

|     |                                    |     |
|-----|------------------------------------|-----|
| 5.1 | Equipment Specifications .....     | 5-2 |
| 5.2 | Power and Current.....             | 5-3 |
| 5.3 | Equipment Label .....              | 5-4 |
| 5.4 | Flowmeters .....                   | 5-5 |
| 5.5 | Oxygen Analyzer Certification..... | 5-6 |
| 5.6 | Oxygen Analyzer Setup .....        | 5-7 |
| 5.7 | UPS System .....                   | 5-8 |
| 5.8 | Channel Assignments.....           | 5-9 |

|                                                                                                                                                                         |                                 |                                 |                          |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|---------------------------------|--------------------------|
|  <b>LCI Furnaces</b><br>DIVISION OF LOCHABER CORNWALL INC<br>CONTINUOUS BELT IR FURNACE | <b>EQUIPMENT SPECIFICATIONS</b> | DOC NBR: 15-004 - 802-101401 R2 |                          |
|                                                                                                                                                                         |                                 | MODEL: TF-618                   | CUSTOMER: TBD            |
|                                                                                                                                                                         |                                 | SERIAL NBR: 2015260             | SHT 1 OF 1 PRNT 02/24/21 |

| Equipment Model |                                               | Application: Fuel Cell Processing (890 C) |                       |        |                            |
|-----------------|-----------------------------------------------|-------------------------------------------|-----------------------|--------|----------------------------|
| Model           | Base Equipment                                | Control Zones                             | Furnace Heated Length |        | Nominal Furnace Belt Width |
| TF-618          | Continuous Belt Controlled Atmosphere Furnace | 4                                         | 60 in                 | 152 cm | 18.0 in 46 cm              |

| Equipment Arrangement |                                                   |        |        |        |                               |
|-----------------------|---------------------------------------------------|--------|--------|--------|-------------------------------|
| Phase                 | Process                                           | Max    | Length |        | Process Gas Temperature (typ) |
| Phase 1               | IR Furnace, 4 Zones                               | 960 °C | 60 in  | 152 cm | FG 200-960 C                  |
|                       | Transition Tunnel with Stack                      |        | 20 in  | 51 cm  | FG 600-750 C                  |
| Phase 2               | Gas Convective Cooling, Exterior Fan Heat Removal |        | 63 in  | 160 cm | N2 100-400 C                  |
|                       | Exit Baffle                                       |        | 4 in   | 10 cm  | N2 150-250 C                  |

| Process Sections |                       |                        |          |        |                                   |
|------------------|-----------------------|------------------------|----------|--------|-----------------------------------|
| Function         | Name                  | Location               | Length   |        | Process Gas Avg Temperature (typ) |
|                  | Load Station          | Entrance load area     | 24.0 in  | 61 cm  | ambient                           |
| IR Furnace       | ENTRANCE BAFFLE       | Entrance barrier       | 15.0 in  | 38 cm  | N2 50 °C                          |
|                  | ZONE 1                | Heating chamber 1      | 10.0 in  | 25 cm  | FG 890 °C                         |
|                  | ZONE 2                | Heating chamber 1      | 20.0 in  | 51 cm  | FG 900 °C                         |
|                  | ZONE 3                | Heating chamber 2      | 20.0 in  | 51 cm  | FG 890 °C                         |
|                  | ZONE 4                | Heating chamber 2      | 10.0 in  | 25 cm  | FG 890 °C                         |
| Cooling          | RAPID COOL TRANSITION |                        |          |        |                                   |
|                  | TRANSITION TOP        | Cooling Isolatin Trans | 15.0 in  | 38 cm  | N2 740 °C                         |
|                  | WATER COOLING TOP     | Cooling Section 1      | 45.0 in  | 114 cm | N2 361 °C                         |
|                  | WATER COOLING BOT     | Cooling section 2      | 45.0 in  | 114 cm | N2 200 °C                         |
|                  | FREE COOLING          | Cooling section        | 47.5 in  | 121 cm | none 100 °C                       |
| Product Unload   | Unload Station        | Exit station           | 24.0 in  | 61 cm  | 200 °C                            |
|                  | Total                 |                        | 275.5 in | 700 cm |                                   |

| Process Gas                |         |                 |               |                |              |                                |                     |
|----------------------------|---------|-----------------|---------------|----------------|--------------|--------------------------------|---------------------|
| Actual Conditons           |         | Typical, Low O2 |               | Typical, VL O2 |              | Max (all flowmeters open full) |                     |
| Furnace Replenishment Rate |         | 2.6 rep/min     |               | 4.0 rep/min    |              | 6.4 rep/min                    |                     |
|                            | Temp °C | Press psi       | Min Flow scfh | Min Flow sL/m  | Typical scfh | Typical sL/m                   | Max Compressor sL/m |
| N2 Supply                  | 21      | 70              | 477           | 225            | 693          | 327                            | 1,694 799           |
| TOTAL PROCESS GAS          |         |                 | 847           | 400            | 1,604        | 757                            | 2,876 1 357         |

| Exhaust Gas |         |              |               |               |              |              |                      |
|-------------|---------|--------------|---------------|---------------|--------------|--------------|----------------------|
|             | Temp °C | Press in H2O | Min Flow scfh | Min Flow sL/m | Typical scfh | Typical sL/m | Maximum Exhaust sL/m |
| N2 & FG mix | 200     | 6            | 604           | 285           | 1173         | 554          | 3,282 3 282          |

| Cabinet Ventilation                                          |             |        |        |                           |
|--------------------------------------------------------------|-------------|--------|--------|---------------------------|
| Cabinet Ventilation Fans<br>(vent to room or exhaust system) | Flowrate    | 0 cfm  | 0 m3/h | (2 x 2 pair 10-inch fans) |
|                                                              | Temperature | <122°F | <50°C  |                           |

| Transport System |                                 |                            |                                          |                              |
|------------------|---------------------------------|----------------------------|------------------------------------------|------------------------------|
| Belt width       | 18.0 in                         | 45.7 cm                    | Belt Edge Heater(s): 60-inch, pair       |                              |
| Belt type        | Balanced spiral weave           |                            |                                          |                              |
| Product height   | 2 in (5.1 cm) above belt level. |                            | Baffle plate clearance: 0.25" above belt |                              |
| Belt speed range | MAIN<br><br>ALT                 | 7.5 - 75 inches per minute | 19.05 - 190.5 cm per minute              |                              |
| Belt speed range |                                 | 0.3 - 4 inches per minute  | 0.762 - 10.16 cm per minute              |                              |
| Conveyor height  | 36.0 in                         | +/- 1.5 in                 | adjustable                               | 91.4 cm +/-3.8 cm adjustable |

| Electrical System                  |                      |
|------------------------------------|----------------------|
| Voltage required                   | 480 Vac, 60 Hz, 3 Ph |
| Maximum power (Connected Pwr)      | 100.2 kW, 120.5 A    |
| Typical (operating) power required | 55.1 kW, 66.2 A      |

| Materials of Construction |                       |              |                         |                                        |
|---------------------------|-----------------------|--------------|-------------------------|----------------------------------------|
| Heating Chamber           | 304 Stainless steel   | Cooling      | 304 Stainless Steel     | Belt Nichrome V, 80%Ni,20%Cr, <1% Fe   |
| Baffle & Eductor          | 304 Stainless steel   | Belt support | Quartz rod, Quartz tube | Frame Steel, powder coated             |
| Heating element           | Quartz, near infrared | Belt Return  | UHMW-PE                 | Cover Panels 18GA Steel, powder coated |

| Furnace Dimensions  |                |          |           |                         |              |             |
|---------------------|----------------|----------|-----------|-------------------------|--------------|-------------|
|                     |                | Length   | Width     | Height (floor to stack) | Furnace Sect | Weight      |
| Furnace, English    | Net            | 276 in   | 50.0 in   | 67.0 in +/- 1.5 in      |              | 4000 LB     |
| Furnace, Metric     | Net            | 7.00 m   | 1.27 m    | 1.70 m +/- 0.04 mm      |              | 1820 kg     |
| Crate, English      | Furnace, Gross | 284 in   | 58 in     | 87 in                   | Gross Wt:    | 4400 LB     |
| Crate, Metric       | Furnace, Gross | 7.20 m   | 1.47 m    | 2.20 m                  | Gross Wt:    | 590 kg      |
| Standard Conditions |                | Pressure | 14.7 psia | 101.3 kPa               | Temperature  | 70 °F 21 °C |

|                                                                                                                                          |                                      |  |                     |  |               |  |         |  |
|------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|--|---------------------|--|---------------|--|---------|--|
|  <b>LCI Furnaces</b><br>DIVISION OF LOCHABER CORNWALL INC | DATA SHEET                           |  | DOC NBR: 15-004     |  | 802-101501-00 |  | R0      |  |
|                                                                                                                                          | IR FURNACE SYSTEM<br>POWER & CURRENT |  | MODEL: TF-618       |  | APVL SLB      |  | 4/16/15 |  |
|                                                                                                                                          |                                      |  | SERIAL NBR: 2015260 |  | CONF: JMC     |  | 4/16/15 |  |
|                                                                                                                                          |                                      |  | PRINT: 02/24/21     |  | SHT 1         |  | of 1    |  |
| Customer: TBD                                                                                                                            |                                      |  |                     |  |               |  |         |  |

| INPUT TABLE                      |           |      |
|----------------------------------|-----------|------|
| Entry OK?                        | VALID     |      |
| Enter Line Voltage:              | 480 Vac   | TRUE |
| (208,220,380,400,415,480)        |           |      |
| Limit Lamps to Max Rating? (Y/N) | Y         | TRUE |
| Line Frequency (50/60)           | 60 Hz     | TRUE |
| Number of Phases:                | 3 Φ       | TRUE |
| Lamp Length (6, 9, 15, 24, 36)   | 18 inches | TRUE |
| Typical Operating %              | 54 %      | TRUE |

| SUMMARY OF RESULTS |          |
|--------------------|----------|
| Max Power:         | 100.2 kW |
| Max Current:       | 120.5 A  |
| Typical Power:     | 55.0 kW  |
| Typical Current:   | 66.2 A   |

| HARDWARE                 |           |
|--------------------------|-----------|
| Lamps: 56                | SCRs: 10  |
| EMs: 7                   | TCs: 4    |
| EM IDC5: 7               |           |
| Nbr strings 28           |           |
| Nbr Lamps in 10" zone: 6 | AOV-25: 5 |
|                          | AITM: 2   |

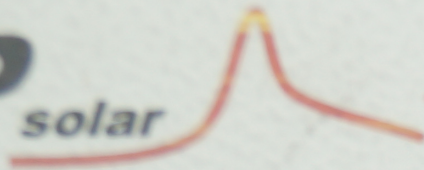
| CONFIGURATION                         | Zone 1         | Zone 2  | Zone 3  | Zone 4  | Zone 5 | Zone 6 | Zone 7 | Zone 8 | Zone 9 | Zone 10 | Zone 11 | Zone 12 | Totals                                   |
|---------------------------------------|----------------|---------|---------|---------|--------|--------|--------|--------|--------|---------|---------|---------|------------------------------------------|
| Length (6.6,7.5,10,14.3,15,20,30) in. | 10             | 20      | 20      | 10      |        |        |        |        |        |         |         |         | 60 in.                                   |
| Length Entry OK?                      | TRUE           | TRUE    | TRUE    | TRUE    |        |        |        |        |        |         |         |         |                                          |
| (F)urn., (F)urn. (1) SCR-Zn, (D)ryer  | F              | F       | F       | F       |        |        |        |        |        |         |         |         | 4                                        |
| Zone Type OK?                         | TRUE           | TRUE    | TRUE    | TRUE    |        |        |        |        |        |         |         |         |                                          |
| No. Lamps in Series/String (1-5)      | 2              | 2       | 2       | 2       |        |        |        |        |        |         |         |         |                                          |
| Lamps/String OK?                      | TRUE           | TRUE    | TRUE    | TRUE    |        |        |        |        |        |         |         |         |                                          |
| No. Lamps in Top/Bottom Power         | 6/6            | 8/8     | 8/8     | 6/6     |        |        |        |        |        |         |         |         | Plenum: 240                              |
| SCR PHASE                             | Zone Entry OK? | VALID   | VALID   | VALID   | VALID  |        |        |        |        |         |         |         |                                          |
| Top Lamp Phase (1/2/3):               | 1              | 2       | 3       | 1       |        |        |        |        |        |         |         |         | Lamp Balance (kW)                        |
| Bottom Lamp Phase (1/2/3):            | 1              | 2       | 3       | 1       |        |        |        |        |        |         |         |         | Phase 1: 39.6                            |
| SCR POWER                             |                |         |         |         |        |        |        |        |        |         |         |         | Phase 2: 26.4                            |
| Rated Lamp Voltage                    | 225            | 225     | 225     | 225     |        |        |        |        |        |         |         |         | Phase 3: 26.4                            |
| Max. Lamp Wired Voltage               | 225            | 225     | 225     | 225     |        |        |        |        |        |         |         |         | <-- Vrms                                 |
| 50% Power SCR Cal Span Setting        | 285            | 285     | 285     | 285     |        |        |        |        |        |         |         |         |                                          |
| Max. Lamp Wired Power (W)             | 1650           | 1650    | 1650    | 1650    |        |        |        |        |        |         |         |         |                                          |
| No. Strings per SCR                   | 3              | 4       | 4       | 3       |        |        |        |        |        |         |         |         |                                          |
| Max. Current per String (A)           | 7.3            | 7.3     | 7.3     | 7.3     |        |        |        |        |        |         |         |         |                                          |
| No. Lamps in Zone                     | 12             | 16      | 16      | 12      |        |        |        |        |        |         |         |         | 56                                       |
| No. SCRs in Zone                      | 2              | 2       | 2       | 2       |        |        |        |        |        |         |         |         | 8                                        |
| No. Strings in Furnace Zones          | 6              | 8       | 8       | 6       |        |        |        |        |        |         |         |         | 28                                       |
|                                       |                |         |         |         |        |        |        |        |        |         |         |         | Nbr. lamp strings per element monitor: 4 |
| Top Lamp Power (kW)                   | 9.9            | 13.2    | 13.2    | 9.9     |        |        |        |        |        |         |         |         |                                          |
| Bottom Lamp Power (kW)                | 9.9            | 13.2    | 13.2    | 9.9     |        |        |        |        |        |         |         |         |                                          |
| Total Power/Zone (kW)                 | 19.8           | 26.4    | 26.4    | 19.8    |        |        |        |        |        |         |         |         | 92.4                                     |
| Current Required Top SCR (A)          | 22.0           | 29.3    | 29.3    | 22.0    |        |        |        |        |        |         |         |         |                                          |
| Current Required Bottom SCR (A)       | 22.0           | 29.3    | 29.3    | 22.0    |        |        |        |        |        |         |         |         |                                          |
| Color Temp (K) (nominal: 2500K)       | 2500           | 2500    | 2500    | 2500    |        |        |        |        |        |         |         |         |                                          |
| Peak Wavelength (µm)                  | 1.16           | 1.16    | 1.16    | 1.16    |        |        |        |        |        |         |         |         |                                          |
| % Energy NIR (<2 µm)                  | 67%            | 67%     | 67%     | 67%     |        |        |        |        |        |         |         |         |                                          |
| % Energy MW (2-4 µm)                  | 33%            | 33%     | 33%     | 33%     |        |        |        |        |        |         |         |         |                                          |
| Estimated Lamp Life (hrs)             | 5000 hr        | 5000 hr | 5000 hr | 5000 hr |        |        |        |        |        |         |         |         |                                          |
| Lumen Output vs. Rated (%)            | 100            | 100     | 100     | 100     |        |        |        |        |        |         |         |         |                                          |

| Furnace Total        | Number of Item? | Voltage (Vac) | Current (Amps) | Power (kW) Max | Power (kW) Typical | Phase Assigned | EH in EM? (y/n) | Other Items                                                |
|----------------------|-----------------|---------------|----------------|----------------|--------------------|----------------|-----------------|------------------------------------------------------------|
| Lamps                | 56              | 480           | as above       | 92.4           | 49.9               | as above       | N               | 10" Cabinet or CACT Fans, 117 Vac, 0.30/029 A for 50/60 Hz |
| PC, Monitor          | 1               | 117           | 1.3            | 0.2            | 0.2                | 1              | TRUE            | 4" Box (Muffin) Fans, product cooling, 117 Vac, 0.16 A     |
| Belt, Opto22, EM     | 1               | 117           | 2.1            | 0.2            | 0.2                | 1              |                 | Cross-flow Fans, product cooling, 230 Vac, 1.27 A max      |
| UC (Pump & Gen)      | 1               | 117           | 10.0           | 1.2            | 1.2                | 1              | OK              | Lower Cabinet Blowers (Impellers), 230 Vac, 0.72 A max     |
| UC (Tank Heater)     |                 | 117           | 8.4            |                |                    |                |                 | H2 Igniters, 120 Vac, 5 A 24 Vdc PS, 120 Vac, 2 A          |
| UCD (Blower)         |                 | 117           | 2.0            |                |                    |                |                 | No more than 8 SCRs/phase per TRx xfmr 24 Vac secondary    |
| UCD (Heater)         |                 | 480           | 16.0           |                |                    |                |                 | TR1: 4 TR2: 4 TR3: 2                                       |
| Edg Htr 1 Length     | 60              | 480           | 12.0           | 5.8            | 3.1                | 2              | OK              | EH1 Ω: 81 Current: 6.0 A Cal Span: 305 Vac                 |
| Edg Htr 2 Length     |                 |               |                |                |                    |                |                 | EH2 Ω: Current: Cal Span:                                  |
| Edg Htr 3 Length     |                 |               |                |                |                    |                |                 | EH3 Ω: Current: Cal Span:                                  |
| Cabinet Vent Fan 10" | 0               | 117           | 0.29           |                |                    |                |                 | Cabinet/CACT/Control Box Fans: 1.74 A                      |
| CACT Fans 10"        | 6               | 117           | 0.29           | 0.2            | 0.2                | 1              | OK              |                                                            |
| CACT Fans 4"         | 0               | 117           | 0.16           |                |                    |                |                 |                                                            |
| Control Box Fans 4"  | 0               | 117           | 0.16           |                |                    |                |                 |                                                            |
| Prod Cooling fans    | 6               | 117           | 0.16           | 0.1            | 0.1                | 1              | OK              |                                                            |
| OA & Pump            | 1               | 117           | 1.0            | 0.1            | 0.1                | 1              | OK              |                                                            |
| Furnace Totals:      |                 |               |                | 100.2          | 55.0               |                |                 |                                                            |

| PHASE        | PHASE BALANCING |      |      | TOTAL |
|--------------|-----------------|------|------|-------|
|              | 1               | 2    | 3    |       |
| LAMP PWR, kW | 39.6            | 26.4 | 26.4 | 92.4  |
| EH/OTHER     | 2.0             | 3.1  | 0.0  | 5.1   |
| TOTAL        | 41.6            | 29.5 | 26.4 | 97.5  |



**TP**<sub>solar</sub>



INNOVATIVE FURNACE TECHNOLOGIES

|                       |                                    |
|-----------------------|------------------------------------|
| Serial Number         | 2015260                            |
| Model Number          | TF-618-FG                          |
| Input Service         | 480 Vac, 3 Wire / Neutral / Ground |
| Frequency             | 50 / 60 Hz                         |
| Peak Power            | 100 KW                             |
| Peak Amps             | 120 Amps                           |
| Water Input           | 19 LPM @ 4 Bar                     |
| Peak Flow             | 2000 SCFH                          |
| Max Input Pressure    | 75 PSI                             |
| Process Exhaust       | 350 SCFH                           |
| Cabinet Exhaust 1 & 2 | 500 CFM Each                       |
| Manufactured Date     | 01-2016                            |

TPsolar + waveform is a registered trademark of TP Solar, Inc. All right reserved. TPSI furnace technology, furnaces, components and processing covered under one or more of: US Patent 7,805,064; R.O.C. Patent No. ZL200780023525.5; Taiwan Patent No. I-335978; and other pending US and Foreign Patents. Control programs are Copyright © 2015 TP Solar, Inc. MADE IN THE USA

16310 Downey Ave., Paramount, CA 90723, USA

Tel: 562-808-2171 Fax: 562-529-2483



**Arc**  
**A**

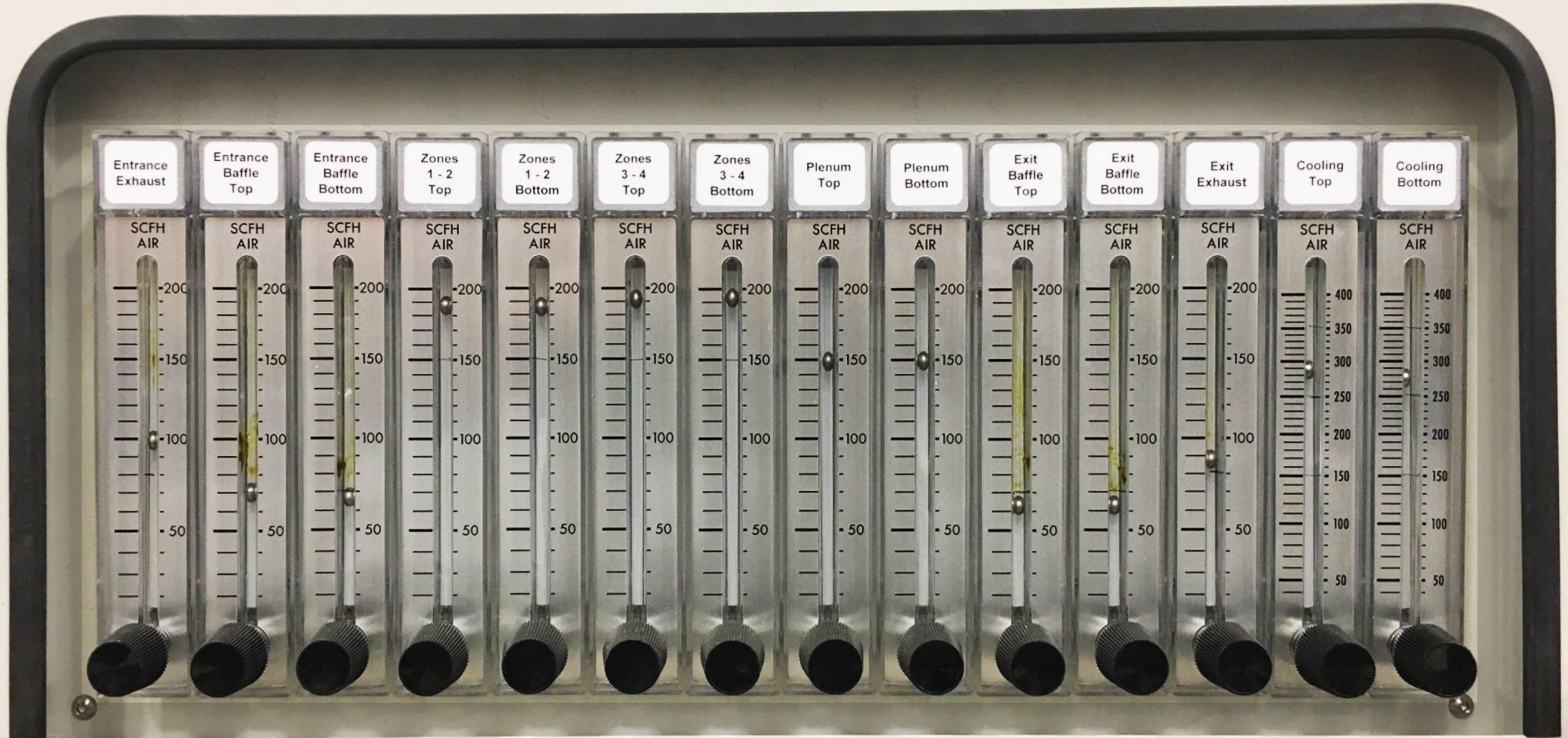
**Do not o**  
**appropri**

**Failure to**

**BRADY**

**TPSI**









Illinois Instruments, Inc.  
2401 Hiller Ridge Road  
Johnsburg, IL 60050 USA  
TEL: (815) 344-6212  
FAX: (815) 344-6332

## CERTIFICATION AND CALIBRATION REPORT

NUMBER **102115-03** ISSUE DATE **10/21/15**  
MODEL **EC913** SERIAL **EC913FD1095115**

### Sensor(s)

|             |                           |                  |               |
|-------------|---------------------------|------------------|---------------|
| Part Number | <b>900 021 (H2 Trace)</b> | <b>1015-0306</b> | Serial Number |
|             | <b>900 168 (Percent)</b>  | <b>1015-0431</b> |               |

### OXYGEN CALIBRATION

| CERTIFIED GAS (O2) CONTENT | BATCH NUMBER | INSTRUMENT READING |
|----------------------------|--------------|--------------------|
|----------------------------|--------------|--------------------|

|                        |                       |                 |
|------------------------|-----------------------|-----------------|
| <b>N2 (&lt; 2 ppm)</b> | <b>&lt; 2 ppm</b>     | <b>0.72 ppm</b> |
| <b>102.2 ppm</b>       | <b>54-124471099-5</b> | <b>102 ppm</b>  |
| <b>AIR (20.9 %)</b>    | <b>20.9 %</b>         | <b>20.9 %</b>   |
|                        |                       |                 |

\* All gases are N.I.S.T. traceable mixtures of oxygen in nitrogen.

\* This certificate expires 12 months from the issue date.

### This Analyzer is equipped with the following option(s):

- |                                                             |                                                  |                                             |                                                    |
|-------------------------------------------------------------|--------------------------------------------------|---------------------------------------------|----------------------------------------------------|
| <input type="checkbox"/> 1/4" Bulkheads                     | <input type="checkbox"/> Analog Output 3 Channel | <input type="checkbox"/> Flow Alarm         | <input type="checkbox"/> Solenoid Shutoffs         |
| <input type="checkbox"/> 24VDC Input                        | <input type="checkbox"/> Auto Calibration        | <input type="checkbox"/> Hydrogen Sensor    | <input type="checkbox"/> Special Configuration     |
| <input type="checkbox"/> Alarms                             | <input type="checkbox"/> Bypass Flow             | <input type="checkbox"/> Pressure Regulator | <input type="checkbox"/> Stainless Steel Bulkheads |
| <input checked="" type="checkbox"/> Analog Output 1 Channel | <input type="checkbox"/> Female NPT Bulkeads     | <input checked="" type="checkbox"/> Pump    | <input type="checkbox"/> Stainless Steel Plumbing  |

☐ Remote Sensor with 50'-100' Cable(s) and Explosion-Proof Enclosure

CALIBRATED BY : **Mark Rice**

SIGNATURE : \_\_\_\_\_

|                                                                                                                                            |                                  |                               |                          |
|--------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|-------------------------------|--------------------------|
|  <b>LCI Furnaces</b><br>DIVISION OF LOCHABER CORNWALL INC | <b>OXYGEN ANALYZER<br/>SETUP</b> | DOC NBR: 15-004 802-101543 R1 |                          |
|                                                                                                                                            |                                  | MODEL NBR: TPS TF-918         | DATE: 28Oct15            |
|                                                                                                                                            |                                  | SERIAL NBR: 2015260           | APVL: JCLARK 28Oct15     |
|                                                                                                                                            |                                  | SIZE: A                       | PRNT: 28Oct15 SHT 1 of 1 |
| <b>FACTORY SETTINGS</b>                                                                                                                    |                                  |                               |                          |

O2 ANALYZER, ILLINOIS INSTRUMENTS MODEL EC913

SERIAL NUMBER EC913FD1095115

|                                                       |       |           |
|-------------------------------------------------------|-------|-----------|
| 1 PAGE                                                |       | 1         |
| 2 AL1                                                 | NO    | n/a       |
| 3 AL2                                                 | NC    | n/a       |
| 4 SET PAGE0 to either RANGE0 or RANGE1                | SCALE | RANGE0    |
| 4a OPH1 = 0.1%. Sets upper limit of analog output     | pct   | 0.10%     |
| OPH1 = 0.1%. Sets upper limit of analog output (ppmv) | ppmv  | 1,000     |
| 4b OPL1 = 0%. Sets lower limit of analog output       | pct   | 0.00%     |
| OPL1 = 0%. Sets lower limit of analog output (ppmv)   | ppmv  | 0         |
| OPH2                                                  |       |           |
| OPL2                                                  |       |           |
| OPH3                                                  |       |           |
| OPL3                                                  |       |           |
| 7 LIFEL                                               |       | Read Only |
| 8 LIFEH                                               |       | Read Only |
| 8 GO TO PAGE1 (Password is 1234)                      |       | 1234      |

COMMENT

PAGE 0 functions (no password required).

See PAGE1 for latch configuration.

See PAGE1 for latch configuration.

Note: Analog Card not factory configured.

For GE datalogging use

For GE datalogging use

not installed

not installed

not installed

not installed

Remaining life of cell (ppm)

Remaining life of cell (%)

PAGE 1 functions (password required)

9 OL ALARM CONFIGURATION 30

| DIGIT 1 | ALARM 1 | ALARM 2 | DIGIT 2 | ALARM 1   | ALARM 2   |
|---------|---------|---------|---------|-----------|-----------|
| 0       | Low     | Low     | 0       | Unlatched | Unlatched |
| 1       | High    | Low     | 1       | Latched   | Unlatched |
| 2       | Low     | High    | 2       | Unlatched | Latched   |
| 3       | High    | High    | 3       | Latched   | Latched   |

Sets alarm level and latch conditions.

self-clearing.

latched requires pressing enter button to clear.

| 9a ALARM CONTACTS | Contacts | Type | Setting |
|-------------------|----------|------|---------|
| Alarm 1           | 9-10     | NC   | 100     |
| Alarm 1           | 11-10    | NO   | 100     |
| Alarm 2           | 12-13    | NC   | n/a     |
| Alarm 2           | 14-13    | NO   | n/a     |

SPARE, not connected to furnace

To Furnace Alarm system

SPARE, not connected to furnace

SPARE, not connected to furnace

10 ANCH1 SET ANALOG OUTPUT TYPE

|                                                                 |               |
|-----------------------------------------------------------------|---------------|
| 10a ANCH1 Sets channel 1 output to 0=4-20mA; 1=0-20mA; 2=0-10V. | 2             |
| ANCH2. Sets channel 2 output to 0=4-20mA; 1=0-20mA; 2=0-10V.    | not installed |
| ANCH3 Sets channel 3 output to 0=4-20mA; 1=0-20mA; 2=0-10V.     | not installed |

0-10 V

|                                                      |       |
|------------------------------------------------------|-------|
| 11 GAS = 28.02 Set molecular weight for Nitrogen     | 28.02 |
| 12 PUMP = 1. Enables sample pump. (=0 Disables pump) | 1     |

Factory setting

Factory setting

|                                                                                                                                           |  |                                    |                                                         |                                                                                      |  |               |               |            |      |  |
|-------------------------------------------------------------------------------------------------------------------------------------------|--|------------------------------------|---------------------------------------------------------|--------------------------------------------------------------------------------------|--|---------------|---------------|------------|------|--|
|  <b>LCI Furnaces</b><br>DIVISION OF LOCHABER CORNWALL INC |  | <b>SPECIFICATION,<br/>UPS</b>      |                                                         | DOC NBR: 15-004                                                                      |  | 802-101421    |               | R 0        |      |  |
| CUSTOMER                                                                                                                                  |  |                                    |                                                         | MODEL: TF-618                                                                        |  | APVL JCLARK   |               | 9/9/14     |      |  |
|                                                                                                                                           |  |                                    |                                                         | S/N: 2015260                                                                         |  | PM JCLARK     |               | 9/9/14     |      |  |
|                                                                                                                                           |  |                                    |                                                         | SIZE: A                                                                              |  | PRNT 11/05/21 |               | SHT 1 of 1 |      |  |
|                                                                                                                                           |  |                                    |                                                         |                                                                                      |  |               |               |            |      |  |
| Part Number                                                                                                                               |  | Qty                                | Description                                             |                                                                                      |  |               |               |            |      |  |
| UPS-650D                                                                                                                                  |  | 1                                  | Uninterruptible Power Supply, 650 VA, 400 W, Multistar™ |                                                                                      |  |               |               |            |      |  |
|                                                                                                                                           |  | Specifications                     |                                                         |                                                                                      |  |               |               |            |      |  |
|                                                                                                                                           |  |                                    |                                                         |                                                                                      |  |               |               |            |      |  |
|                                                                                                                                           |  | Power                              |                                                         | 650VA/400W                                                                           |  |               |               |            |      |  |
|                                                                                                                                           |  | Technology                         |                                                         | Line Interactive                                                                     |  |               |               |            |      |  |
| Input                                                                                                                                     |  | Input Voltage Range                |                                                         | 145V-275Vac/90Vac-140Vac±3%                                                          |  |               |               |            |      |  |
|                                                                                                                                           |  | Nominal Input Voltage              |                                                         | 220/230/240/110/120Vac                                                               |  |               |               |            |      |  |
|                                                                                                                                           |  | Input Frequency                    |                                                         | 50/60Hz                                                                              |  |               |               |            |      |  |
|                                                                                                                                           |  | Max.Input Current                  |                                                         | 2.6A/5.2A                                                                            |  |               |               |            |      |  |
| Output                                                                                                                                    |  | Nominal Output Voltage             |                                                         | 220/230/240/110/120Vac                                                               |  |               |               |            |      |  |
|                                                                                                                                           |  | Max.Output Current                 |                                                         | 1.8A/3.6A                                                                            |  |               |               |            |      |  |
|                                                                                                                                           |  | Output Voltage Range(Normal Mode)  |                                                         | 220/230/240/110/120Vac+10%-15%                                                       |  |               |               |            |      |  |
|                                                                                                                                           |  | Output Voltage Range(Battery Mode) |                                                         | 220/230/240/110/120Vac±10%                                                           |  |               |               |            |      |  |
|                                                                                                                                           |  | Output Frequency(Normal Mode)      |                                                         | Synchronized (Sine Wave)                                                             |  |               |               |            |      |  |
|                                                                                                                                           |  | Output Frequency(Battery Mode)     |                                                         | 50/60Hz                                                                              |  |               |               |            |      |  |
|                                                                                                                                           |  | Wave Form                          |                                                         | Step Wave                                                                            |  |               |               |            |      |  |
|                                                                                                                                           |  | Power Factor                       |                                                         | 0.6                                                                                  |  |               |               |            |      |  |
| Efficiency                                                                                                                                |  |                                    |                                                         | > 90%                                                                                |  |               |               |            |      |  |
| Transfer Time                                                                                                                             |  |                                    |                                                         | < 10ms                                                                               |  |               |               |            |      |  |
| Batteries & Runtime                                                                                                                       |  | Battery Type                       |                                                         | Maintenance-free Sealed Lead-Acid                                                    |  |               |               |            |      |  |
|                                                                                                                                           |  | Included Battery Modules           |                                                         | Battery Leakproof                                                                    |  |               |               |            |      |  |
|                                                                                                                                           |  | Runtime                            |                                                         | 1×12V/7.0Ah                                                                          |  |               |               |            |      |  |
|                                                                                                                                           |  |                                    |                                                         | Full Load 2 Minutes                                                                  |  |               |               |            |      |  |
|                                                                                                                                           |  |                                    |                                                         | Half Load 7 Minutes                                                                  |  |               |               |            |      |  |
|                                                                                                                                           |  | Charge Time                        |                                                         | <5 Hours(90%)                                                                        |  |               |               |            |      |  |
| LCD Status Display                                                                                                                        |  |                                    |                                                         | Output Voltage,Normal,Fault,Battery,Overload,Battery                                 |  |               |               |            |      |  |
| Audible Alarm                                                                                                                             |  | Buzzer                             |                                                         | AC Unusual/Battery Low Voltage/Overload/Short Circuit/PCB Failed,BEEP for 240Seconds |  |               |               |            |      |  |
| Interface Port(s)                                                                                                                         |  | Interface                          |                                                         | RS-232/USB                                                                           |  |               |               |            |      |  |
|                                                                                                                                           |  | Control Software                   |                                                         | UPSlion2000                                                                          |  |               |               |            |      |  |
| Cold-start Capability                                                                                                                     |  |                                    |                                                         | Yes                                                                                  |  |               |               |            |      |  |
| Protection                                                                                                                                |  | Surge Protection and Filtering     |                                                         | High Voltage,Low Voltage,Surge,Spike                                                 |  |               |               |            |      |  |
|                                                                                                                                           |  | Overload Protection                |                                                         | 120%-150%                                                                            |  |               |               |            |      |  |
|                                                                                                                                           |  | Battery Low Voltage Protection     |                                                         | 10V                                                                                  |  |               |               |            |      |  |
|                                                                                                                                           |  | Output Short Circuit Protection    |                                                         | Output auto cut off,Buzzer beeping                                                   |  |               |               |            |      |  |
|                                                                                                                                           |  | EMI Filter                         |                                                         | Yes                                                                                  |  |               |               |            |      |  |
|                                                                                                                                           |  | Tel/Fax/Modem Jack/USB             |                                                         | Yes. Optional                                                                        |  |               |               |            |      |  |
| Regulatory Approvals                                                                                                                      |  |                                    |                                                         | CE                                                                                   |  |               |               |            |      |  |
| Operating Conditions                                                                                                                      |  | Operating Temperature              |                                                         | 0-40°C                                                                               |  |               |               |            |      |  |
|                                                                                                                                           |  | Storage Temperature                |                                                         | -15-45°C                                                                             |  |               |               |            |      |  |
|                                                                                                                                           |  | Operating Relative Humidity        |                                                         | 10%RH-95%RH,Non-condensing                                                           |  |               |               |            |      |  |
| Dimension                                                                                                                                 |  | Inner Box(mm)                      |                                                         | 385*125*230                                                                          |  |               |               |            |      |  |
|                                                                                                                                           |  | Unit Weight(kgs)                   |                                                         | 6.8                                                                                  |  |               |               |            |      |  |
|                                                                                                                                           |  |                                    |                                                         |                                                                                      |  |               |               |            |      |  |
|                                                                                                                                           |  |                                    |                                                         |                                                                                      |  |               |               |            |      |  |
|                                                                                                                                           |  |                                    |                                                         |                                                                                      |  |               |               |            |      |  |
| 0                                                                                                                                         |  | ORIGINAL RELEASE                   |                                                         |                                                                                      |  |               | JCLARK 9Sep14 |            |      |  |
| REVISION                                                                                                                                  |  | DESCRIPTION                        |                                                         |                                                                                      |  |               | BY            |            | DATE |  |





## I/O Channel Assignments

### Analog Module Thermocouple Input 1 (TC 1)

| Channel | Description                  |
|---------|------------------------------|
| 0       | Thermocouple Input Zone 1    |
| 1       | Thermocouple Input Zone 2    |
| 2       | Thermocouple Input Zone 3    |
| 3       | Thermocouple Input Zone 4    |
| 4       | Thermocouple Input Water In  |
| 5       | Thermocouple Input Water Out |

### Analog Module Output (AO1)

| Channel | Description                  |
|---------|------------------------------|
| 0       | SCR ZONE 1 TOP               |
| 1       | SCR ZONE 1 BOTTOM            |
| 2       | SCR ZONE 2 TOP               |
| 3       | SCR ZONE 2 BOTTOM            |
| 4       | SCR ZONE 3 TOP               |
| 5       | SCR ZONE 3 BOTTOM            |
| 6       | SCR ZONE 4 TOP               |
| 7       | SCR ZONE 4 BOTTOM            |
| 8       | SCR EDGE HEAT RIGHT          |
| 9       | SCR EDGE HEAT LEFT           |
| 10      | Motor Control Signal Control |

### Analog Module Input (AI1)

| Channel | Description                   |
|---------|-------------------------------|
| 0       | Motor Control Signal Feedback |
| 1       | Oxygen Analyzer Feed Back     |

### Digital Module DO 1

| Channel | Description            |        |
|---------|------------------------|--------|
| 0       | Main Power             | Output |
| 1       | Lamp Power             | Output |
| 2       | Alarm                  | Output |
| 3       | Auto OFF               | Output |
| 4       | Light Tower Yellow     | Output |
| 5       | Light Tower Green      | Output |
| 6       | Oxygen Valve Source    | Output |
| 7       | Oxygen Valve Zone 1    | Output |
| 8       | Oxygen Valve Zone 2    | Output |
| 9       | Oxygen Valve Zone 3    | Output |
| 10      | Oxygen Analyzer ON/OFF | Output |
| 11      | CDA Main Valve         | Output |
| 12      | Nitrogen Main Valve    | Output |
| 13      | Forming Gas Main Valve | Output |

### Digital Module DI 1

| Channel | Description                 |       |
|---------|-----------------------------|-------|
| 0       | Air Flow Sensor CDA         | Input |
| 1       | Air Flow Sensor NITROGEN    | Input |
| 2       | Air Flow Sensor FORMING GAS | Input |
| 3       | Transport Motion Fault      | Input |
| 4       | SMEMA Sensor Entrance       | Input |
| 5       | SMEMA Sensor Exit           | Input |

