



PROFILER

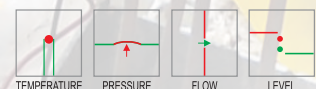
**Reactor Temperature
Measurement System**

**965# SERIES
CATALYST PROFILER
REACTOR MULTIPOINT THERMOCOUPLES**

PYRO ELECTRIC®

✓ *We sense it the best*

Call us for presentation on +91 (832) 2252719
OR write to us on marketing@pyro-electric.in



PYRO/15-16/CORP.

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965# SERIES CATALYST PROFILER MULTIPOINT THERMOCOUPLES

Reactor Temperature Measurement System

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- OUR ADVANCED MULTIPOINT TEMPERATURE SENSORS PROVIDE RELIABLE MONITORING OF THE CATALYST CONDITIONS.
- IMPROVES THE PERFORMANCE AND OUTPUT OF YOUR CATALYTIC PROCESSING UNIT.
- ADDS TO YOUR REFINING MARGINS.
- SUITABLE FOR HYDROPROCESSING & OTHER BED TYPE REACTORS IN :

HYDROTREATERS

HYDROCRACKERS

CCR

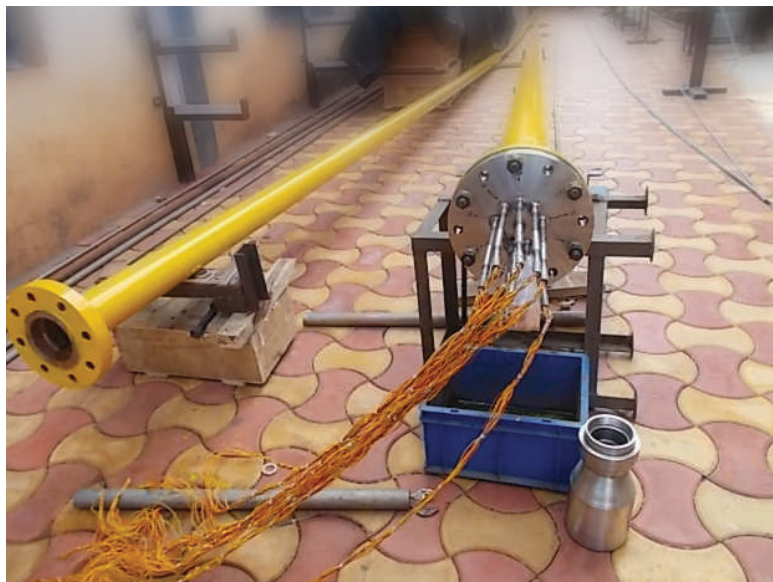
AROMATICS

CO SHIFT

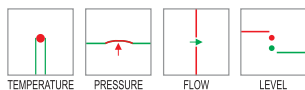
Temperature measurement systems for monitoring catalyst temperature is a vital aspect of a hydrocarbon reactor. Atypical reactor in a refinery such as a hydrotreater would employ such temperature measuring sensors in the catalyst bed, popularly known as Multipoint Reactor thermocouples.

Pyro Electric Instruments Goa, India, specializes in advanced multipoint temperature sensors for catalyst beds, by using the flexible multi-junction thermocouple technology to generate a profile of temperature. Such a technology can be employed in all the catalyst bed reactors for DHT, VGO, DHDS and CCR plants.

Pyro Electric's CATALYST PROFILER multipoint system consists of one or more thermocouple sheaths, which can provide between 2 to 9 measuring points on each sheath. Depending on the process connection flange size, the catalyst profiler can employ upto 10 thermocouple sheaths or 80 sensing points through one nozzle, and spread over the catalyst bed.



A 40 point Catalyst profiler Reactor thermocouples
for a PX reactor ready for hydrotest

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The thermocouple sheaths have a robust Mineral Insulated construction, and are directly TIG welded to the process flange. These sheaths exit through the secondary sealing containment chamber and terminate into a Junction box directly or remotely. The thermocouple sheaths can be provided special ceramic to metal cold end sealing to ensure leak-proof sheath design and close any possible leakage paths through the Mineral insulated sheath.

The sheath's swaged design allows for higher diameter in the welding zones, thereby improving the weld joint reliability. The swaged design of sheath as well cuts down heavily on the number of weld joints due to avoidance of intermediate feed through sleeves at weld points.

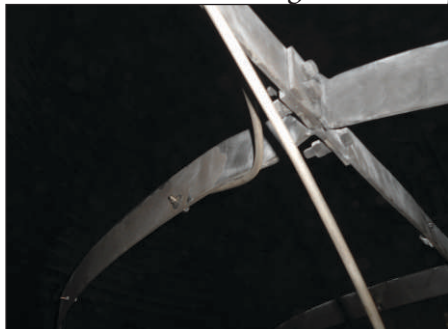
The Catalyst Profiler comes with a complete in-reactor installation kit consisting of

- cleats for welding onto the reactor wall,
- brackets and support structures



Site installation being carried out in a DHT reactor at a refinery in North India.
Location : Bhatinda

These kits are worked on right from concept & design to installation and site support, and supervised by our team of site engineers

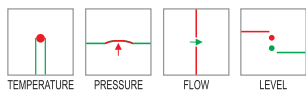


Typical installation arrangements of wall supports, brackets and circular supports at one of the site in Southern India. Location : Mangalore

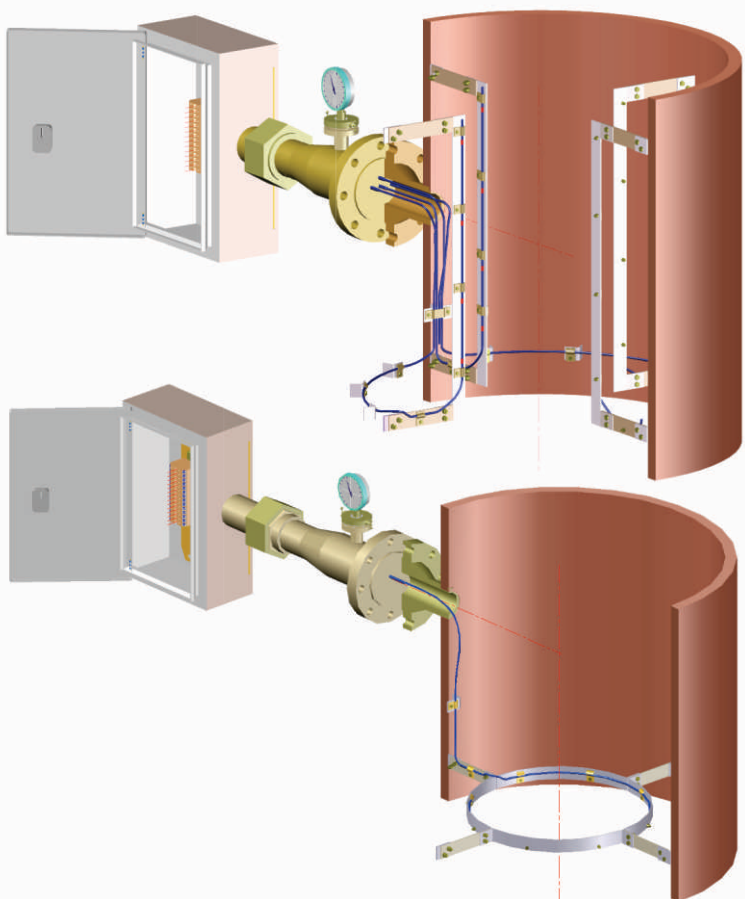
Every component & manufactured product is 100% tested for performance & reliability at our facility in Goa. Special attention is given to aspects such as

- PMI
- Thermocouple accuracy and characteristics
- Weld joint integrity by hydro and pneumatic pressure test, alongwith Dye Penetrant test
- Sheath integrity test
- 100% material traceability

At Pyro Electric, we would be glad to share our applications and answer questions about the Catalyst Profiler. Please email us at catalystprofiler@pyro-electric.in or visit us at www.pyro-electric.in and we will get in touch with you.



COMPLETE IN-REACTOR INSTALLATION STRUCTURES FOR



Vertical Mounting of Thermocouples

This arrangement can replace the 'spider-web' configuration in many cases, however is also ideal in cases of hot junctions located in different axis and plane (such as spiral arrangement).

In such a design, the vertical support structure allows for routing the thermocouples along the length of the reactor and generating a hot junction profile which is more dense compared to the concentric design.

Circular Concentric mounting of Thermocouples

This arrangement is typically suited in bed type reactors wherein the measuring points are located in a single axis fashion.

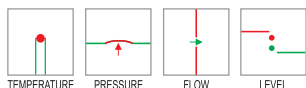
In such a case, the 'spider-web' configuration of the support structure locates the hot junctions at various elevations in the SAME plane.

Catalyst profiler Thermocouple Assembly triumph over regular Multipoint Thermocouple Assembly

- Catalyst profiler Multipoint Thermocouple assembly comprises of one or more mineral insulate Thermocouple cable with several hot junctions along the length.
- Assembly can be designed to provide several sensing points to measure the Temperature inside the vessel.
- Each sensing point is independent & isolated from one another & ungrounded from sheath.
- Seamless sheath along the entire length ensures usage at very high operating pressures. The welded end of the sheath is checked by N₂ pressure test at 100 Bar.
- Welded to mounting flange & provided with secondary containment chamber to ensure safe & reliable operation for use in high pressure vessels.
- Sensing points can be placed anywhere inside the vessel or catalyst bed, with minimum mounting hardware.
- Catalyst profiler Multipoint Thermocouple assembly can be designed for use on Retrofit vessel or on Reactor or on any other hydrocarbon storage equipment & our scope could also include design, supply, installation & commissioning of the temperature profiling system.
- Can be supplied with 2-Wire Temperature Transmitter of reputed Make with HART[®], Fieldbus[®] or Profibus[®] protocol.

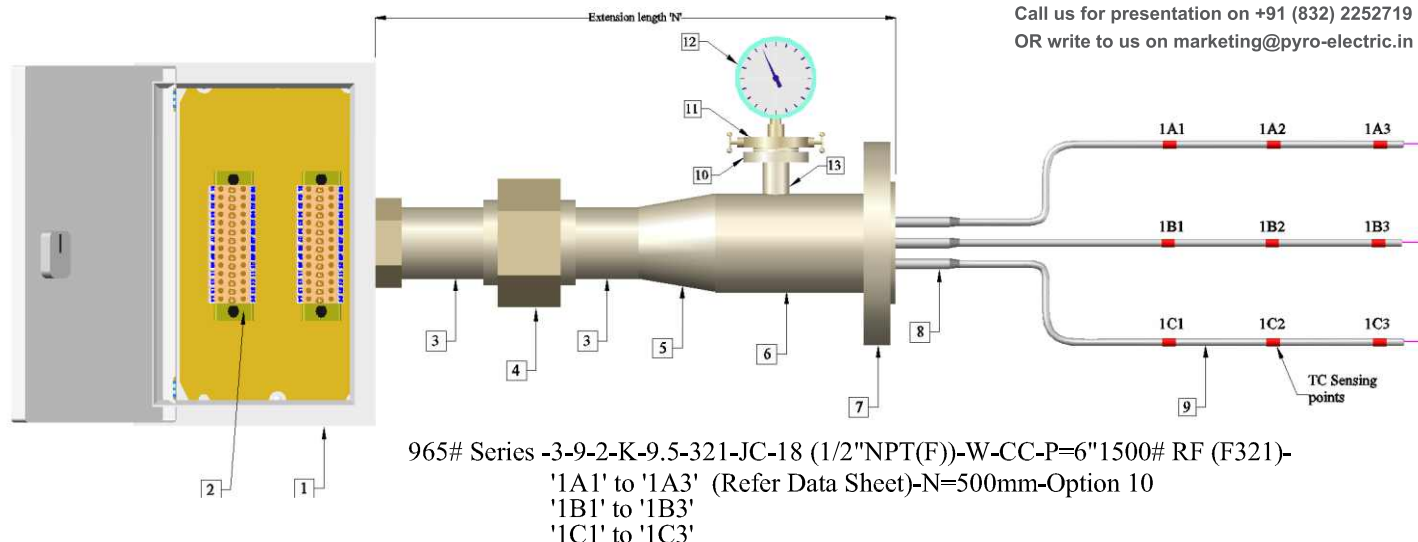


Bracket installation underway in a VGO reactor.
Location : Bhatinda Client : HMEL. Licensor : Axens



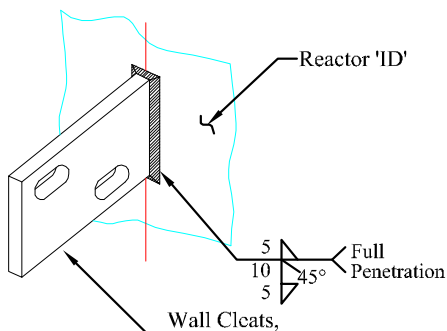
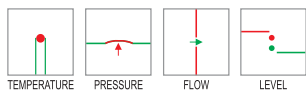
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SRL	TYPICAL PARTS DESCRIPTION	TYPICAL DIMENSION / SIZE	TYPICAL MATERIAL	TYPICAL QTY.
01	Junction Box, Ex-proof IIC & W/p to IP:66	-	Die cast Al	01
02	Terminal Strip, 2 Rows of 20 terminals each	2.5 Sq mm	-	40
03	Nipple	2" NPT(M) X2" NPT (M)	SS 316	02
04	Union	2" NPT (F) X2 NPT (F)	SS 316	01
05	Reducer	3" x 2"	SS 316	01
06	Pipe for containment chamber	3" Sch 80, 120 mm long	SS 321	01
07	Blind Flange	6" 1500# RF	ASTM A182 F321	01
08	Feed thru'	OD= 12.7	SS 321	06
09	TC sheath, MI, type 'K', 9.5, with 3 nos duplex sensing points	OD=9.5	SS 321	03
10	Flange	1.5" 1500#RF	A182 F321	01
11	Monoflange Manifold with block & bleed Valve	1.5" 1500# RF	A182 F321	01
12	Pressure Gauge (Range: 0 to 160 kg Cm2)	-	-	01
13	Pipe	1/2" Sch 160, 70 mm long	SS 321	01

Thermocouple sheath 'OD'		No of Conductors	Simplex sensing Points	Duplex Sensing Points	Minimum Sheath thickness in mm
mm	Inches				
9.5	3/8"	16	8 nos	4 nos	1.5
9.5	3/8"	12	6 nos	3 nos	1.5
9.5	3/8"	8	4 nos	2 nos	1.5
9.5	3/8"	6	3 nos		1.5
9.5	3/8"	4	2 nos	1 no	1.5
12.7	1/2"	18	9 nos		1.5

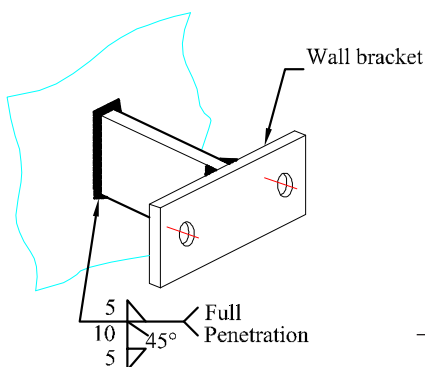


SITE SUPPORT ACTIVITIES OFFERED BY US FOR CATALYST PROFILER THERMOCOUPLES

Pyro Electric Instruments Goa - India offers complete assistance for site installation, supervision and satisfactory handover of the Catalyst Profiler thermocouples. The Catalyst Profiler site support team consists of

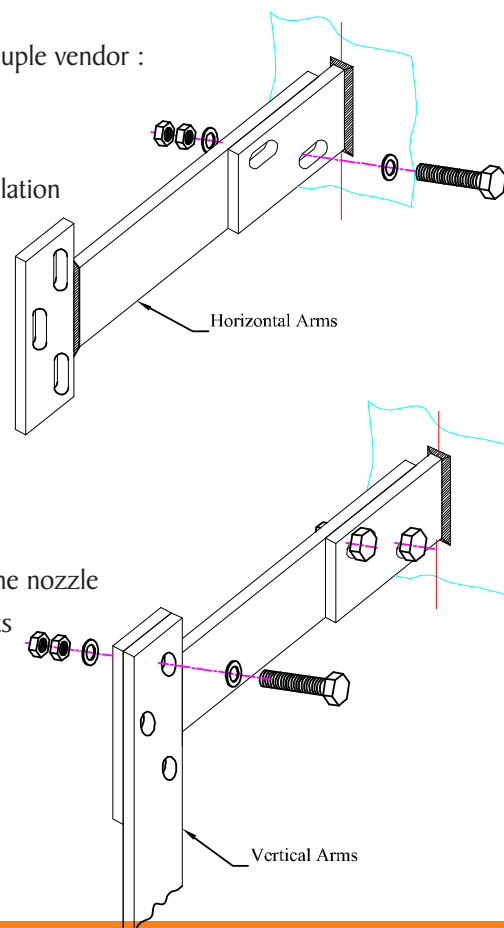
- A senior engineer with an experience of over 10 years – Head of the team
- A welder
- 3 fitters / helpers

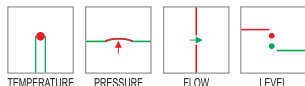
The site support team is guided by the internal OHSAS guidelines of the Company driven by ISO 18001. The team is equipped with PPE at all times



ACTIVITIES undertaken as a part of the package by Pyro Electric as a Reactor thermocouple vendor :

- Safety Induction and Orientation
- Meeting with Mechanical contractor at the project site, for scheduling the installation
- Meeting with the customer and licensor.
- Preparation of a plan of installation activity and the Inspection plan
- Identification and marking of the points of installation inside the reactor.
- Welding of brackets on the wall
- Fixing of brackets on the arms, and then arms to the circular support.
- MARKING of Hot junction locations on the support as per requirements
- Functional check of the thermocouples before installation
- Straightening of MI thermocouple near nozzle
- ENSURE installing the flange gasket before pushing the thermocouples inside the nozzle
- Guide the MI thermocouples to its locations inside the reactor onto the brackets
- Bolt the flange
- Functional test of Thermocouples – mV output and response time checking
- Offer final inspection to Licensor





Reactor Temperature Measurement System

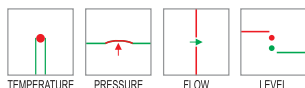
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Ordering Example - THERMOCOUPLE

Model No: 400#-MI-2-K-6-20AWG-SS316-IEC584-CJT1001-400-D_IP67-1-HA108-SS316-F316-250-0-80-150-1/2"-150-RF-28-26-16-0-0-7-6-Op 1A,3A,5A,4B,31A,15B,16B

Model	Suffix Codes	Description
965 #TC		965#TC Multipoint thermocouple
Thermocouple Type	MI.....	Mineral Insulated
Number of TC sheaths	1 - 10 (define).....	Number of sheaths welded to the flange
Number of TC points	(define).....	Total number of measuring points (e.g 40)
Each TC element	1..... 2.....	Simplex Duplex
Element Type	J..... K..... T..... E..... N.....	Iron Constantan Chromel Alumel Copper Constantan Chromel Constantan Nicrosil Nisil
Sheath Diameter of TC	9.5..... 12.7.....	9.5mm 12.7mm
Sheath Material for TC	316..... 316L..... 321..... INC 600.....	SS316 SS316L SS321 Inconel 600
Calibration Standard	ANSIMC96.1..... DIN43710..... IEC60584.....	TC calibration as per ANSIME 96.1 TC calibration as per DIN 43710 TC calibration as per IEC 60584
Junction Box Type	JD_IP67..... JC.....	Weatherproof with IP67 Certified as per IEC 60529 Explosion Exd IIC T6,IP67 as per IEC 60079 (For more options refer table H)
No of Conduit Entries	01-40..... XX.....	Number of input + output entries Note Applicable
Primary Seal	W.....	Welded
Secondary Seal	CC.....	Containment Chamber
Flange Material	F321..... F316..... F316L.....	SS 321 SS316 SS 316L (Other options available)
Each Thermocouple location / sheath	A1,A2,A3,A4.....(define length)..... B1,B2,B3,B4.....(define length).....	A1 = location of first measuring point on sheath 1 B1 = location of first measuring point on sheath 2 (and so on)
Head extension length mm*	N.....	Head extension length 'N' mm
Flanged Process Connection Size	2.....	2" ANSI (Other options available)
Flanged Process Connection Rating	150#..... 300#..... 600#..... 900#..... 1500#..... 2500#.....	150# as per B16.5 300# as per B16.5 600# as per B16.5 900# as per B16.5 1500# as per B16.5 2500# as per B16.5
Flanged Process Connection Facing	BLRF..... BLRTJ.....	Blind Raised Face Blind Ring Type Joint
Options.....		(For options refer table A)

*Please consult our marketing team for any non standard dimensions. Note: For field which are not applicable ,select 'XX' or enter '0' whichever is mentioned .



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REFERENCES OF CATALYST PROFILER SUPPLIES MADE BY PYRO ELECTRIC

The supply was made to :	Indian Oil Corporation Ltd, Mathura refinery
The reactor was :	CCR
The licensor for the plant was :	Axens
The number of sensing points were :	6 simplex points
The number of sheaths were :	1 sheath
The pressure rating was :	300#
The quantity supplied was :	1
The year of supply was :	2008

Performance
Certificate Received

The supply was made to :	Lukoil refinery RUSSIA
The reactor was :	HDS
The number of sensing points were :	4 point and 8 point
The number of sheaths were :	2 sheaths and 1 sheath
The pressure rating was :	900#
The quantity supplied was :	2
The year of supply was :	2008

Performance
Certificate Received

The supply was made to :	HPCL Mittal Energy Ltd, Bhatinda INDIA
The reactor was :	DHDT and VGO
The licensor for the plant was :	Axens
The number of sensing points were :	6 point, 12 point, 18 point and 24 point (all duplex)
The number of sheaths were :	maximum 8 sheaths per assembly
The pressure rating was :	900#
The quantity supplied was :	10
The year of supply was :	2012

Performance
Certificate Received

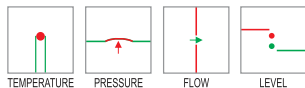
The supply was made to :	Mangalore refinery and Petrochemicals INDIA
The reactor was :	GOHDS
The licensor for the plant was :	Axens
The number of sensing points were :	12 duplex points
The number of sheaths were :	4 sheaths per assembly
The pressure rating was :	900#
The quantity supplied was :	3
The year of supply was :	2010

Performance
Certificate Received

The supply was made to :	HPCL Mittal Energy Ltd, Bhatinda INDIA
The reactor was :	DHDT and VGO
The licensor for the plant was :	Axens
The number of sensing points were :	6 point, 12 point, 18 point and 24 point (all duplex)
The number of sheaths were :	maximum 8 sheaths per assembly
The pressure rating was :	900#
The quantity supplied was :	10
The year of supply was :	2014 (installed and running)

The supply was made to :	Reliance Industries Ltd, Jamnagar INDIA
The reactor was :	PX4, Isomerization and Transalkylation
The licensor for the plant was :	CLG
The number of sensing points were :	40 duplex points and 9 duplex points
The number of sheaths were :	maximum of 10 sheaths per assembly
The pressure rating was :	300#
The quantity supplied was :	3
The year of supply was :	2015 (not yet installed)

The supply was made to :	Hindustan Petroleum Corpn Ltd, INDIA
The reactor was :	DHDS
The licensor for the plant was :	DuPont, Isotherming technology
The number of sensing points were :	12 duplex points
The number of sheaths were :	3 sheaths per assembly
The pressure rating was :	900#
The quantity supplied was :	2
The year of supply was :	2015 (installed and running)



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09 July 2012

TO WHOMSOEVER IT MAY CONCERN

This is to certify that M/s Pyro Electric Instruments Goa Pvt. Ltd have supplied and installed 6 Nos. of Multi Point Thermocouples for our Vacuum Gas Oil Hydro treater (VGO-HDT) Project. This is used in the Reactor operating at a pressure of about 68 atmospheres and temperature of about 365°C. This Reactor is used to reduce sulphur content of the Gas Oil. Technology for the project is provided by M/s Axens of France.

This Reactor is commissioned on 28th March, 2012. These thermocouples have been working satisfactorily without any problems since them. They have crossed the mile stone of completing 2000 hours of satisfactory non-stop working.

This certificate is issued at the behest on M/s Pyro Electric Instruments Goa Pvt. Ltd.

For HPCL- Mittal Energy Ltd


P.S. Prasad

Chief Manager- Maintenance

HPCL-Mittal Energy Limited

Regd. Office : Village Phulokhari, Taluka Talwandi Sabo, Distt. Bathinda, Punjab - 151301 Tele : +91 01655-271271, Fax : +91 01655 272150 Website : www.hmel.in
Corporate Office : INOX Towers, Plot No. 17, Sector 16-A, NOIDA-201301 (U.P.) INDIA



09 July 2012

TO WHOMSOEVER IT MAY CONCERN

This is to certify that M/s Pyro Electric Instruments Goa Pvt. Ltd have supplied and installed 4 Nos. of Multi Point Thermocouples for our Diesel Hydro treater (DHDT) Project. This is used in the Reactor operating at a pressure of about 60 atmospheres and temperature of about 335°C. This Reactor is used to reduce sulphur content of the Gas Oil. Technology for the project is provided by M/s Axens of France.

This Reactor is commissioned on 8th Feb, 2012. These thermocouples have been working satisfactorily without any problems since them. They have crossed the mile stone of completing 3500 hours of satisfactory non-stop working.

This certificate is issued at the behest on M/s Pyro Electric Instruments Goa Pvt. Ltd.

For HPCL- Mittal Energy Ltd


P.S. Prasad

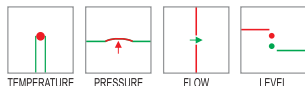
Chief Manager- Maintenance

HPCL-Mittal Energy Limited

Regd. Office : Village Phulokhari, Taluka Talwandi Sabo, Distt. Bathinda, Punjab - 151301 Tele : +91 01655-271271, Fax : +91 01655 272150 Website : www.hmel.in
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Thermal Resources Management LTD
TEMPERATURE HOUSE
21 Sedling Road
Wear Industrial Estate
Washington
Tyne & Wear
NE38 9BZ
United Kingdom

Thursday 4th June 2013

To whom it may concern,

This refers to our Purchase Order No 5439 dated 8th June 2009.

The Reactor Multi Point assemblies were supplied to Lukoil Refinery for measuring the Temperature of the catalyst bed in the HDS reactor & following is the translation of the letter sent by the end user, in Russian language.

To Mr. Ulanovsky,
Director of Obninsk Thermoelectric Company Ltd
4 Gorkogo Street
Obninsk
Kaluga Region
Russia 249033

Dear Mr. Ulanovsky,

In response to your enquiry, I can inform that two Reactor Multi Point Thermocouple assemblies manufactured by Pyro Electric Instruments Goa Pvt Ltd, Goa were 4 zone TP-K 0406(4-965)-I-9.5-12243 and 8 zone TP-K 0406(8-965)-I-2x9.5-9845 have been installed to the unit of hydro cleaning of diesel fuel LCh24/2000 at the reactor R200 during its refurbishment.

Over the period of use from December 2009 till August 2010 temperature readings of the assemblies are stable; their reaction to variation of technological parameters of the reactor is within expected tolerance. We do not have any complaint to the work of these assemblies

Signed by
(Senior Metrologist of Lukoil Nizhegorodnefteorgsintez Ltd)

This letter was received by our Agent in Moscow on 2nd Aug 2010

This can be treated as a letter of performance for TRM Ltd

Thermal Resources Management Ltd
21 Sedling Road, Wear Ind. Est.,
Washington NE38 9BZ United Kingdom
Company reg # 04112049

Jamie Groves
Commercial Manager
TRM Ltd.

Telephone: +44 (0) 191 416 8884
Fax: +44 (0) 191 419 2345
Co. Reg #: 04112049
VAT #: GB 759 079 777

www.temperature-house.com



MINUTES OF MEETING BETWEEN HPCL & PYRO ELECTRIC

DATE: 04.05.2015

ITEM: MULTIPLE THERMOMETRY

PO: 14000129-OQ-48009

VENDOR: M/s PYRO ELECTRIC, GOA

Basis Purchase order 14000129-OQ-48009 dated 22.10.15, M/s Pyro Electric have supplied 2 numbers of Multiple thermometry for installation in R-01 in DHDS unit.

For installation supervision services; Mr M L Gore of M/s Pyro Electric has reported at site on 28.04.15 and carried out following activities:

1. Verification of marking of multiple thermometry support cleat for welding.
2. Checking the welding for one support.
3. Supervision of installation of multiple thermometry in R-01 bed 1 & bed 2.
4. Milivolt signal at junction box have been verified after installation of both multiple thermometry.

The supervision job for installation of two assemblies of multiple thermometry in R-01 was completed successfully on 04.05.15.

M/s Pyro Electric left the site on 04.05.15.

HPCL informed Pyro that they will be in communication with Pyro during commissioning of reactor & evaluation of initial performance of multiple thermometry. HPCL also requested to extend support during commissioning, if any problem arises.

For HPCL

Mr R S Rao *RS Rao*

Suresh Kumar *Suresh Kumar*

For PYRO ELECTRIC

M L Gore *M L Gore*

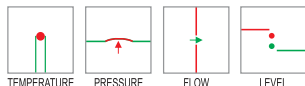


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मंगलूर रिफाइनरी एंड पेट्रोकेमिकल्स लिमिटेड
MANGALORE REFINERY AND PETROCHEMICALS LIMITED

(ऑइल एंड नेचुरल गैस कॉर्पोरेशन लिमिटेड की सहायक कंपनी) (A Subsidiary of Oil and Natural Gas Corporation Ltd)
पंजीकृत कार्यालय : कुत्थेनूर पोस्ट वावा काटीपल्ल, मंगलूर Regd Office : Kuthethoor P.O., Via Katipalla, MANGALORE - 575 030

दूरभाष Ph: 0824 2270400, फैक्स Fax: 0824 2271404
ई-मेल E-mail: mrplmir@mrplindia.com Website: www.mrpl.co.in
"AN ISO 9001 AND 14001 CERTIFIED COMPANY"

November 28, 2013

TO WHOMSOEVER IT MAY CONCERN


This is to certify that M/s Pyro Electric Instruments Goa Pvt. Ltd. have supplied multi point thermocouples for Gas Oil Hydro De-sulphurisation Unit Revamp project in MRPL. These are used in the reactor for measuring catalyst bed temperatures at various points. Technology for this project was provided by M/s Axens, France.

These thermocouples have been working satisfactorily since the reactor was commissioned on 15-04-2010.

This certificate is issued at the behest of M/s Pyro Electric Instruments Goa Pvt.Ltd.

With Regards,

For Mangalore Refinery and Petrochemicals Limited


H. C. Sathyanarayana
GM (Instrumentation)

Delhi Office : LGF, Mercantile House, 15 K.G. Marg, New Delhi - 110 001. Ph: 011 23463100, Fax: 011 23463201
Bangalore Office : MRPL opp. to KSSIDC Industrial Estate Rajajinagar, Bangalore 560 010. Ph: 080 22642200, Fax: 080 - 23505501
Mumbai Office : Maker Tower, 'F' Wing, 16th Floor, Cuffe Parade, Colaba, Mumbai - 400 005. Tel: 91 22 22173000. Fax: 91 22 22173233

इंडियन ऑइल कॉर्पोरेशन लिमिटेड
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मधुरा-281 005 (उ.प्र.) भारत
Indian Oil Corporation Limited
Muthura Refinery
Muthura-281 005 (U. P.) India
Tel. : 0565-2417125, 2417292
Fax : 0565-2480160, 2480116
Gram : OILREFIN
Internet Site : www.iocl.com

रिफाइनरी प्रभाग
Refineries Division

April 12, 2010

TO WHOM SO EVER IT MAY CONCERN

This is to certify that M/s Pyro Electric Instruments Goa Pvt. Limited had supplied a six point flexible thermocouple constructed in a single sheath design along with all mounting accessories vide PO No. RMRMM 78161/ 17769874 dated 06.06.2008. The same was installed on the regenerator of CCRU (Licensor: Axens, France) in September 2008 and have been performing satisfactorily till date.

This certificate is being issued to M/s Pyro Electric Instruments Goa Pvt. Limited on their request. The same is in continuation to the certificate issued earlier dated Nov 28, 2008 for the same thermocouple.


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PYRO/15-16/CORP.

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