

| | |
|---------------------|-----------------|
| Date | 22 January 2019 |
| Time | 15:27:59 |
| Test Number | HRSG Test 40 |
| Mixture Composition | 100% H2 |
| Ambient Temperature | -0.3 °C |
| Ambient Pressure | 948 mbar |
| Wind Speed | 2.2 m/s |
| Wind direction | NNE |
| Relative Humidity | 95.00% |
| Mass Flow | 9.6330 kg/s |
| Equivalence Ratio | 0.54 |

General Comments: (weather, rig configuration)

Weather: Cold and Wintry. Snow on ground intermittent snow showers throughout the day. Light wind.

Rig configuration: 4 x 3m circular duct; expansion section and HRSG attached. End Plate attached. Igniter 258mm from beginning of 2nd circular duct section

Engine Speed: 35%; 11,500 rpm

Test on 100% H2 at an intended EQR of 0.55

The test gave a very strong combustion event. Most sensors provided a good reponse except for the IP rakes - rakes 3 and 4 in the expansion section developed a fault and did not produce a response to the combustion event.

Highest overpressure of 3430 mbar seen at KU7 in HR4

Ionisation Probes

Ionisation Rakes

Optical Probes

Max overpressure
3430 mbar

Max. gas temperature
1172 °C

Max. flame speed
305 m/s

Max. flame speed
205 m/s

Max. flame speed
455 m/s

Initial gas temperature
393 °C

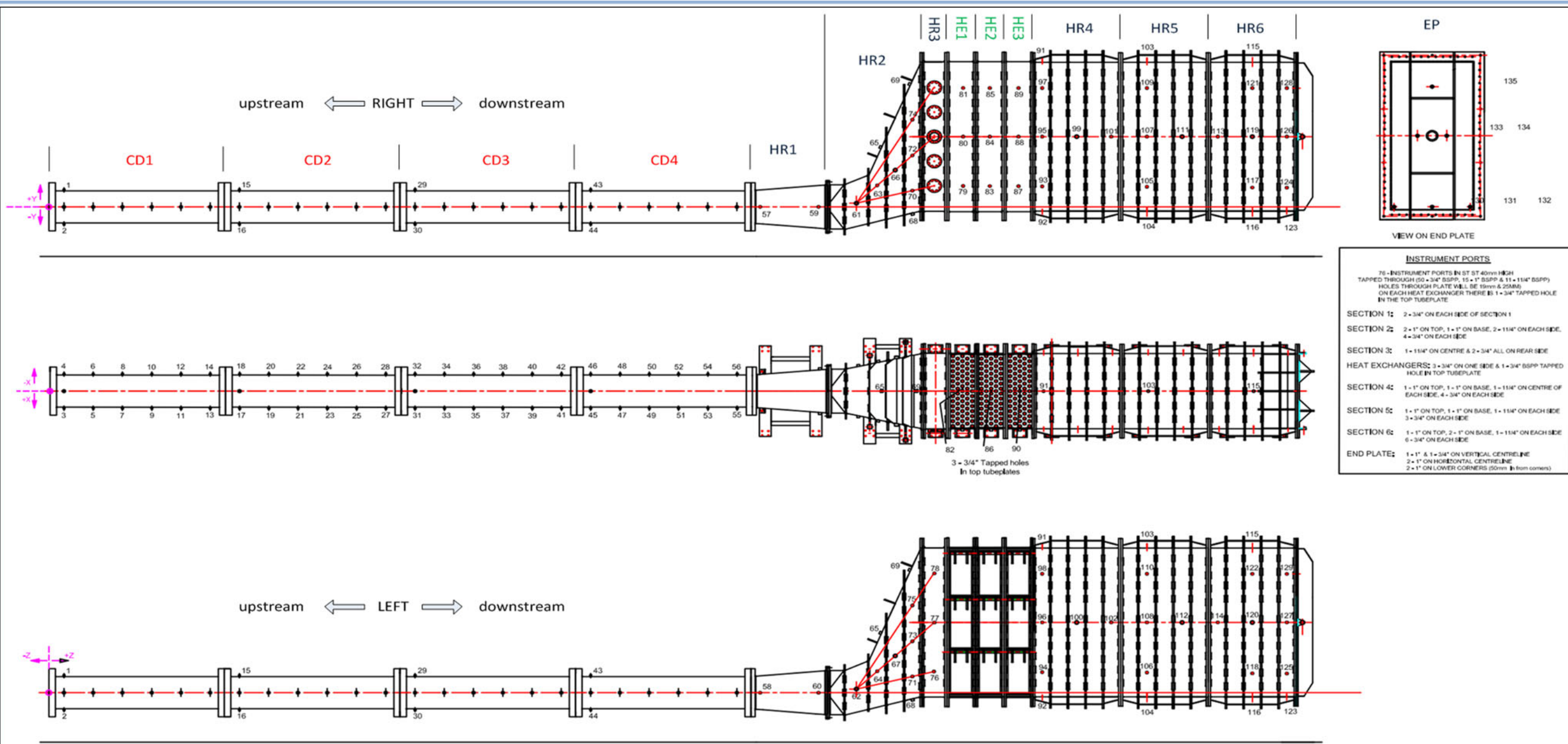
Location of Max. Overpressure
sensor KU7
label HR4-R5U
distance 18165 mm

Location of Max. Temperature
sensor TC2
label CD2-R3
distance 4258 mm

Location of Max. Flame Speed
sensor IP4
label HR3-R1L
distance 15140 mm

Location of Max. Flame Speed
sensor RA1
label HR2-R2M
distance 13785 mm

Location of Max. Flame Speed
sensor OP8
label HR4-R1M
distance 16985 mm



Naming Convention

| | | |
|--|---------------------------|--|
| Section Identifier i.e. HE, HR, CD or EP | HR 1 - R 1 U | Vertical position in section (sides only) i.e. U, M or L. Absence of letter denotes centreline |
| Section Number (1-6) Numbered from downstream to upstream | Side i.e. R, L, T or B | Longitudinal position in section (numbered from 1) |

Key

| | |
|--------------------------|--|
| CD Circular duct | U Upper |
| HR HRSG | M Middle |
| HE Heat Exchanger | L Lower |
| EP End Plate | R Right Side (when viewed downstream from engine) |
| | L Left Side |
| | T Top |
| | B Bottom |

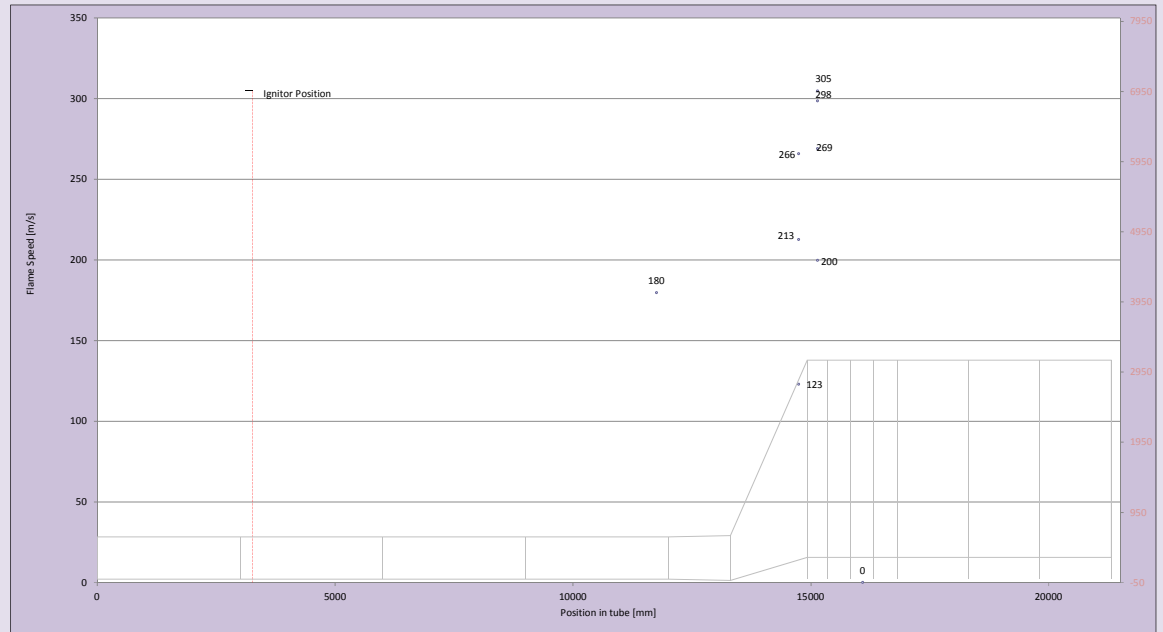
There are 13 sections on the rig

- 4 circular duct sections (CD1 to CD4)
- 6 HRSG sections (HR1 to HR6)
- 3 heat exchanger sections (HE1 to HE3)
located between HR3 and HR4

Location of igniter mm Time of ignition seconds

| IP Number | Location label | Data Name | Position in tube (mm) | Flame arrival time (s) | Avg Flame speed from last sensor (m/s) |
|-----------|----------------|---------------------|-----------------------|------------------------|--|
| IP0 | CD4-L6 | Ionisation probe 0 | 11758 | 19.83735 | 180 |
| IP1 | HR2-L5L | Ionisation probe 1 | 14745 | 19.84859 | 266 |
| IP2 | HR2-L5M | Ionisation probe 2 | 14745 | 19.85140 | 213 |
| IP3 | HR2-L5U | Ionisation probe 3 | 14745 | 19.86166 | 123 |
| IP4 | HR3-R1L | Ionisation probe 4 | 15140 | 19.84845 | 305 |
| IP5 | HR3-R1LM | Ionisation probe 5 | 15140 | 19.84868 | 298 |
| IP6 | HR3-R1M | Ionisation probe 6 | 15140 | 19.84993 | 269 |
| IP7 | HR3-R1U | Ionisation probe 7 | 15140 | 19.85428 | 200 |
| IP8 | HR3-L1U | Ionisation probe 8 | 15140 | 19.86803 | - |
| IP9 | HE2-R1M | Ionisation probe 9 | 16090 | 19.85157 | - |
| IP10 | HR4-L1L | Ionisation probe 10 | 16985 | 19.85341 | - |
| IP11 | HR4-L1M | Ionisation probe 11 | 16985 | 19.85392 | - |
| IP12 | HR4-L1U | Ionisation probe 12 | 16985 | 19.85470 | - |
| IP13 | HR4-R1U | Ionisation probe 13 | 16985 | 19.85437 | - |
| IP14 | HR4-R3U | Ionisation probe 14 | 17575 | 19.85485 | - |
| IP15 | HR4-L5L | Ionisation probe 15 | 18165 | - | - |
| IP16 | HR4-L5M | Ionisation probe 16 | 18165 | 19.85509 | - |
| IP17 | HR4-L5U | Ionisation probe 17 | 18165 | 19.85560 | - |
| IP18 | HR4-R5M | Ionisation probe 18 | 18165 | 19.85486 | - |
| IP19 | HR5-L2L | Ionisation probe 19 | 18775 | 19.85556 | - |
| IP20 | HR5-L2M | Ionisation probe 20 | 18775 | 19.85584 | - |
| IP21 | HR5-L2U | Ionisation probe 21 | 18775 | 19.85636 | - |
| IP22 | HR5-R2U | Ionisation probe 22 | 18775 | 19.85636 | - |
| IP23 | HR6-L1M | Ionisation probe 23 | 19985 | 19.85756 | - |

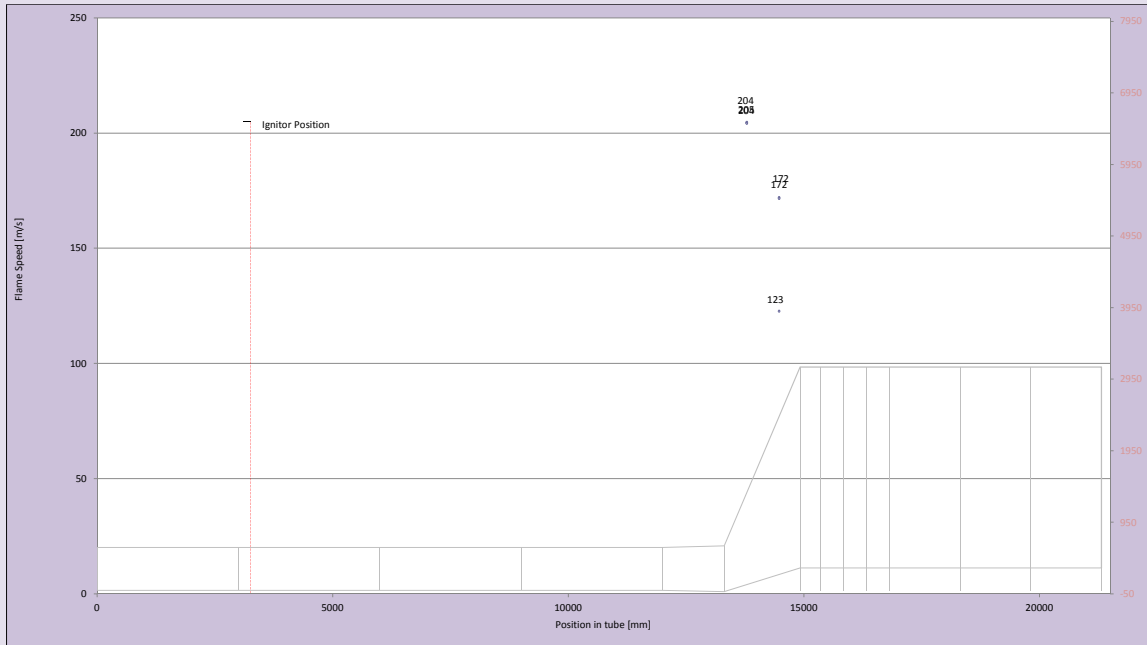
KEY: ND - not detected - sensor working but flame too weak to be picked up
 NW - not working - sensor not working



Location of igniter 3258 mm Time of ignition 19.79001 seconds

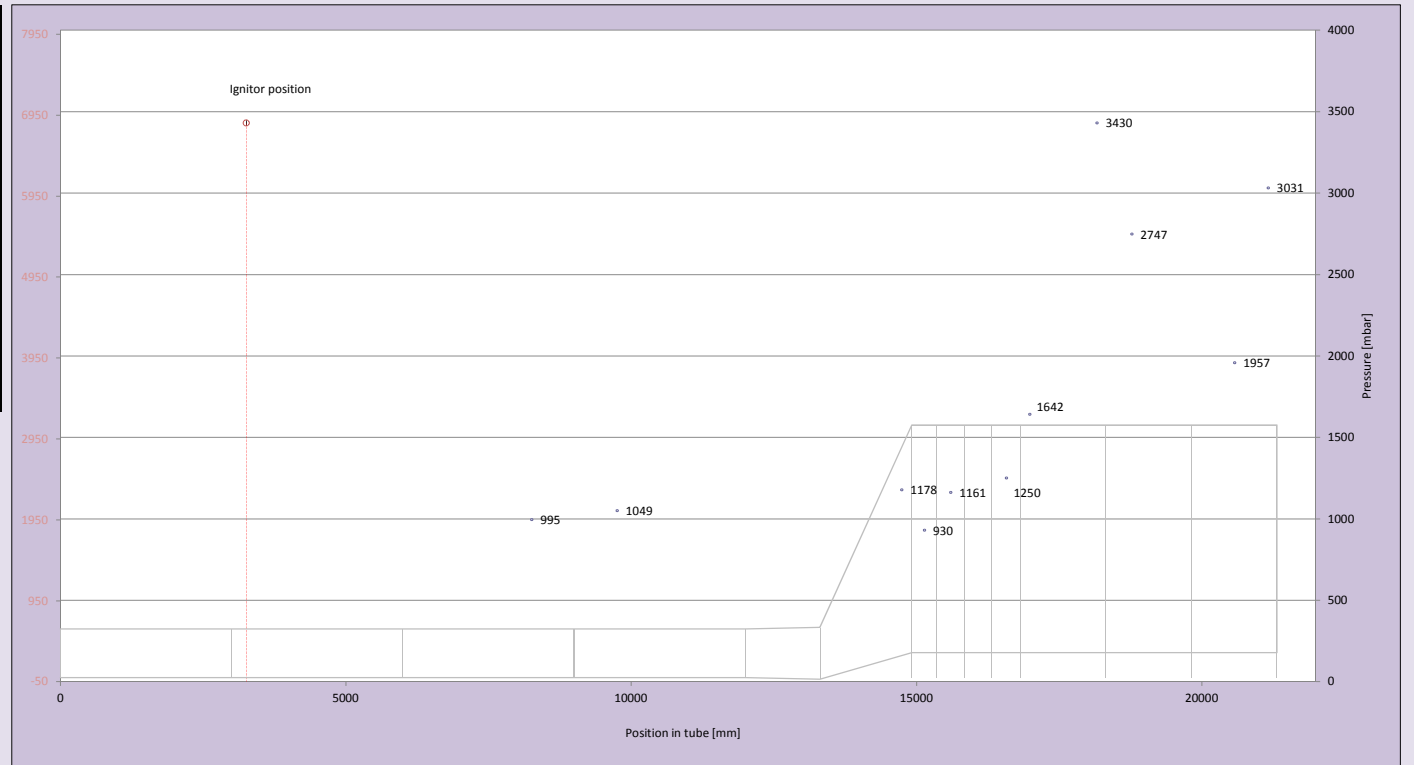
| Rake Number | IP Number | Location label | Data Name | Position in tube (mm) | Flame arrival time (s) | Avg Flame speed from last sensor (m/s) |
|-------------|-----------|----------------|-----------|-----------------------|------------------------|--|
| RA1 | IP24 | HR2-R2M | IP24 | 13785 | 19.8414 | 205 |
| RA1 | IP25 | HR2-R2M | IP25 | 13785 | 19.8415 | 204 |
| RA1 | IP26 | HR2-R2M | IP26 | 13785 | 19.8415 | 204 |
| RA2 | IP27 | HR2-R4M | IP27 | 14475 | 19.8454 | 172 |
| RA2 | IP28 | HR2-R4M | IP28 | 14475 | 19.8455 | 172 |
| RA2 | IP29 | HR2-R4M | IP29 | 14475 | 19.8471 | 123 |
| RA3 | IP30 | HR4-R3M | IP30 | 17575 | NW | |
| RA3 | IP31 | HR4-R3M | IP31 | 17575 | NW | |
| RA3 | IP32 | HR4-R3M | IP32 | 17575 | NW | |
| RA4 | IP33 | HR4-R3L | IP33 | 17575 | NW | |
| RA4 | IP34 | HR4-R3L | IP34 | 17575 | NW | |
| RA4 | IP35 | HR4-R3L | IP35 | 17575 | NW | |

KEY: ND - not detected - sensor working but flame too weak to be picked up
 NW - not working - sensor not working



Location of igniter 3258 mm

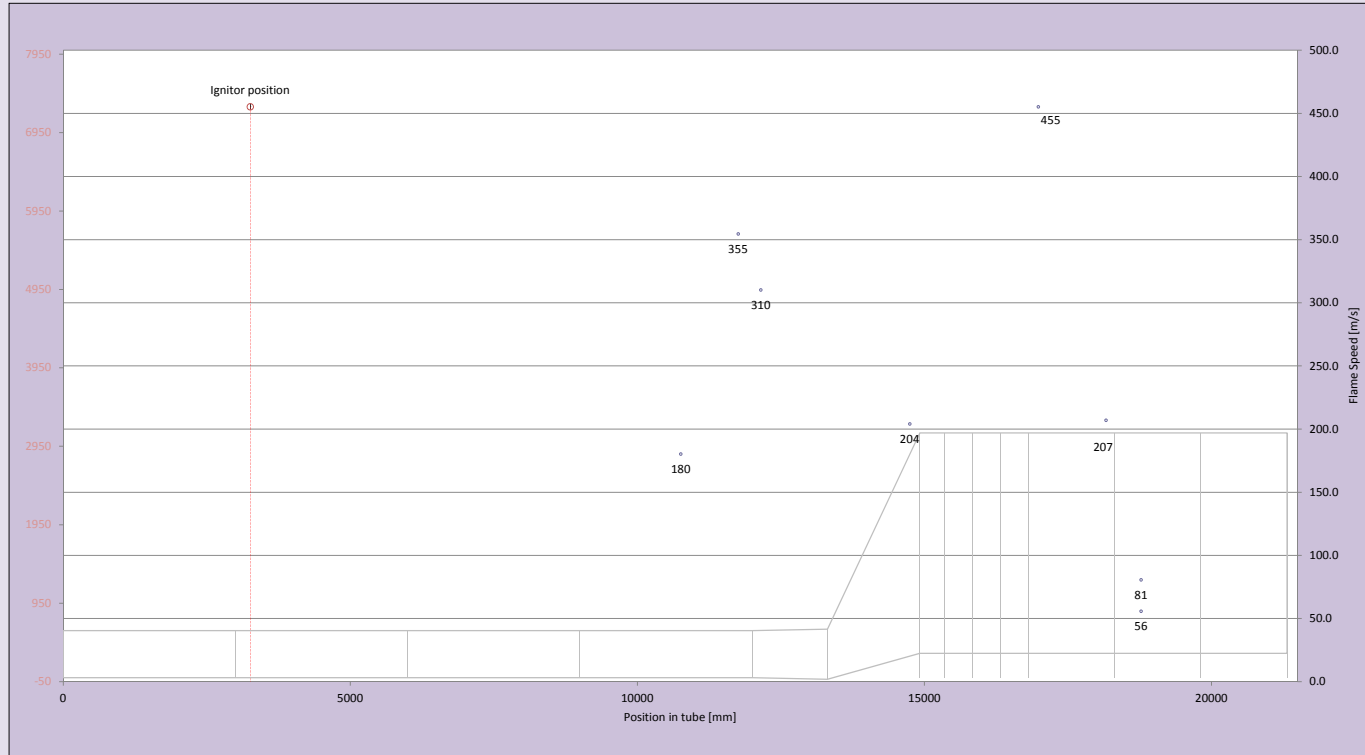
| Transducer number | Location | Position in tube [mm] | ΔP_{max} [mbar] | Time ΔP_{max} [sec] |
|-------------------|----------|-----------------------|-------------------------|-----------------------------|
| KU0 | CD3-R5 | 8258 | 995 | 19.9201 |
| KU1 | CD4-R2 | 9758 | 1049 | 19.9214 |
| KU2 | HR2-T5 | 14745 | 1178 | 19.8708 |
| KU3 | HR3-L1L | 15140 | 930 | 19.9258 |
| KU4 | HE1-R1U | 15600 | 1161 | 19.8548 |
| KU5 | HE3-R1L | 16580 | 1250 | 19.8528 |
| KU6 | HR4-R1L | 16985 | 1642 | 19.8534 |
| KU7 | HR4-R5U | 18165 | 3430 | 19.8563 |
| KU8 | HR5-R2L | 18775 | 2747 | 19.8556 |
| KU9 | HR6-R3L | 20575 | 1957 | 19.8611 |
| KU10 | HR6-LSL | 21165 | 3031 | 19.8621 |
| | | | | |
| | | | | |



Location of igniter 3258 mm Time of ignition 19.79001 seconds

| OP Number | Location label | Position in tube (mm) | Flame arrival time (s) | Average flame speed (m/s) |
|-----------|----------------|-----------------------|------------------------|---------------------------|
| OP0 | CD4-L4 | 10758 | 19.8316 | 180.3 |
| OP1 | CD4-R6 | 11758 | 19.8344 | 354.6 |
| OP2 | HR1-R1 | 12152 | 19.8357 | 310.2 |
| OP3 | HR2-R5M | 14745 | 19.8484 | 204.2 |
| OP4 | HE1-T1 | 15600 | 19.8498 | |
| OP5 | HE2-T1 | 16090 | 19.8536 | |
| OP6 | HE3-T1 | 16580 | 19.8542 | |
| OP7 | HR4-T1 | 16985 | 19.8533 | |
| OP8 | HR4-R1M | 16985 | 19.8533 | 455.3 |
| OP9 | HR4-R5L | 18165 | 19.8590 | 207.0 |
| OP10 | HR5-T2 | 18775 | 19.8755 | 80.7 |
| OP11 | HR5-R2M | 18775 | 19.8854 | 55.8 |
| | | | | |
| | | | | |
| | | | | |

KEY: ND - not detected - sensor working but flame too weak to be picked up
 NW - not working - sensor not working



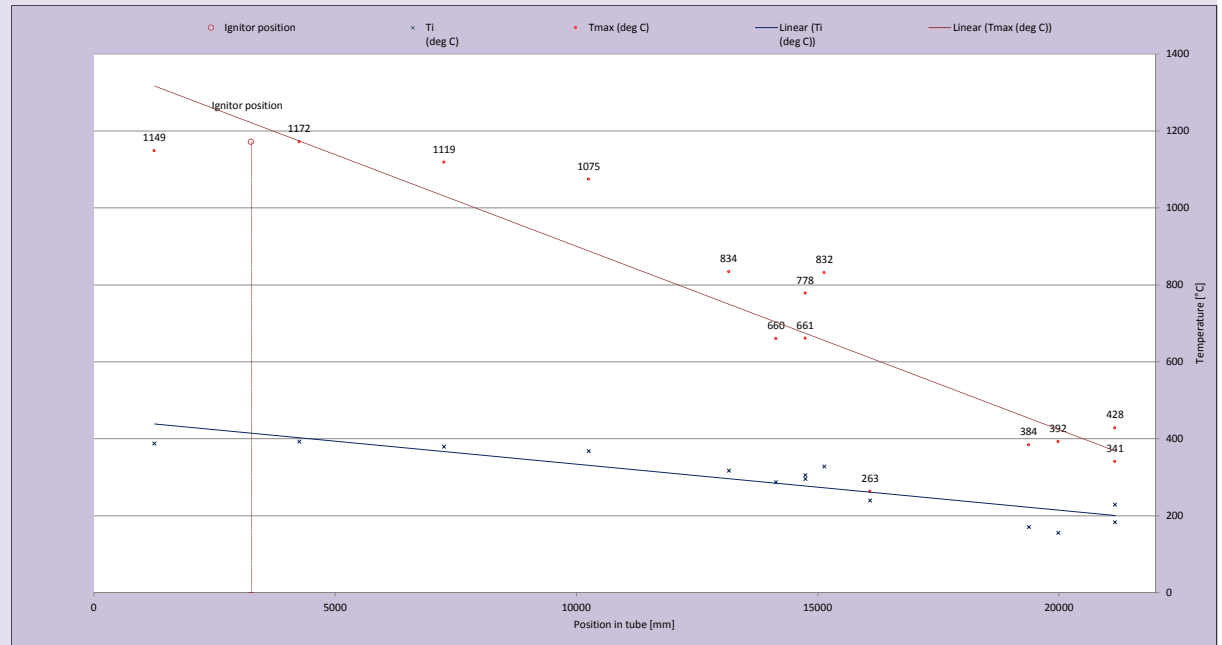
Location of igniter mm Time of ignition seconds

| Thermocouple number | Location | Position in tube (mm) | Flame arrival time (s) | Average flame speed (m/s) | T _{max} (deg C) | T _i (deg C) |
|---------------------|----------|-----------------------|------------------------|---------------------------|--------------------------|------------------------|
| TC0 | CD1-R3 | 1258 | | | 1149 | 388 |
| TC2 | CD2-R3 | 4258 | 19.825 | | 1172 | 393 |
| TC4 | CD3-R3 | 7258 | 19.835 | 300 | 1119 | 380 |
| TC6 | CD4-R3 | 10258 | 19.844 | 333 | 1075 | 368 |
| TC8 | HR1-R2 | 13160 | 19.860 | 181 | 834 | 317 |
| TC12 | CD3-T1 | 6258 | | | | |
| TC13 | CD3-L1 | 6258 | | | | |
| TC14 | CD3-B1 | 6258 | | | | |
| TC15 | CD3-R1 | 6258 | | | | |
| TC16 | HR2-R3M | 14140 | 19.858 | | 660 | 287 |
| TC17 | HR2-R5L | 14745 | 19.871 | | 778 | 306 |
| TC18 | HR2-R5U | 14745 | 19.868 | | 661 | 296 |
| TC19 | HR3-L1M | 15140 | 19.871 | | 832 | 328 |
| TC20 | HE2-R1L | 16090 | NW | | | |
| TC21 | HE2-R1U | 16090 | 19.872 | | 263 | 240 |
| TC22 | HR5-R4M | 19375 | 19.890 | | 384 | 171 |
| TC23 | HR6-R1M | 19985 | | | 392 | 156 |
| TC24 | HR6-R5L | 21165 | | | 341 | 183 |
| TC25 | HR6-R5U | 21165 | | | 428 | 229 |

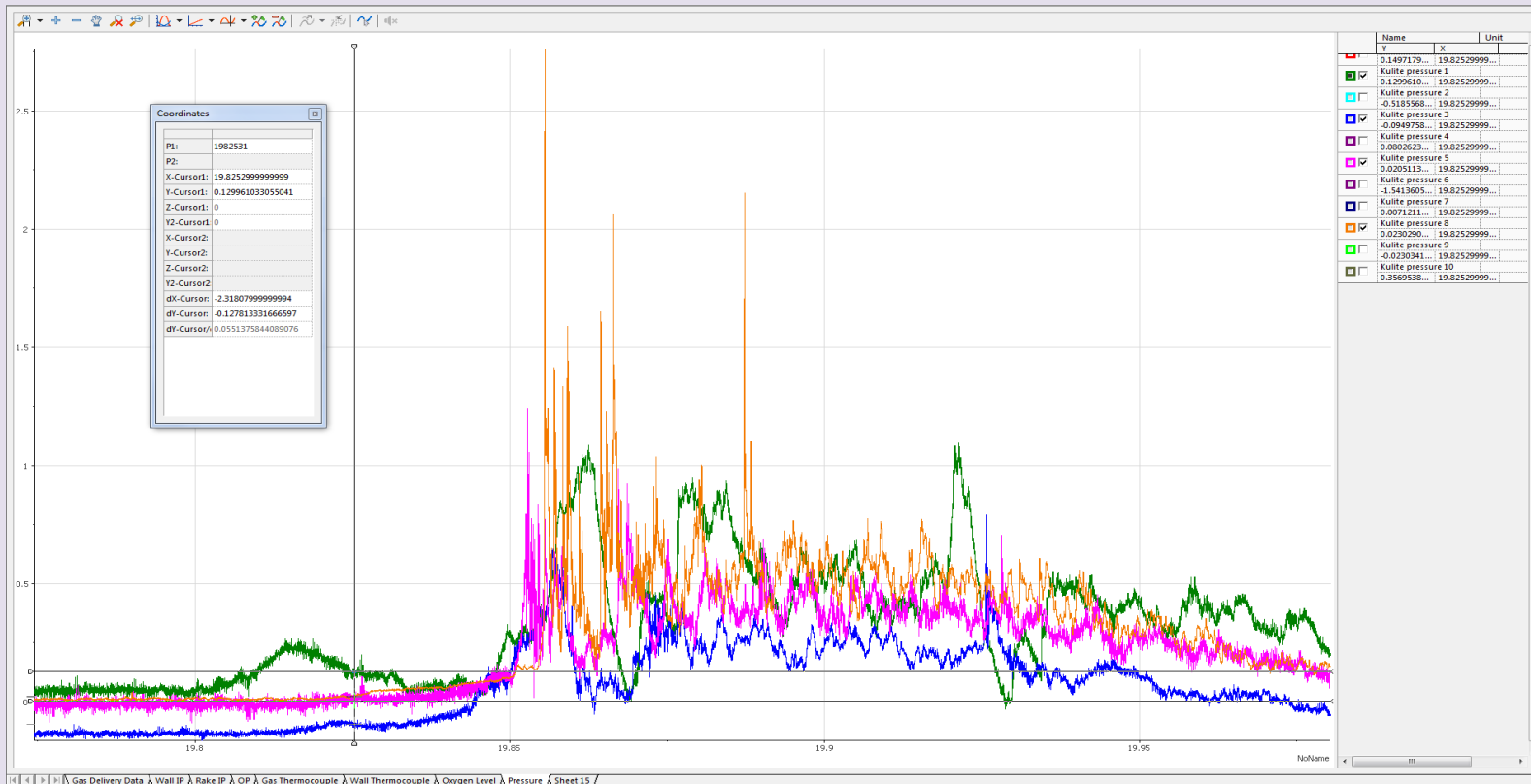
surface thermocouples [not plotted]

| | | |
|-----|--------|-------|
| TC1 | CD1-T2 | 1508 |
| TC3 | CD2-T2 | 4508 |
| TC5 | CD3-T2 | 7508 |
| TC7 | CD4-T2 | 10508 |

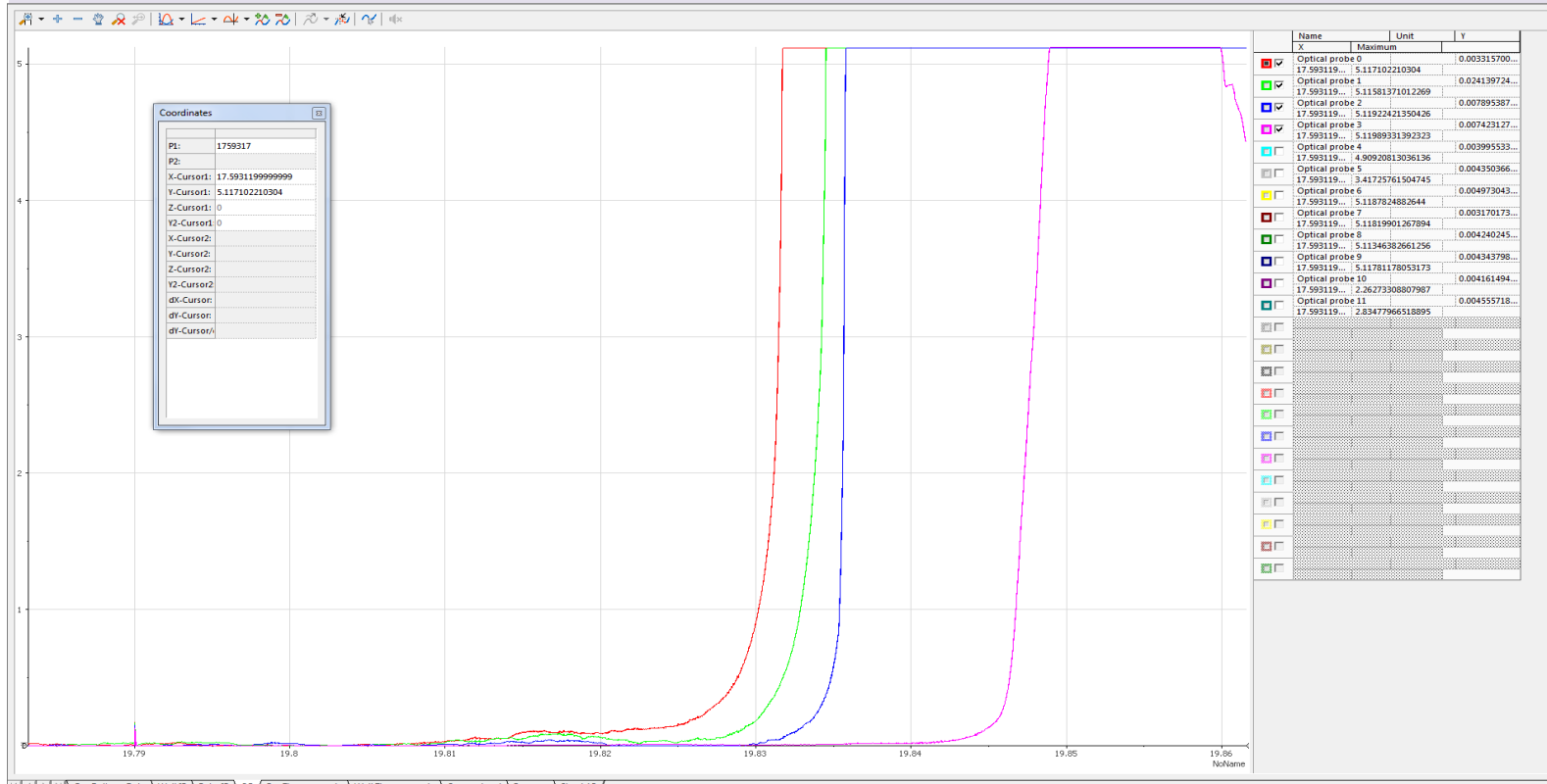
| | |
|-----|-----|
| 174 | 163 |
| 159 | 150 |
| 165 | 157 |



Pressure



Optical Probes



Coordinates

P1: 1759317

P2:

X-Cursor1: 17.5931199999999

Y-Cursor1: 5.117102210304

Z-Cursor1: 0

Y2-Cursor1: 0

X-Cursor2:

Y-Cursor2:

Z-Cursor2:

Y2-Cursor2:

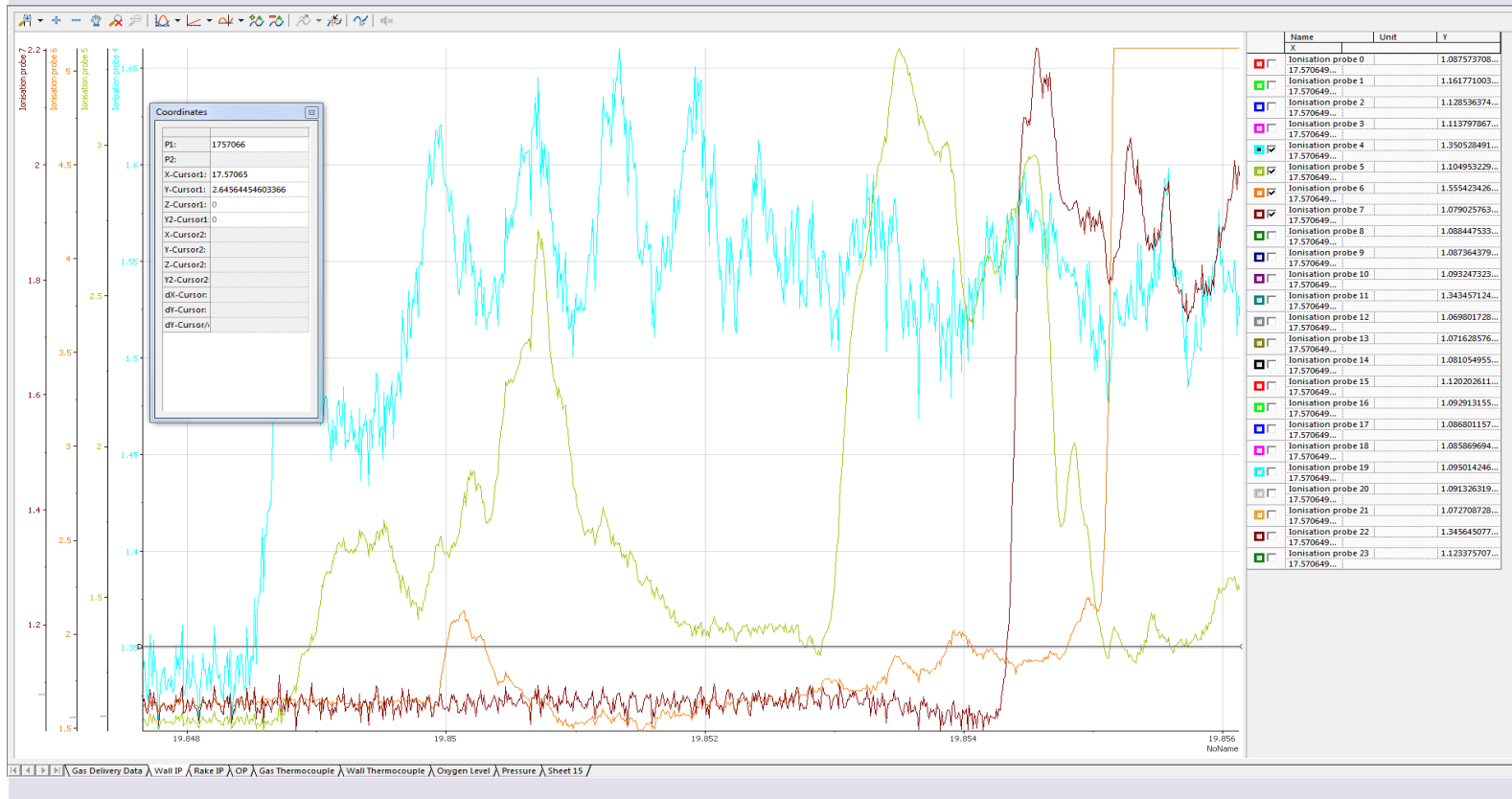
dX-Cursor:

dY-Cursor:

dV-Cursor/:

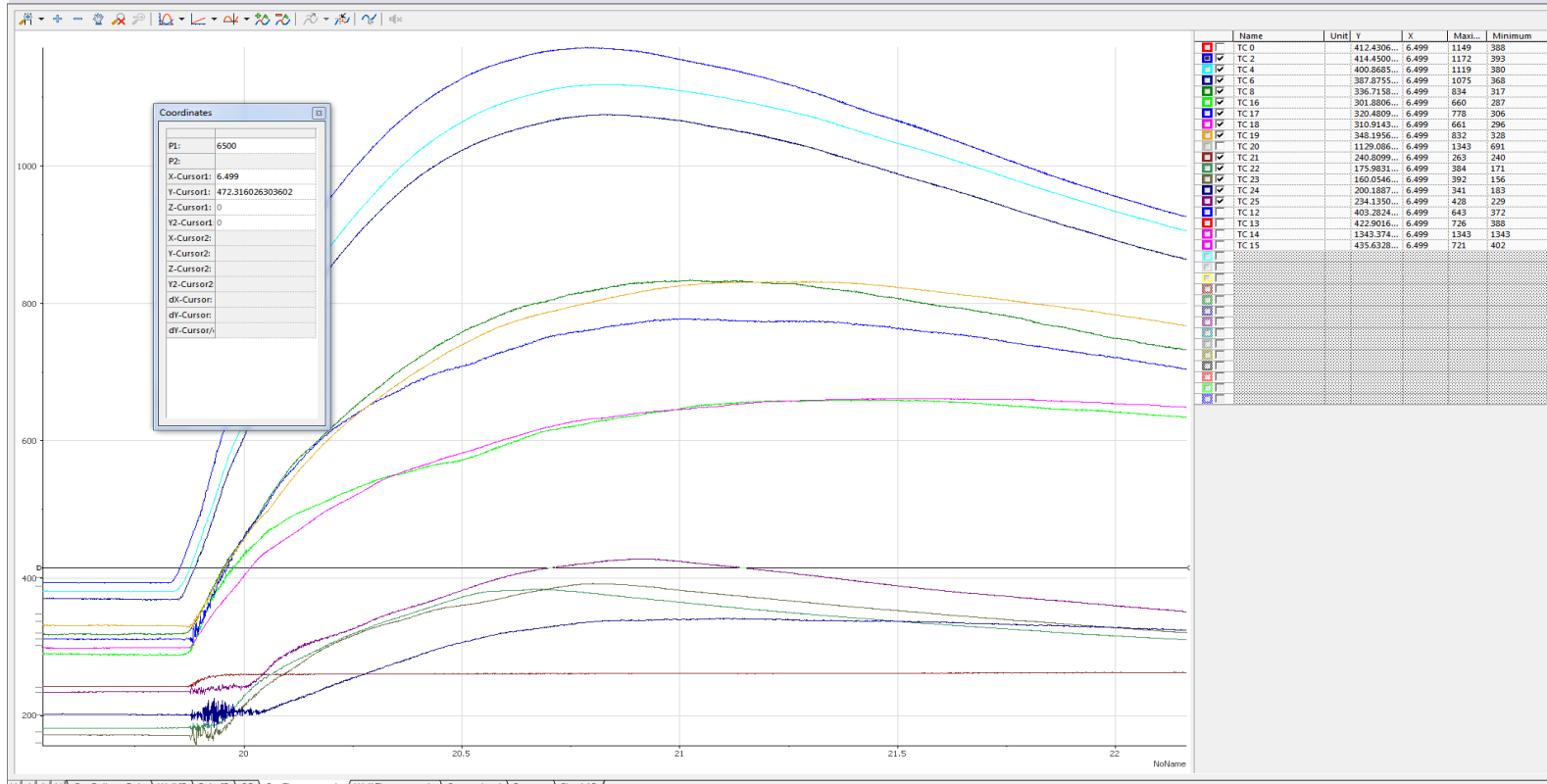
| Name | Unit | Y |
|---|-------------------------------|----------------|
| X | Maximum | |
| <input checked="" type="checkbox"/> Optical probe 0 | 17.593119... 5.117102210304 | 0.003315700... |
| <input checked="" type="checkbox"/> Optical probe 1 | 17.593119... 5.11581371012269 | 0.024139724... |
| <input checked="" type="checkbox"/> Optical probe 2 | 17.593119... 5.11922421350426 | 0.007895387... |
| <input checked="" type="checkbox"/> Optical probe 3 | 17.593119... 5.11989331392323 | 0.007423127... |
| <input type="checkbox"/> Optical probe 4 | 17.593119... 4.90920813036136 | 0.003995533... |
| <input type="checkbox"/> Optical probe 5 | 17.593119... 3.41725761504745 | 0.004350366... |
| <input type="checkbox"/> Optical probe 6 | 17.593119... 5.1187824882644 | 0.004973043... |
| <input type="checkbox"/> Optical probe 7 | 17.593119... 5.11819901267894 | 0.003170173... |
| <input type="checkbox"/> Optical probe 8 | 17.593119... 5.11346332661256 | 0.004240245... |
| <input type="checkbox"/> Optical probe 9 | 17.593119... 5.11781178053173 | 0.004343798... |
| <input type="checkbox"/> Optical probe 10 | 17.593119... 2.26273308807987 | 0.004161494... |
| <input type="checkbox"/> Optical probe 11 | 17.593119... 2.83477966518895 | 0.004555718... |

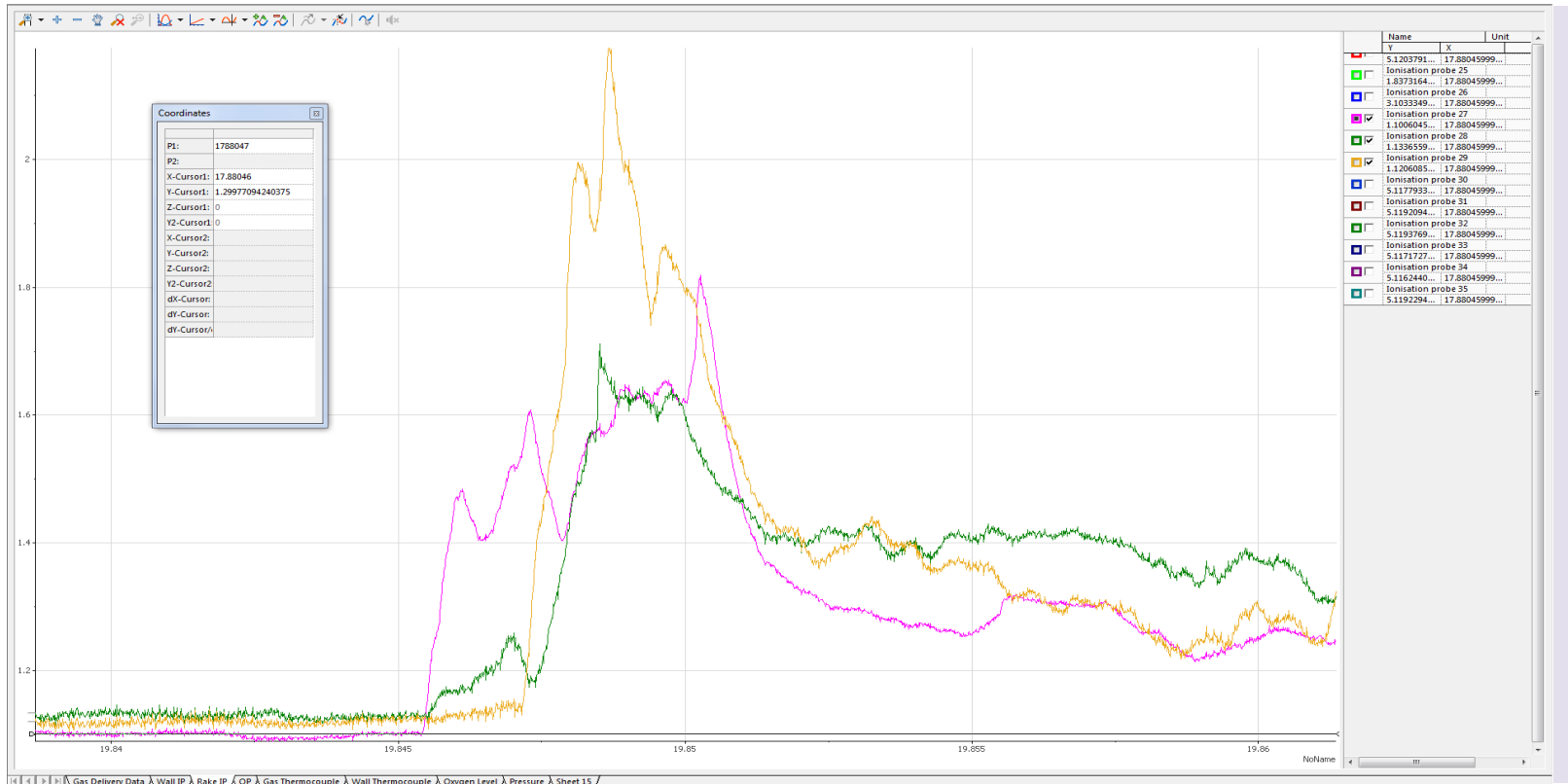
Ionisation Probes



| Name | Unit | Y |
|--|------|----------------|
| X | | |
| <input type="checkbox"/> Ionisation probe 0 | | 1.087573708... |
| <input type="checkbox"/> 17.570649... | | |
| <input type="checkbox"/> Ionisation probe 1 | | 1.161771003... |
| <input type="checkbox"/> 17.570649... | | |
| <input type="checkbox"/> Ionisation probe 2 | | 1.128336374... |
| <input type="checkbox"/> 17.570649... | | |
| <input type="checkbox"/> Ionisation probe 3 | | 1.113797867... |
| <input type="checkbox"/> 17.570649... | | |
| <input checked="" type="checkbox"/> Ionisation probe 4 | | 1.350528491... |
| <input type="checkbox"/> 17.570649... | | |
| <input checked="" type="checkbox"/> Ionisation probe 5 | | 1.104953229... |
| <input type="checkbox"/> 17.570649... | | |
| <input checked="" type="checkbox"/> Ionisation probe 6 | | 1.555423426... |
| <input type="checkbox"/> 17.570649... | | |
| <input checked="" type="checkbox"/> Ionisation probe 7 | | 1.079025763... |
| <input type="checkbox"/> 17.570649... | | |
| <input type="checkbox"/> Ionisation probe 8 | | 1.088447533... |
| <input type="checkbox"/> 17.570649... | | |
| <input type="checkbox"/> Ionisation probe 9 | | 1.087364379... |
| <input type="checkbox"/> 17.570649... | | |
| <input type="checkbox"/> Ionisation probe 10 | | 1.093247323... |
| <input type="checkbox"/> 17.570649... | | |
| <input type="checkbox"/> Ionisation probe 11 | | 1.343457124... |
| <input type="checkbox"/> 17.570649... | | |
| <input type="checkbox"/> Ionisation probe 12 | | 1.069801728... |
| <input type="checkbox"/> 17.570649... | | |
| <input type="checkbox"/> Ionisation probe 13 | | 1.071628576... |
| <input type="checkbox"/> 17.570649... | | |
| <input type="checkbox"/> Ionisation probe 14 | | 1.081054955... |
| <input type="checkbox"/> 17.570649... | | |
| <input type="checkbox"/> Ionisation probe 15 | | 1.120202611... |
| <input type="checkbox"/> 17.570649... | | |
| <input type="checkbox"/> Ionisation probe 16 | | 1.092913155... |
| <input type="checkbox"/> 17.570649... | | |
| <input type="checkbox"/> Ionisation probe 17 | | 1.086801157... |
| <input type="checkbox"/> 17.570649... | | |
| <input type="checkbox"/> Ionisation probe 18 | | 1.085869694... |
| <input type="checkbox"/> 17.570649... | | |
| <input type="checkbox"/> Ionisation probe 19 | | 1.099014246... |
| <input type="checkbox"/> 17.570649... | | |
| <input type="checkbox"/> Ionisation probe 20 | | 1.091326519... |
| <input type="checkbox"/> 17.570649... | | |
| <input type="checkbox"/> Ionisation probe 21 | | 1.072708728... |
| <input type="checkbox"/> 17.570649... | | |
| <input type="checkbox"/> Ionisation probe 22 | | 1.345645077... |
| <input type="checkbox"/> 17.570649... | | |
| <input type="checkbox"/> Ionisation probe 23 | | 1.123375707... |
| <input type="checkbox"/> 17.570649... | | |

Temperature





| Sensor | OLD DESIGNATION | NEW DESIGNATION | Section | Section Number | Side | Horizontal Location | Vertical Location | PORT REF | SIZE | "X" | "Y" | "Z" |
|--------|-----------------|-----------------|---------|----------------|------|---------------------|-------------------|----------|-----------|------|------|-------|
| - | | CD1-T1 | CD | 1 | T | 1 | | 1 | 1" BSPP | 0 | 298 | 258 |
| TC1 | TS1-1 | CD1-T2 | CD | 1 | T | 2 | | NA | SURFACE | 0 | 298 | 1508 |
| - | | CD1-B1 | CD | 1 | B | 1 | | 2 | 1" BSPP | 0 | -298 | 258 |
| - | NS1-1 | CD1-R1 | CD | 1 | R | 1 | | 3 | 3/4" BSPP | 298 | 0 | 258 |
| - | FS1-1 | CD1-L1 | CD | 1 | L | 1 | | 4 | 3/4" BSPP | -298 | 0 | 258 |
| - | NS1-2 | CD1-R2 | CD | 1 | R | 2 | | 5 | 3/4" BSPP | 298 | 0 | 758 |
| - | FS1-2 | CD1-L2 | CD | 1 | L | 2 | | 6 | 3/4" BSPP | -298 | 0 | 758 |
| TC0 | NS1-3 | CD1-R3 | CD | 1 | R | 3 | | 7 | 3/4" BSPP | 298 | 0 | 1258 |
| - | FS1-3 | CD1-L3 | CD | 1 | L | 3 | | 8 | 3/4" BSPP | -298 | 0 | 1258 |
| - | NS1-4 | CD1-R4 | CD | 1 | R | 4 | | 9 | 3/4" BSPP | 298 | 0 | 1758 |
| - | FS1-4 | CD1-L4 | CD | 1 | L | 4 | | 10 | 3/4" BSPP | -298 | 0 | 1758 |
| - | NS1-5 | CD1-R5 | CD | 1 | R | 5 | | 11 | 3/4" BSPP | 298 | 0 | 2258 |
| - | FS1-5 | CD1-L5 | CD | 1 | L | 5 | | 12 | 3/4" BSPP | -298 | 0 | 2258 |
| - | NS1-6 | CD1-R6 | CD | 1 | R | 6 | | 13 | 3/4" BSPP | 298 | 0 | 2758 |
| - | FS1-6 | CD1-L6 | CD | 1 | L | 6 | | 14 | 3/4" BSPP | -298 | 0 | 2758 |
| IGN | | CD2-T1 | CD | 2 | T | 1 | | 15 | 1" BSPP | 0 | 298 | 3258 |
| TC3 | TS2-1 | CD2-T2 | CD | 2 | T | 2 | | NA | SURFACE | 0 | 298 | 4508 |
| - | | CD2-B1 | CD | 2 | B | 1 | | 16 | 1" BSPP | 0 | -298 | 2358 |
| - | NS2-1 | CD2-R1 | CD | 2 | R | 1 | | 17 | 3/4" BSPP | 298 | 0 | 3258 |
| - | FS2-1 | CD2-L1 | CD | 2 | L | 1 | | 18 | 3/4" BSPP | -298 | 0 | 3258 |
| - | NS2-2 | CD2-R2 | CD | 2 | R | 2 | | 19 | 3/4" BSPP | 298 | 0 | 3758 |
| - | FS2-2 | CD2-L2 | CD | 2 | L | 2 | | 20 | 3/4" BSPP | -298 | 0 | 3758 |
| TC2 | NS2-3 | CD2-R3 | CD | 2 | R | 3 | | 21 | 3/4" BSPP | 298 | 0 | 4258 |
| - | FS2-3 | CD2-L3 | CD | 2 | L | 3 | | 22 | 3/4" BSPP | -298 | 0 | 4258 |
| - | NS2-4 | CD2-R4 | CD | 2 | R | 4 | | 23 | 3/4" BSPP | 298 | 0 | 4758 |
| - | FS2-4 | CD2-L4 | CD | 2 | L | 4 | | 24 | 3/4" BSPP | -298 | 0 | 4758 |
| - | NS2-5 | CD2-R5 | CD | 2 | R | 5 | | 25 | 3/4" BSPP | 298 | 0 | 5258 |
| - | FS2-5 | CD2-L5 | CD | 2 | L | 5 | | 26 | 3/4" BSPP | -298 | 0 | 5258 |
| - | NS2-6 | CD2-R6 | CD | 2 | R | 6 | | 27 | 3/4" BSPP | 298 | 0 | 5758 |
| - | FS2-6 | CD2-L6 | CD | 3 | L | 6 | | 28 | 3/4" BSPP | -298 | 0 | 5758 |
| TC12 | | CD3-T1 | CD | 3 | T | 1 | | 29 | 1" BSPP | 0 | 298 | 6258 |
| TC5 | TS1-1 | CD3-T2 | CD | 3 | T | 2 | | NA | SURFACE | 0 | 298 | 7508 |
| TC14 | | CD3-B1 | CD | 3 | B | 1 | | 30 | 1" BSPP | 0 | -298 | 6258 |
| TC15 | NS3-1 | CD3-R1 | CD | 3 | R | 1 | | 31 | 3/4" BSPP | 298 | 0 | 6258 |
| TC13 | FS3-1 | CD3-L1 | CD | 3 | L | 1 | | 32 | 3/4" BSPP | -298 | 0 | 6258 |
| - | NS3-2 | CD3-R2 | CD | 3 | R | 2 | | 33 | 3/4" BSPP | 298 | 0 | 6758 |
| - | FS3-2 | CD3-L2 | CD | 3 | L | 2 | | 34 | 3/4" BSPP | -298 | 0 | 6758 |
| TC4 | NS3-3 | CD3-R3 | CD | 3 | R | 3 | | 35 | 3/4" BSPP | 298 | 0 | 7258 |
| - | FS3-3 | CD3-L3 | CD | 3 | L | 3 | | 36 | 3/4" BSPP | -298 | 0 | 7258 |
| - | NS3-4 | CD3-R4 | CD | 3 | R | 4 | | 37 | 3/4" BSPP | 298 | 0 | 7758 |
| - | FS3-4 | CD3-L4 | CD | 3 | L | 4 | | 38 | 3/4" BSPP | -298 | 0 | 7758 |
| KU0 | NS3-5 | CD3-R5 | CD | 3 | R | 5 | | 39 | 3/4" BSPP | 298 | 0 | 8258 |
| - | FS3-5 | CD3-L5 | CD | 3 | L | 5 | | 40 | 3/4" BSPP | -298 | 0 | 8258 |
| - | NS3-6 | CD3-R6 | CD | 3 | R | 6 | | 41 | 3/4" BSPP | 298 | 0 | 8758 |
| - | FS3-6 | CD3-L6 | CD | 3 | L | 6 | | 42 | 3/4" BSPP | -298 | 0 | 8758 |
| - | | CD4-T1 | CD | 4 | T | 1 | | 43 | 1" BSPP | 0 | 298 | 9258 |
| TC7 | TS1-1 | CD4-T2 | CD | 4 | T | 2 | | NA | SURFACE | 0 | 298 | 10508 |
| - | | CD4-B1 | CD | 4 | B | 1 | | 44 | 1" BSPP | 0 | -298 | 9258 |
| - | NS4-1 | CD4-R1 | CD | 4 | R | 1 | | 45 | 3/4" BSPP | 298 | 0 | 9258 |
| - | FS4-1 | CD4-L1 | CD | 4 | L | 1 | | 46 | 3/4" BSPP | -298 | 0 | 9258 |
| KU1 | NS4-2 | CD4-R2 | CD | 4 | R | 2 | | 47 | 3/4" BSPP | 298 | 0 | 9758 |
| - | FS4-2 | CD4-L2 | CD | 4 | L | 2 | | 48 | 3/4" BSPP | -298 | 0 | 9758 |
| TC6 | NS4-3 | CD4-R3 | CD | 4 | R | 3 | | 49 | 3/4" BSPP | 298 | 0 | 10258 |
| - | FS4-3 | CD4-L3 | CD | 4 | L | 3 | | 50 | 3/4" BSPP | -298 | 0 | 10258 |
| - | NS4-4 | CD4-R4 | CD | 4 | R | 4 | | 51 | 3/4" BSPP | 298 | 0 | 10758 |
| OP0 | FS4-4 | CD4-L4 | CD | 4 | L | 4 | | 52 | 3/4" BSPP | -298 | 0 | 10758 |
| - | NS4-5 | CD4-R5 | CD | 4 | R | 5 | | 53 | 3/4" BSPP | 298 | 0 | 11258 |
| - | FS4-5 | CD4-L5 | CD | 4 | L | 5 | | 54 | 3/4" BSPP | -298 | 0 | 11258 |
| OP1 | NS4-6 | CD4-R6 | CD | 4 | R | 6 | | 55 | 3/4" BSPP | 298 | 0 | 11758 |

| Sensor | OLD DESIGNATION | NEW DESIGNATION | Section | Section Number | Side | Horizontal Location | Vertical Location | PORT REF | SIZE | "X" | "Y" | "Z" |
|--------|-----------------|-----------------|---------|----------------|------|---------------------|-------------------|----------|----------------|------|------|-------|
| IP0 | FS4-6 | CD4-L6 | CD | 4 | L | 6 | | 56 | 3/4" BSPP | -298 | 0 | 11758 |
| OP2 | | HR1-R1 | HR | 1 | R | 1 | | 57 | 3/4" BSPP | 308 | 0 | 12152 |
| - | | HR1-L1 | HR | 1 | L | 1 | | 58 | 3/4" BSPP | -308 | 0 | 12152 |
| TC8 | | HR1-R2 | HR | 1 | R | 2 | | 59 | 3/4" BSPP | 393 | 0 | 13160 |
| - | | HR1-L2 | HR | 1 | L | 2 | | 60 | 3/4" BSPP | -393 | 0 | 13160 |
| RA1 | | HR2-R2M | HR | 2 | R | 2 | M | 61 | 11/4" BSPP | 448 | 70 | 13785 |
| RA1 | | HR2-L2M | HR | 2 | L | 2 | M | 62 | 11/4" BSPP | -448 | 70 | 13785 |
| TC16 | | HR2-R3M | HR | 2 | R | 3 | M | 63 | 3/4" BSPP | 528 | 410 | 14140 |
| - | | HR2-L3M | HR | 2 | L | 3 | M | 64 | 3/4" BSPP | -528 | 410 | 14140 |
| - | | HR2-T3 | HR | 2 | T | 3 | | 65 | 1" BSPP | 0 | 1122 | 14215 |
| RA2 | | HR2-R4M | HR | 2 | R | 4 | M | 66 | 11/4" BSPP | 598 | 700 | 14475 |
| RA2 | | HR2-L4M | HR | 2 | L | 4 | M | 67 | 11/4" BSPP | -598 | 700 | 14475 |
| - | | HR2-B5 | HR | 2 | B | 5 | | 68 | 1" BSPP | 0 | -100 | 14745 |
| KU2 | | HR2-T5 | HR | 2 | T | 5 | | 69 | 1" BSPP | 0 | 2315 | 14745 |
| TC17 | | HR2-R5L | HR | 2 | R | 5 | L | 70 | 3/4" BSPP | 662 | 310 | 14745 |
| IP1 | | HR2-L5L | HR | 2 | L | 5 | L | 71 | 3/4" BSPP | -662 | 310 | 14745 |
| OP3 | | HR2-R5M | HR | 2 | R | 5 | M | 72 | 3/4" BSPP | 662 | 975 | 14745 |
| IP2 | | HR2-L5M | HR | 2 | L | 5 | M | 73 | 3/4" BSPP | -662 | 975 | 14745 |
| TC18 | | HR2-R5U | HR | 2 | R | 5 | U | 74 | 3/4" BSPP | 662 | 1660 | 14745 |
| IP3 | | HR2-L5U | HR | 2 | L | 5 | U | 75 | 3/4" BSPP | -662 | 1660 | 14745 |
| KU3 | | HR3-L1L | HR | 3 | L | 1 | L | 76 | 3/4" BSPP | -700 | 400 | 15140 |
| TC19 | | HR3-L1M | HR | 3 | L | 1 | M | 77 | 11/4" BSPP | -700 | 1335 | 15140 |
| IP8 | | HR3-L1U | HR | 3 | L | 1 | U | 78 | 3/4" BSPP | -700 | 2270 | 15140 |
| IP4 | | HR3-R1L | HR | 3 | R | 1 | L | 136 | 3/4" BSPP | 700 | 400 | 15140 |
| IP5 | | HR3-R1LM | HR | 3 | R | 1 | LM | 137 | 3/4" BSPP | 700 | 868 | 15140 |
| IP6 | | HR3-R1M | HR | 3 | R | 1 | M | 138 | 3/4" BSPP | 700 | 1335 | 15140 |
| - | | HR3-R1UM | HR | 3 | R | 1 | UM | 139 | 3/4" BSPP | 700 | 1802 | 15140 |
| IP7 | | HR3-R1U | HR | 3 | R | 1 | U | 140 | 3/4" BSPP | 700 | 2270 | 15140 |
| - | | HE1-R1L | HE | 1 | R | 1 | L | 79 | 3/4" BSPP | 700 | 400 | 15600 |
| - | | HE1-R1M | HE | 1 | R | 1 | M | 80 | 3/4" BSPP | 700 | 1335 | 15600 |
| KU4 | | HE1-R1U | HE | 1 | R | 1 | U | 81 | 3/4" BSPP | 700 | 2270 | 15600 |
| TC20 | | HE2-R1L | HE | 2 | R | 1 | L | 83 | 3/4" BSPP | 700 | 400 | 16090 |
| IP9 | | HE2-R1M | HE | 2 | R | 1 | M | 84 | 3/4" BSPP | 700 | 1335 | 16090 |
| TC21 | | HE2-R1U | HE | 2 | R | 1 | U | 85 | 3/4" BSPP | 700 | 2270 | 16090 |
| KU5 | | HE3-R1L | HE | 3 | R | 1 | L | 87 | 3/4" BSPP | 700 | 400 | 16580 |
| - | | HE3-R1M | HE | 3 | R | 1 | M | 88 | 3/4" BSPP | 700 | 1335 | 16580 |
| - | | HE3-R1U | HE | 3 | R | 1 | U | 89 | 3/4" BSPP | 700 | 2270 | 16580 |
| OP4 | | HE1-T1 | HE | 1 | T | 1 | | 82 | 3/4" BSPP HOLE | -47 | 2735 | 15600 |
| OP5 | | HE2-T1 | HE | 2 | T | 1 | | 86 | 3/4" BSPP HOLE | 0 | 2735 | 16090 |
| OP6 | | HE3-T1 | HE | 3 | T | 1 | | 90 | 3/4" BSPP HOLE | -47 | 2735 | 16580 |
| OP7 | | HR4-T1 | HR | 4 | T | 1 | | 91 | 1" BSPP | 0 | 2735 | 16985 |
| - | | HR4-B1 | HR | 4 | B | 1 | | 92 | 1" BSPP | 0 | -65 | 16985 |
| KU6 | | HR4-R1L | HR | 4 | R | 1 | L | 93 | 3/4" BSPP | 700 | 400 | 16985 |
| IP10 | | HR4-L1L | HR | 4 | L | 1 | L | 94 | 3/4" BSPP | -700 | 400 | 16985 |
| OP8 | | HR4-R1M | HR | 4 | R | 1 | M | 95 | 3/4" BSPP | 700 | 1335 | 16985 |
| IP11 | | HR4-L1M | HR | 4 | L | 1 | M | 96 | 3/4" BSPP | -700 | 1335 | 16985 |
| IP13 | | HR4-R1U | HR | 4 | R | 1 | U | 97 | 3/4" BSPP | 700 | 2270 | 16985 |
| IP12 | | HR4-L1U | HR | 4 | L | 1 | U | 98 | 3/4" BSPP | -700 | 2270 | 16985 |
| RA3 | | HR4-R3M | HR | 4 | R | 3 | M | 99 | 11/4" BSPP | 700 | 1335 | 17575 |
| RA3 | | HR4-L3M | HR | 4 | L | 3 | M | 100 | 11/4" BSPP | -700 | 1335 | 17575 |
| RA4 | | HR4-R3L | HR | 4 | R | 3 | L | 141 | 11/4" BSPP | 700 | 400 | 17575 |
| IP14 | | HR4-R3U | HR | 4 | R | 3 | U | 142 | 3/4" BSPP | 700 | 2270 | 17575 |
| RA4 | | HR4-L3L | HR | 4 | L | 3 | L | 143 | 11/4" BSPP | -700 | 400 | 17575 |
| - | | HR4-L3U | HR | 4 | L | 3 | U | 144 | 3/4" BSPP | -700 | 2270 | 17575 |
| IP18 | | HR4-R5M | HR | 4 | R | 5 | M | 101 | 3/4" BSPP | 700 | 1335 | 18165 |
| IP16 | | HR4-L5M | HR | 4 | L | 5 | M | 102 | 3/4" BSPP | -700 | 1335 | 18165 |
| OP9 | | HR4-R5L | HR | 4 | R | 5 | L | 145 | 3/4" BSPP | 700 | 400 | 18165 |
| KU7 | | HR4-R5U | HR | 4 | R | 5 | U | 146 | 3/4" BSPP | 700 | 2270 | 18165 |
| IP15 | | HR4-L5L | HR | 4 | L | 5 | L | 147 | 3/4" BSPP | -700 | 400 | 18165 |

| Sensor | OLD DESIGNATION | NEW DESIGNATION | Section | Section Number | Side | Horizontal Location | Vertical Location | PORT REF | SIZE | "X" | "Y" | "Z" |
|--------|-----------------|-----------------|---------|----------------|------|---------------------|-------------------|----------|------------|------|------|-------|
| IP17 | | HR4-L5U | HR | 4 | L | 5 | U | 148 | 3/4" BSPP | -700 | 2270 | 18165 |
| - | | HR5-R1M | HR | 5 | R | 1 | M | NA | SURFACE | 700 | 1200 | 18455 |
| OP10 | | HR5-T2 | HR | 5 | T | 2 | | 103 | 1" BSPP | 0 | 2735 | 18775 |
| - | | HR5-B2 | HR | 5 | B | 2 | | 104 | 1" BSPP | 0 | -65 | 18775 |
| KU8 | | HR5-R2L | HR | 5 | R | 2 | L | 105 | 3/4" BSPP | 700 | 400 | 18775 |
| IP19 | | HR5-L2L | HR | 5 | L | 2 | L | 106 | 3/4" BSPP | -700 | 400 | 18775 |
| OP11 | | HR5-R2M | HR | 5 | R | 2 | M | 107 | 3/4" BSPP | 700 | 1335 | 18775 |
| IP20 | | HR5-L2M | HR | 5 | L | 2 | M | 108 | 3/4" BSPP | -700 | 1335 | 18775 |
| IP22 | | HR5-R2U | HR | 5 | R | 2 | U | 109 | 3/4" BSPP | 700 | 2270 | 18775 |
| IP21 | | HR5-L2U | HR | 5 | L | 2 | U | 110 | 3/4" BSPP | -700 | 2270 | 18775 |
| TC22 | | HR5-R4M | HR | 5 | R | 4 | M | 111 | 11/4" BSPP | 700 | 1335 | 19375 |
| - | | HR5-L4M | HR | 5 | L | 4 | M | 112 | 11/4" BSPP | -700 | 1335 | 19375 |
| TC23 | | HR6-R1M | HR | 6 | R | 1 | M | 113 | 3/4" BSPP | 700 | 1335 | 19985 |
| IP23 | | HR6-L1M | HR | 6 | L | 1 | M | 114 | 3/4" BSPP | -700 | 1335 | 19985 |
| - | | HR6-T3 | HR | 6 | T | 3 | | 115 | 1" BSPP | 0 | 2735 | 20575 |
| - | | HR6-B3 | HR | 6 | B | 3 | | 116 | 3/4" BSPP | 0 | -65 | 20575 |
| KU9 | | HR6-R3L | HR | 6 | R | 3 | L | 117 | 3/4" BSPP | 700 | 400 | 20575 |
| - | | HR6-L3L | HR | 6 | L | 3 | L | 118 | 3/4" BSPP | -700 | 400 | 20575 |
| - | | HR6-R3M | HR | 6 | R | 3 | M | 119 | 11/4" BSPP | 700 | 1335 | 20575 |
| - | | HR6-L3M | HR | 6 | L | 3 | M | 120 | 11/4" BSPP | -700 | 1335 | 20575 |
| - | | HR6-R3U | HR | 6 | R | 3 | U | 121 | 3/4" BSPP | 700 | 2270 | 20575 |
| - | | HR6-L3U | HR | 6 | L | 3 | U | 122 | 3/4" BSPP | -700 | 2270 | 20575 |
| - | | HR6-B5 | HR | 6 | B | 5 | | 123 | 1" BSPP | 0 | -65 | 21165 |
| TC24 | | HR6-R5L | HR | 6 | R | 5 | L | 124 | 3/4" BSPP | 700 | 400 | 21165 |
| KU10 | | HR6-L5L | HR | 6 | L | 5 | L | 125 | 3/4" BSPP | -700 | 400 | 21165 |
| - | | HR6-R5M | HR | 6 | R | 5 | M | 126 | 3/4" BSPP | 700 | 1335 | 21165 |
| - | | HR6-L5M | HR | 6 | L | 5 | M | 127 | 3/4" BSPP | -700 | 1335 | 21165 |
| TC25 | | HR6-R5U | HR | 6 | R | 5 | U | 128 | 3/4" BSPP | 700 | 2270 | 21165 |
| - | | HR6-L5U | HR | 6 | L | 5 | U | 129 | 3/4" BSPP | -700 | 2270 | 21165 |
| - | | EP-1L | EP | | | 1 | L | 130 | 1" BSPP | 650 | -15 | 21330 |
| - | | EP-2L | EP | | | 2 | L | 131 | 1" BSPP | 0 | -15 | 21330 |
| - | | EP-3L | EP | | | 3 | L | 132 | 1" BSPP | -650 | -15 | 21330 |
| - | | EP-1M | EP | | | 1 | M | 133 | 1" BSPP | 250 | 1335 | 21330 |
| - | | EP-2M | EP | | | 2 | M | 134 | 1" BSPP | -250 | 1335 | 21330 |
| - | | EP-1U | EP | | | 1 | U | 135 | 3/4" BSPP | 0 | 2270 | 21330 |

