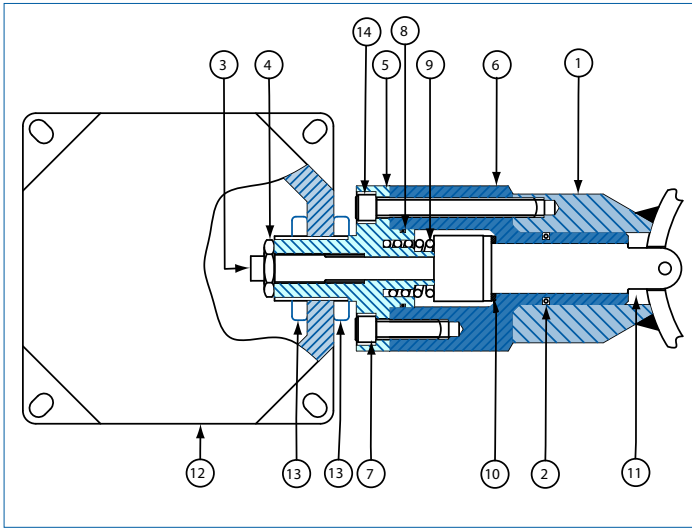
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Web: www.sira-certification.com

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Micro-set Detector Parts

including all wearing, non-wearing and consumable items



| Item | Component | Number per detector | Material | Reference Number |
|------|---|---------------------|--------------------------------|------------------|
| 1 | Prober pipe boss | 1 | carbon steel / stainless steel | |
| 2 | O ring | 1 | Viton | PL1193/9 |
| 3 | Reed switch assembly | 1 | Brass | PL1193/11,12,18 |
| 4 | Reed lock nut | 1 | Brass | PL1193/10 |
| 5 | Top housing and label | 1 | 316 stainless steel | PL1193/41 & 3A |
| 6 | Bottom housing and label | 1 | 316 stainless steel | PL1193/8 & 8A |
| 7 | M8 x 25mm socket screws | 2 | 316 stainless steel | PL1193/5 |
| 8 | O ring | 1 | Viton | PL1193/13 |
| 9 | Spring | 1 | 302 stainless steel | PL1193/7 |
| 10 | Plunger washer | 1 | PEEK | PL1193/15 |
| 11 | Plunger | 1 | 316 stainless steel | PL1193/42 |
| 12 | Junction box | 1 | GRP/stainless steel | |
| 13 | Top and bottom lock nuts and washers for junction box | 2 | Brass/fibre | |
| 14 | M8 x 65mm socket screws | 4 | 316 stainless steel | PL1193/6A |

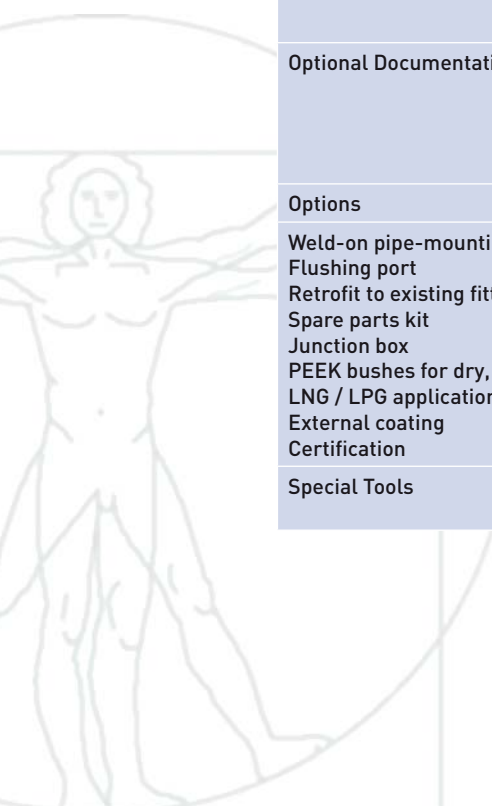
The items in this parts list refer to the Micro-set Detector Arrangement drawing above.

Specifications.

| | |
|----------------------------------|--|
| | |
| Pipe diameter | 3" to 36 and larger |
| Pressure rating | ANSI 600# & 1500# (higher available on request) |
| Element type | Encapsulated reed switch |
| Switch rating | 250V DC at 2 amps or 250V AC maximum |
| Power supply | 24VDC |
| Process connection | Mounting boss |
| Plunger hole diameter | 20 or 32mm depending on pipe wall thickness |
| Vertical displacement resolution | +/- 0.2 mm |
| Design pressure | 600# = 102 barg, 1500# = 255 barg |
| Design temperature (process) | -15 ... +200 °C |
| Design temperature (ambient) | -40 ... +60 °C |
| Materials | Housing: 316 stainless steel Wetted parts: 316 stainless steel O-rings: Viton |
| Electric. Classification | Eex d IIB T6 II 2 G ATEX |
| Cable entry (to junction box) | Customer to advise |
| Hazardous area classification | ATEX II2G, EEx' d' IIB T6 ATEX Certificate No: Sira 03ATEX1127X Issue 2 |
| Certification | SIRA Certificate - SIRA 03ATEX1127X Issue 2 EEx d IIB T6 Ex II 2 G, to ATEX Directive 94/9/EC |

Specifications

| | | |
|---|--|-----------------|
| | | |
| Documentation | Setting, Installation, operating and maintenance manual General arrangement drawing (included in above SIOM manual) Certificate of conformity ATEX hazardous area certificate Detector functional test reports, including pressure tests | |
| Optional Documentation | NACE certification (must be stated at time of order) Junction box hazardous area certificate Junction box IP rating certificate Junction box installation instructions Mounting boss material certificate | |
| Options | | |
| Weld-on pipe-mounting boss | Carbon steel | Stainless steel |
| Flushing port | | |
| Retrofit to existing fittings | | |
| Spare parts kit | | |
| Junction box | GRP | Stainless steel |
| PEEK bushes for dry, low lubricity | | |
| LNG / LPG applications | | |
| External coating | Xylan | |
| Certification | NACE MR 01-75 | |
| Special Tools | ANSI 600# - Setting Jig ANSI 1500# - Setting Jig | |



Micro-set is fitted as original equipment to all KROHNE provers

Systems

- Flow Meters for Custody Transfer
- Liquid Flow Metering Systems
- Gas Flow Metering Systems
- Wet Gas Metering Systems
- Provers & Master Meters
- Flow Computing, Supervisory Software & Analyzer Management
- Calibration Systems
- Tank Inventory & Management Systems
- Analyzer Houses and Shelters
- Loading & Off-loading Systems
- Leak Detection and Localisation Systems
- Revamps & Upgrades
- Testing, Installation, Commissioning, Service
- Training

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Products

- Gas Ultrasonic Flow Meters for Custody Transfer
- Liquid Ultrasonic Flow Meters for Custody Transfer
- Mass Flow Meters for Custody Transfer
- Venturis for Wet Gas Metering
- Prover sphere detectors
- Flow Computers
- Supervisory Systems
- Meter Validation Software Packages
- Electromagnetic Flow Meters
- Level Measuring Instruments
- Variable Area Flow Meters
- Temperature Measuring Instruments
- Pressure Measuring Instruments
- Analyzers
- Vortex Flow Meters
- Flow Controllers

