

Date	09 January 2019
Time	14:31:23
Test Number	HRSG Test 32
Mixture Composition	100% CH4
Ambient Temperature	0.4 °C
Ambient Pressure	982
Wind Speed	2.2 m/s
Wind direction	NW
Relative Humidity	87.00%
Mass Flow	10.1190 kg/s
Equivalence Ratio	0.49

General Comments: (weather, rig configuration)

Weather: Overcast and cold. 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: 40%; 11,800 rpm

Test on 100% CH4 at an intended EQR of 0.50

The test gave a weak combustion event. Many sensors provided an identifiable response albeit weak. Many sensors, downstream of the HE in particular, did not detect a flame

Highest overpressure of 117 mbar seen in duct on KU1

Ionisation Probes

Max. flame speed
112 m/s

Max. gas temperature
1032 °C

Max overpressure
117 mbar

Initial gas temperature
396 °C

Ionisation Rakes

Max. flame speed
95 m/s

Optical Probes

Max. flame speed
162 m/s

Location of Max. Overpressure

sensor	KU1
label	CD4-R2
distance	9758 mm

Location of Max. Temperature

sensor	TC19
label	HR3-L1M
distance	15140 mm

Location of Max. Flame Speed

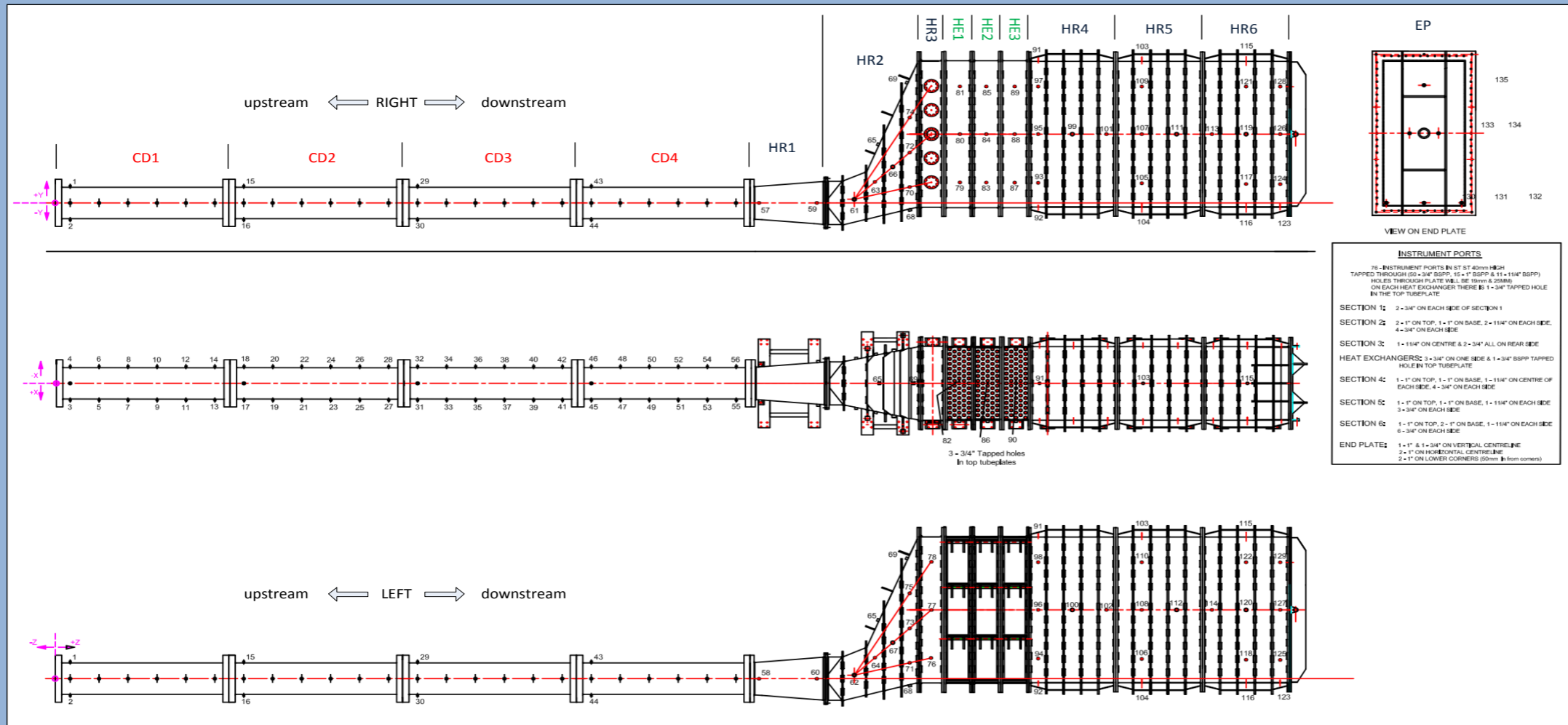
sensor	IPO
label	CD4-L6
distance	11758 mm

Location of Max. Flame Speed

sensor	RA2
label	HR2-R4M
distance	14475 mm

Location of Max. Flame Speed

sensor	OP1
label	CD4-R6
distance	11758 mm



INSTRUMENT PORTS
 75 - INSTRUMENT PORTS IN 31 ST 40mm HIGH TAPPED THROUGH 60 x 3/4" BSPP, 15 x 1" BSPP & 11 x 1/4" BSPP. HOLES THROUGH PLATE WILL BE 10mm & 25mm. ON EACH HEAT EXCHANGER THERE IS 1 - 3/4" TAPPED HOLE IN THE TOP TUBEPLATE.

SECTION 1: 2 x 3/4" ON EACH SIDE OF SECTION 1
SECTION 2: 2 x 1" ON TOP, 1 x 1" ON BASE, 2 x 1/4" ON EACH SIDE, 4 x 3/4" ON EACH SIDE
SECTION 3: 1 - 1/4" ON CENTRE & 2 x 3/4" ALL ON REAR SIDE
HEAT EXCHANGERS: 1 - 3/4" ON ONE SIDE & 1 - 3/4" BSPP TAPPED HOLE IN TOP TUBEPLATE
SECTION 4: 1 - 1" ON TOP, 1 - 1" ON BASE, 1 - 1/4" ON CENTRE OF EACH SIDE, 4 - 3/4" ON EACH SIDE
SECTION 5: 1 - 1" ON TOP, 1 - 1" ON BASE, 1 - 1/4" ON EACH SIDE, 3 - 3/4" ON EACH SIDE
SECTION 6: 1 - 1" ON TOP, 2 - 1" ON BASE, 1 - 1/4" ON EACH SIDE, 6 - 3/4" ON EACH SIDE
END PLATE: 1 - 1" & 1 - 3/4" ON VERTICAL CENTRELINE, 2 - 1" ON HORIZONTAL CENTRELINE, 2 - 1" ON LOWER CORNERS (50mm from corners)

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

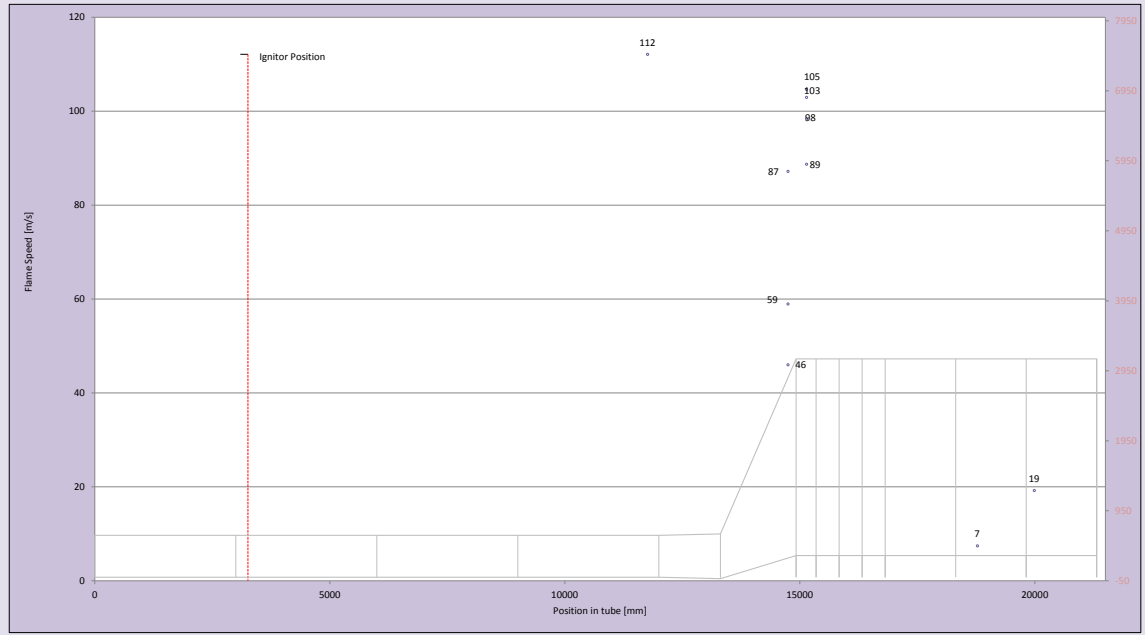
- 4 circular duct sections (CD1 to CD4)
- 6 HRSG sections (HR1 to HR6)
- 3 heat exchanger sections (HE1 to HE3) located between HR3 and HR4

0	3000	6000	9000	12000	13310	14920	15345	15835	16325	16815	18315	19815	21315	21315	19815	16815	16325	15835	15345	14920	13310	12000	9000	6000	3000	0
600	600	600	600	600	620	3120	3120	3120	3120	3120	3120	3120	3120	310	310	310	310	310	310	310	-20	0	0	0	0	0

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	18.95570	112
IP1	HR2-L5L	Ionisation probe 1	14745	18.98996	87
IP2	HR2-L5M	Ionisation probe 2	14745	19.00636	59
IP3	HR2-L5U	Ionisation probe 3	14745	19.02063	46
IP4	HR3-R1L	Ionisation probe 4	15140	18.99345	105
IP5	HR3-R1LM	Ionisation probe 5	15140	18.99529	103
IP6	HR3-R1M	Ionisation probe 6	15140	19.00067	98
IP7	HR3-R1U	Ionisation probe 7	15140	19.01382	89
IP8	HR3-L1U	Ionisation probe 8	15140	19.01689	
IP9	HE2-R1M	Ionisation probe 9	16090	ND	
IP10	HR4-L1L	Ionisation probe 10	16985	ND	
IP11	HR4-L1M	Ionisation probe 11	16985	ND	
IP12	HR4-L1U	Ionisation probe 12	16985	ND	
IP13	HR4-R1U	Ionisation probe 13	16985	ND	
IP14	HR4-R3U	Ionisation probe 14	17575	ND	
IP15	HR4-L5L	Ionisation probe 15	18165	19.16287	
IP16	HR4-L5M	Ionisation probe 16	18165	19.24524	
IP17	HR4-L5U	Ionisation probe 17	18165	ND	
IP18	HR4-R5M	Ionisation probe 18	18165	19.23353	
IP19	HR5-L2L	Ionisation probe 19	18775	19.20650	
IP20	HR5-L2M	Ionisation probe 20	18775	19.32726	7
IP21	HR5-L2U	Ionisation probe 21	18775	19.55812	
IP22	HR5-R2U	Ionisation probe 22	18775		
IP23	HR6-L1M	Ionisation probe 23	19985	19.39025	19

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

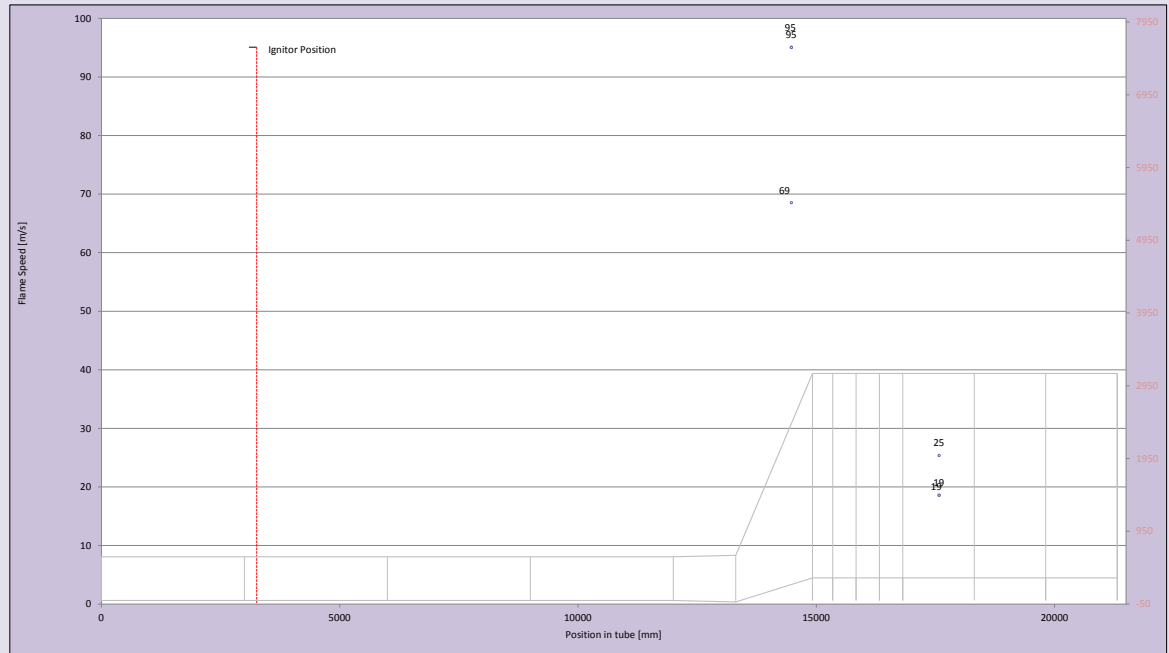


Location of igniter 3258 mm

Time of ignition 18.87989 seconds

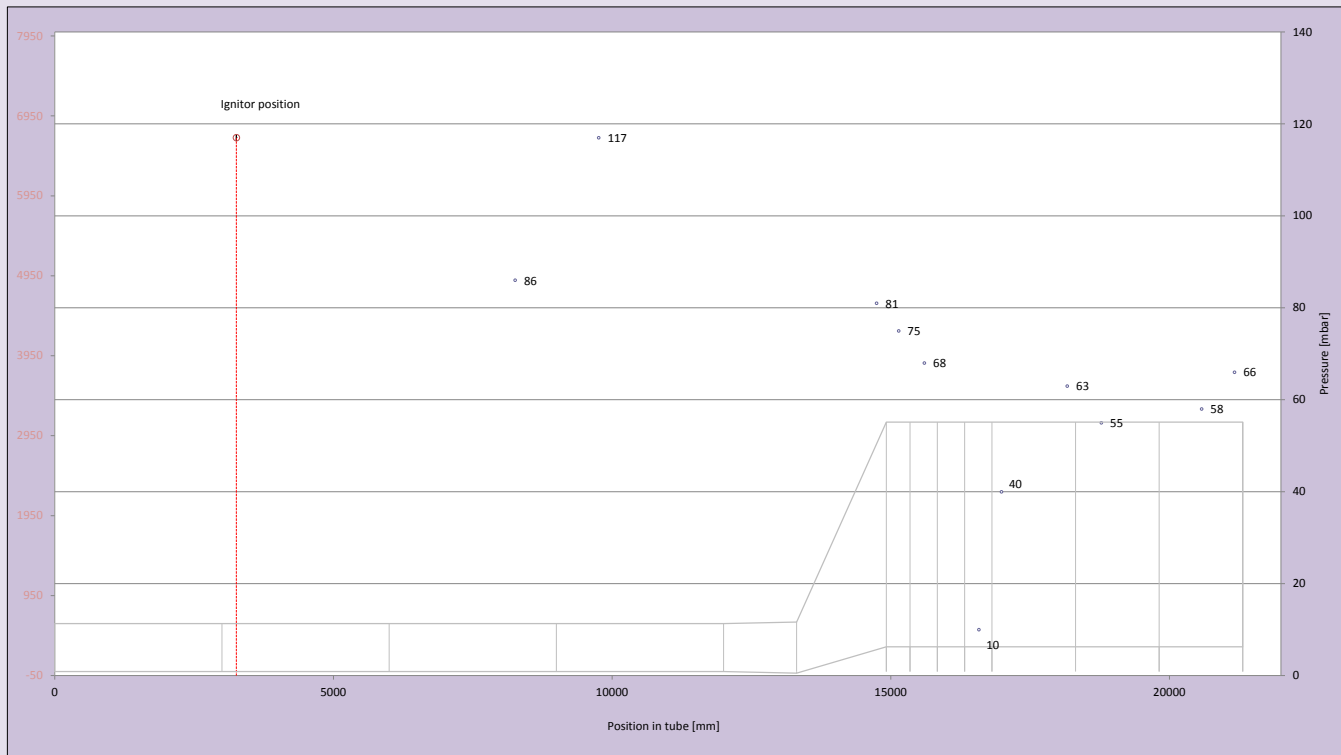
Rake Number	IP Number	Location label	Data Name	Position in tube (mm)	Flame arrival time (s)	Avg Flame speed from last sensor (m/s)
RA1	IP24	HR2-R2M	IP24	13785	NW	
RA1	IP25	HR2-R2M	IP25	13785	NW	
RA1	IP26	HR2-R2M	IP26	13785	NW	
RA2	IP27	HR2-R4M	IP27	14475	18.9979	95
RA2	IP28	HR2-R4M	IP28	14475	18.9979	95
RA2	IP29	HR2-R4M	IP29	14475	19.0435	69
RA3	IP30	HR4-R3M	IP30	17575	19.1645	19
RA3	IP31	HR4-R3M	IP31	17575	19.1646	19
RA3	IP32	HR4-R3M	IP32	17575	19.1656	25
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 mm

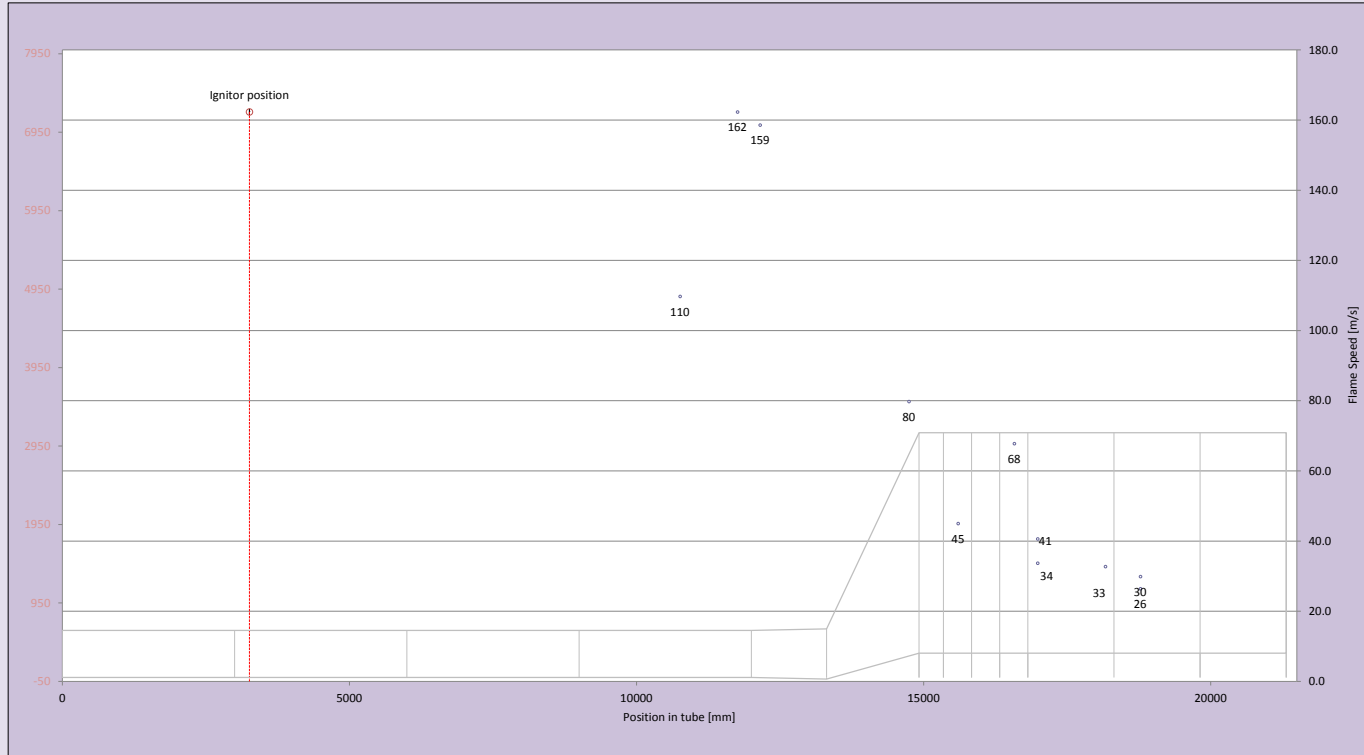
Transducer number	Location	Position in tube [mm]	ΔP_{max} [mbar]	Time ΔP_{max} [sec]
KU0	CD3-R5	8258	86	19.0228
KU1	CD4-R2	9758	117	19.0245
KU2	HR2-T5	14745	81	18.9926
KU3	HR3-L1L	15140	75	18.9844
KU4	HE1-R1U	15600	68	18.9916
KU5	HE3-R1L	16580	10	19.0093
KU6	HR4-R1L	16985	40	19.0128
KU7	HR4-R5U	18165	63	19.0021
KU8	HR5-R2L	18775	55	19.0010
KU9	HR6-R3L	20575	58	18.9993
KU10	HR6-L5L	21165	66	18.9995



Location of igniter mm Time of ignitio seconds

OP Number	Location label	Position in tube (mm)	Flame arrival time (s)	Average flame speed (m/s)
OP0	CD4-L4	10758	18.9482	109.8
OP1	CD4-R6	11758	18.9544	162.3
OP2	HR1-R1	12152	18.9570	158.6
OP3	HR2-R5M	14745	18.9982	79.8
OP4	HE1-T1	15600	19.0558	45.0
OP5	HE2-T1	16090	ND	
OP6	HE3-T1	16580	19.0341	67.8
OP7	HR4-T1	16985	19.1014	40.7
OP8	HR4-R1M	16985	19.1328	33.7
OP9	HR4-R5L	18165	19.1744	32.7
OP10	HR5-T2	18775	19.2164	29.9
OP11	HR5-R2M	18775	19.2515	26.4

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



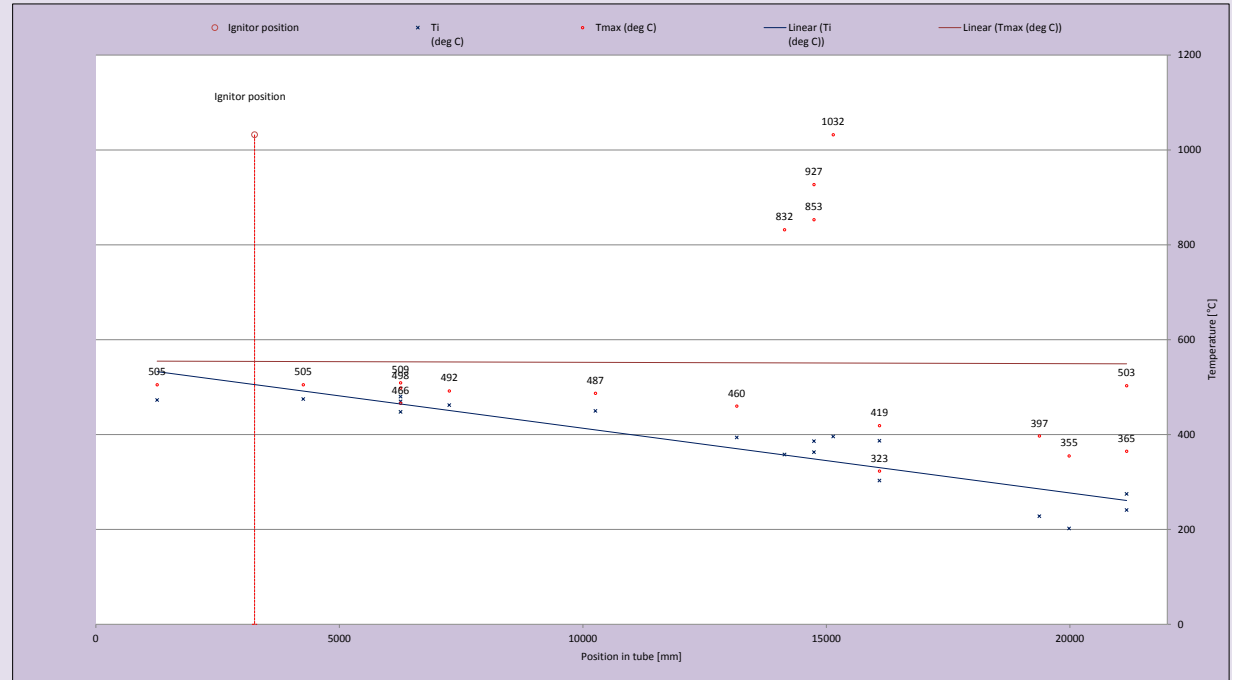
Location of igniter mm Time of ignition seconds

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			505	473
TC2	CD2-R3	4258		0	505	475
TC4	CD3-R3	7258		0	492	462
TC6	CD4-R3	10258		0	487	450
TC8	HR1-R2	13160		-1	460	394
TC12	CD3-T1	6258			466	448
TC13	CD3-L1	6258			498	470
TC14	CD3-B1	6258				
TC15	CD3-R1	6258			509	480
TC16	HR2-R3M	14140		-1	832	358
TC17	HR2-R5L	14745		-1	927	386
TC18	HR2-R5U	14745		-1	853	363
TC19	HR3-L1M	15140		-1	1032	396
TC20	HE2-R1L	16090			419	387
TC21	HE2-R1U	16090		-1	323	303
TC22	HR5-R4M	19375		-1	397	228
TC23	HR6-R1M	19985		-1	355	202
TC24	HR6-R5L	21165		-1	365	241
TC25	HR6-R5U	21165		-1	503	275

surface thermocouples [not plotted]

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

261	253
235	228
248	242
221	218



432

435

423

404

345

291

315

303

343

330

216

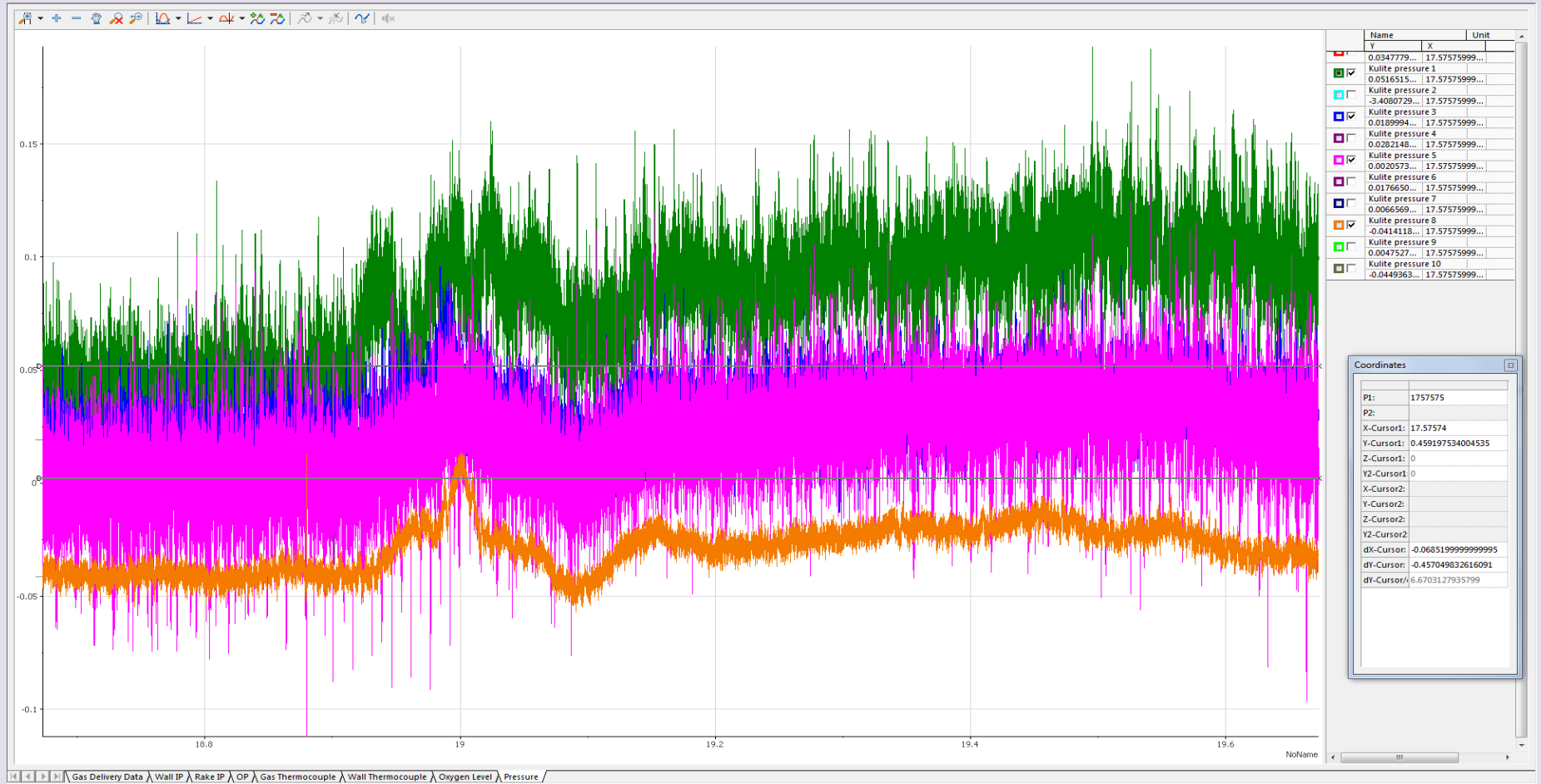
174

157

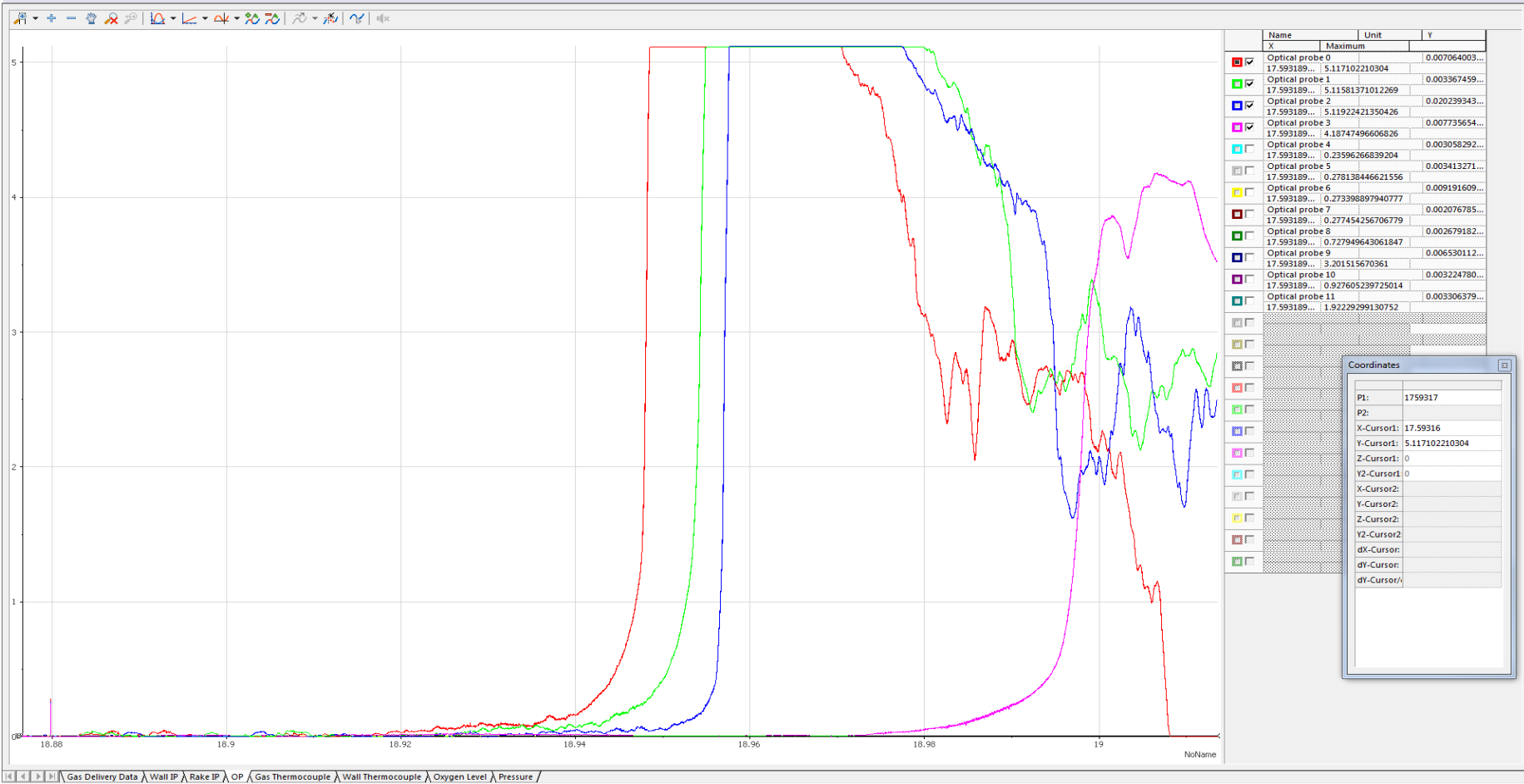
195

228

Pressure



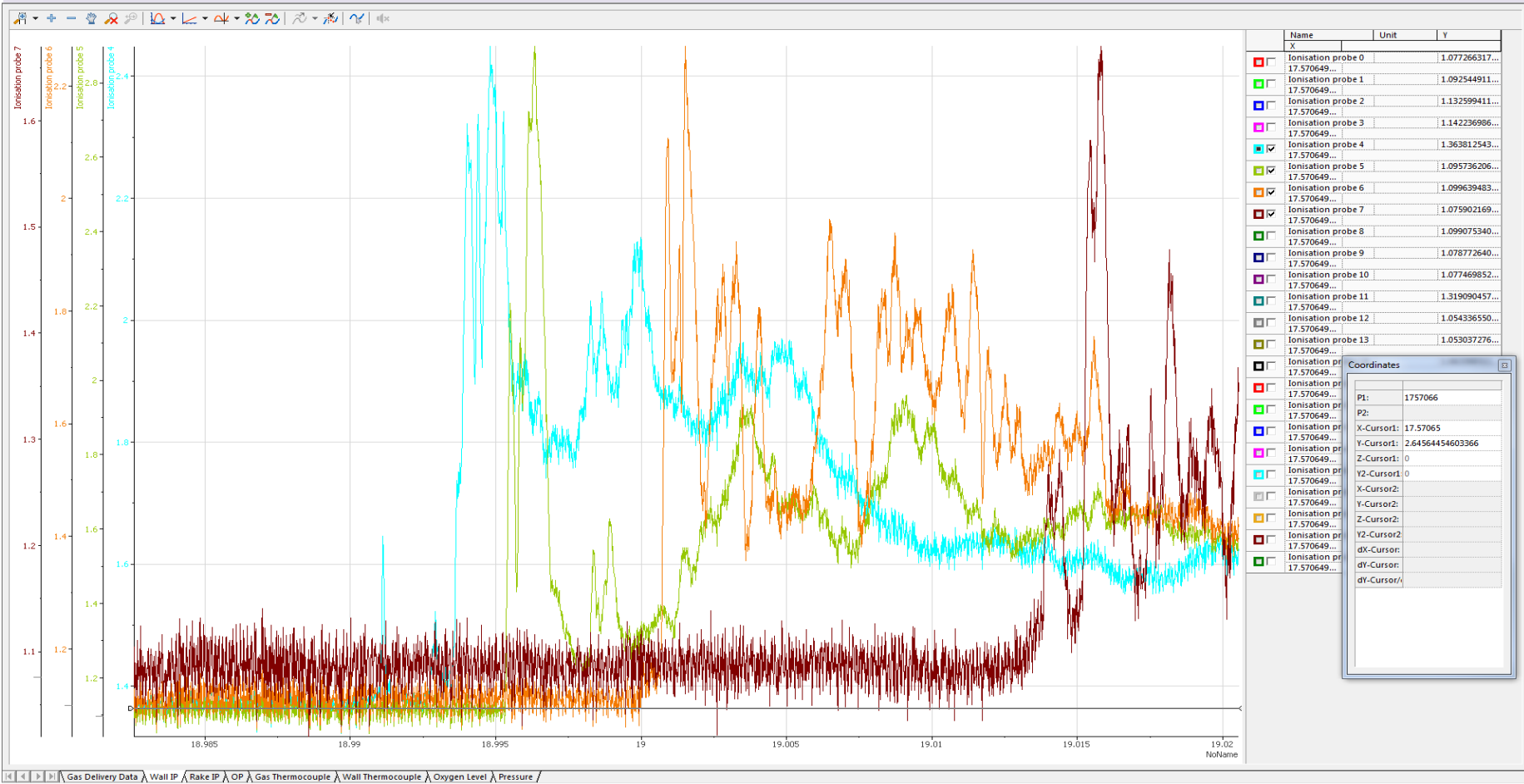
Optical Probes



Name	Unit	Y
Optical probe 0		0.007064003...
17.593189... 5.117102210304		
Optical probe 1		0.003367459...
17.593189... 5.11581371012269		
Optical probe 2		0.020239343...
17.593189... 5.11922421350426		
Optical probe 3		0.007735654...
17.593189... 4.18747496606826		
Optical probe 4		0.003058292...
17.593189... 0.23596266839204		
Optical probe 5		0.003413271...
17.593189... 0.278138446621556		
Optical probe 6		0.009191609...
17.593189... 0.273398897940777		
Optical probe 7		0.002076785...
17.593189... 0.277454256706779		
Optical probe 8		0.002679182...
17.593189... 0.727949643061847		
Optical probe 9		0.006530112...
17.593189... 3.201515670361		
Optical probe 10		0.003224780...
17.593189... 0.927605239725014		
Optical probe 11		0.003306379...
17.593189... 1.92229299130752		

Coordinates	
P1:	1759317
P2:	
X-Cursor1:	17.59316
Y-Cursor1:	5.117102210304
Z-Cursor1:	0
Y2-Cursor1:	0
X-Cursor2:	
Y-Cursor2:	
Z-Cursor2:	
Y2-Cursor2:	
dX-Cursor:	
dY-Cursor:	
dY-Cursor/:	

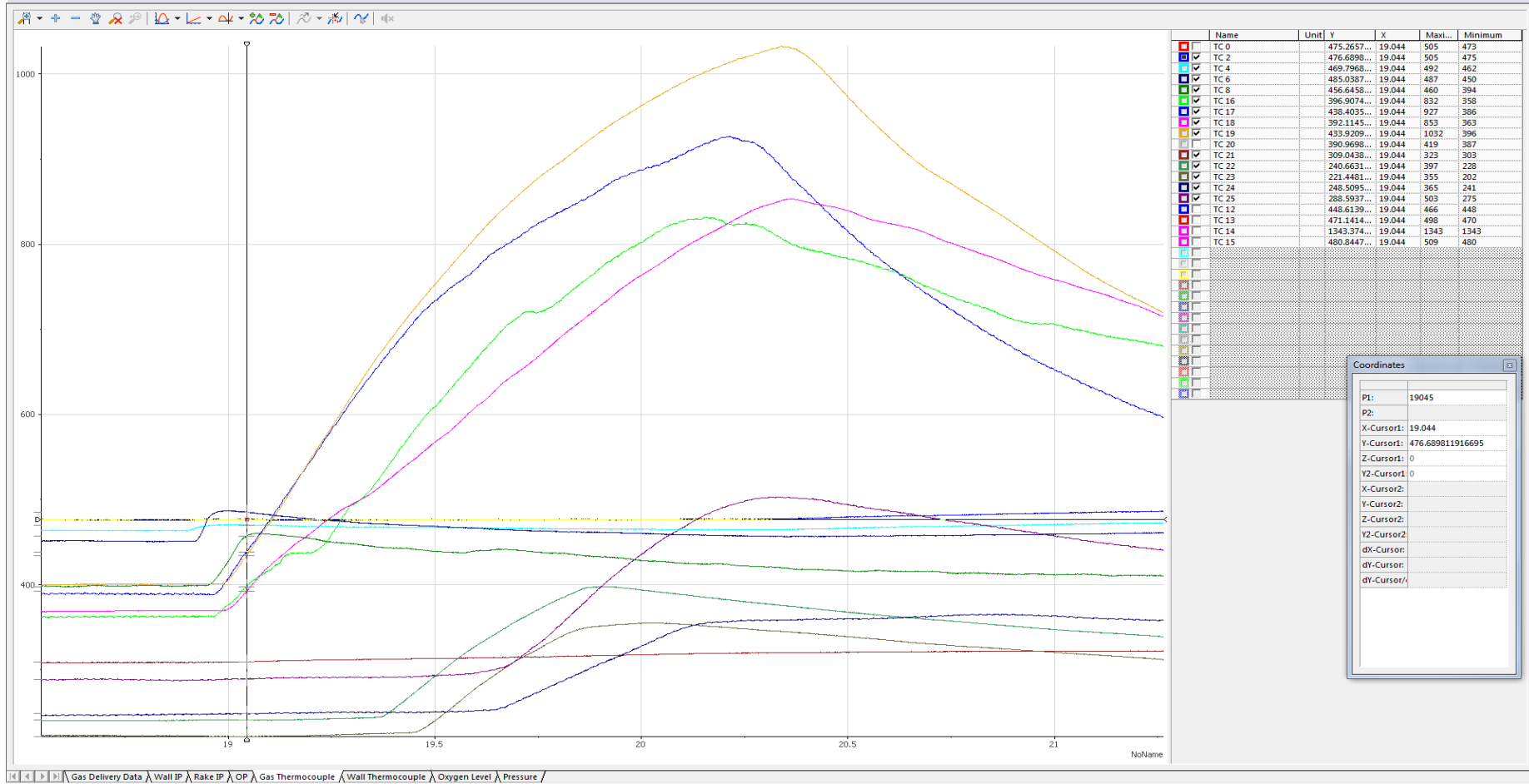
Ionisation Probes



Name	Unit	Y
X		
<input type="checkbox"/> Ionisation probe 0		1.077266317...
<input type="checkbox"/> Ionisation probe 1		1.092544911...
<input type="checkbox"/> Ionisation probe 2		1.132599411...
<input type="checkbox"/> Ionisation probe 3		1.142236986...
<input type="checkbox"/> Ionisation probe 4		1.363812543...
<input checked="" type="checkbox"/> Ionisation probe 5		1.095736206...
<input checked="" type="checkbox"/> Ionisation probe 6		1.099639483...
<input checked="" type="checkbox"/> Ionisation probe 7		1.075902169...
<input type="checkbox"/> Ionisation probe 8		1.099075340...
<input type="checkbox"/> Ionisation probe 9		1.078772640...
<input type="checkbox"/> Ionisation probe 10		1.077469852...
<input type="checkbox"/> Ionisation probe 11		1.319090457...
<input type="checkbox"/> Ionisation probe 12		1.054336550...
<input type="checkbox"/> Ionisation probe 13		1.053037276...

Coordinates	
P1:	1757066
P2:	
X-Cursor1:	17.57065
Y-Cursor1:	2.64564454603366
Z-Cursor1:	0
Y2-Cursor1:	0
X-Cursor2:	
Y-Cursor2:	
Z-Cursor2:	
Y2-Cursor2:	
dX-Cursor:	
dY-Cursor:	
dY-Cursor/:	

Temperature



Coordinates

P1: 19045

P2:

X-Cursor1: 19.044

Y-Cursor1: 476.689811916695

Z-Cursor1: 0

Y2-Cursor1: 0

X-Cursor2:

Y-Cursor2:

Z-Cursor2:

Y2-Cursor2:

dX-Cursor:

dY-Cursor:

dY-Cursor/:

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
OPO	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
IPO	FS4-6	CD4-L6	CD	4	L	6		56	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"
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	1 1/4" BSPP	448	70	13785
RA1		HR2-L2M	HR	2	L	2	M	62	1 1/4" 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	1 1/4" BSPP	598	700	14475
RA2		HR2-L4M	HR	2	L	4	M	67	1 1/4" 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	1 1/4" 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	1 1/4" BSPP	700	1335	17575
RA3		HR4-L3M	HR	4	L	3	M	100	1 1/4" BSPP	-700	1335	17575
RA4		HR4-R3L	HR	4	R	3	L	141	1 1/4" 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	1 1/4" 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
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

Sensor	OLD DESIGNATION	NEW DESIGNATION	Section	Section Number	Side	Horizontal Location	Vertical Location	PORT REF	SIZE	"X"	"Y"	"Z"
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	1 1/4" BSPP	700	1335	19375
-		HR5-L4M	HR	5	L	4	M	112	1 1/4" 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	1 1/4" BSPP	700	1335	20575
-		HR6-L3M	HR	6	L	3	M	120	1 1/4" 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

