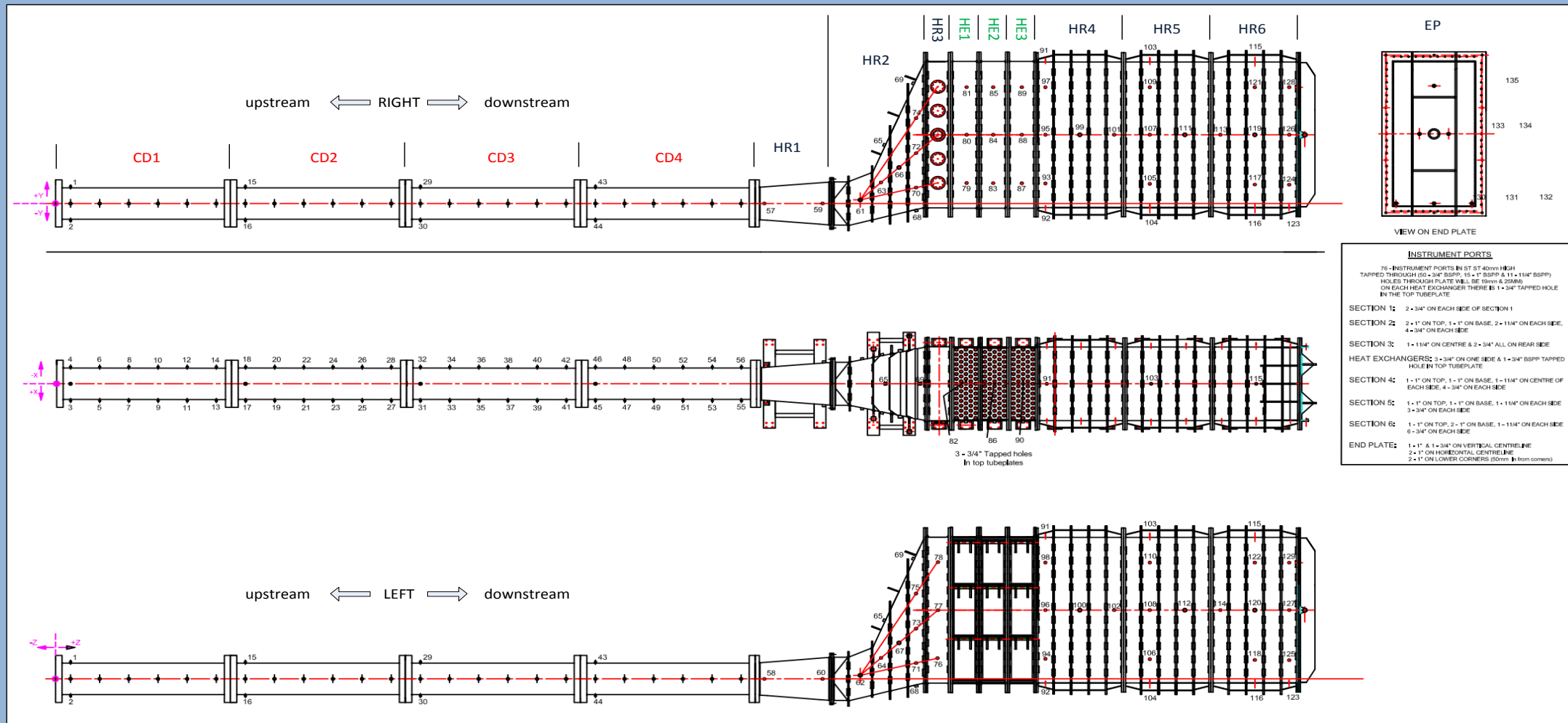


Date	08 March 2016	<b>General Comments: (weather, rig configuration)</b> Weather: Cold and misty with a light North breeze. Snow on ground. Rig configuration: 4 x 3m circular duct; expansion section and HRSG attached. End Plate attached. Igniter 258mm from beginning of 2nd circular duct section Engine Speed: 40%; 11,800 rpm 2nd test with end plate and mixture composition 100% H2 at an EQR of 0.51 The test gave a moderate combustion event and most sensors (except IP rakes) provided an identifiable response. The optical sensors provide a more consistent picture than the IP sensors with an indication of strong flame acceleration around the exit of the heat exchanger. There is some indication that the flame along the wall is faster on the left side although interpretation of flame behaviour from the IP sensors alone is difficult with the suggestion of complicated behaviour. It is noted that the video record shows an interaction of the HRSG flow and flame development with the reflected pressure wave from the end wall and this may complicate a simple interpretation of flame propagation along the HRSG. The rake IP data was less easily analysed and gave limited information on flame speeds. Maximum overpressures of 1012 and 1016mbar were seen in the vicinity of the end plate and likely associated with pressure wave reflection.
Time	12:45:54	
Test Number	10	
Mixture Composition	100% H2	
Ambient Temperature	30C	
Ambient Pressure	954 mbar	
Wind Speed	2.7 m/s	
Wind direction	N	
Relative Humidity	95.00%	
Mass Flow	9.751 kg/s	
Equivalence Ratio	0.51	

Max overpressure		Max. temperature		Ionisation Probes		Ionisation Rakes		Optical Probes	
1016 mbar		1022 °C		Max. flame speed		Max. flame speed		Max. flame speed	
		Initial Temperature		352 m/s		154 m/s		891 m/s	
		493 °C							
Location of Max. Overpressure		Location of Max. Temperature		Location of Max. Flame Speed		Location of Max. Flame Speed		Location of Max. Flame Speed	
sensor	PCB	sensor	TC2	sensor	IP19	sensor	RA1	sensor	OP4
label	EP-1M	label	CD1-R4	label	HR6-L3L	label	HR2-R2M	label	HE3-T1
distance	21330 mm	distance	1758 mm	distance	20575 mm	distance	13785 mm	distance	16580 mm



**VIEW ON END PLATE**

**INSTRUMENT PORTS**

76 - INSTRUMENT PORTS IN 5T 40mm HIGH TAPPED THROUGH ISO - 3/4" BSPP, 15 x 1" BSPP & 11 - 1/4" BSPP HOLES THROUGH PLATE WILL BE (5mm ± 0.25mm) ON EACH HEAT EXCHANGER THERE IS 1 - 3/4" TAPPED HOLE IN THE TOP TUBEPLATE

SECTION 1: 2 - 3/4" ON EACH SIDE OF SECTION 1  
SECTION 2: 2 - 1" ON TOP, 1 - 1" ON BASE, 2 - 1/4" ON EACH SIDE, 4 - 3/4" ON EACH SIDE  
SECTION 3: 1 - 1/4" ON CENTRE & 2 - 3/4" ALL ON REAR SIDE  
HEAT EXCHANGERS: 3 - 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	<b>HR 1 - R 1 U</b>	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			
<b>CD</b>	Circular duct	<b>U</b>	Upper
<b>HR</b>	HRSG	<b>M</b>	Middle
<b>HE</b>	Heat Exchanger	<b>L</b>	Lower
<b>EP</b>	End Plate	<b>R</b>	Right Side (when viewed downstream from engine)
		<b>L</b>	Left Side
		<b>T</b>	Top
		<b>B</b>	Bottom

There are 13 sections on the rig

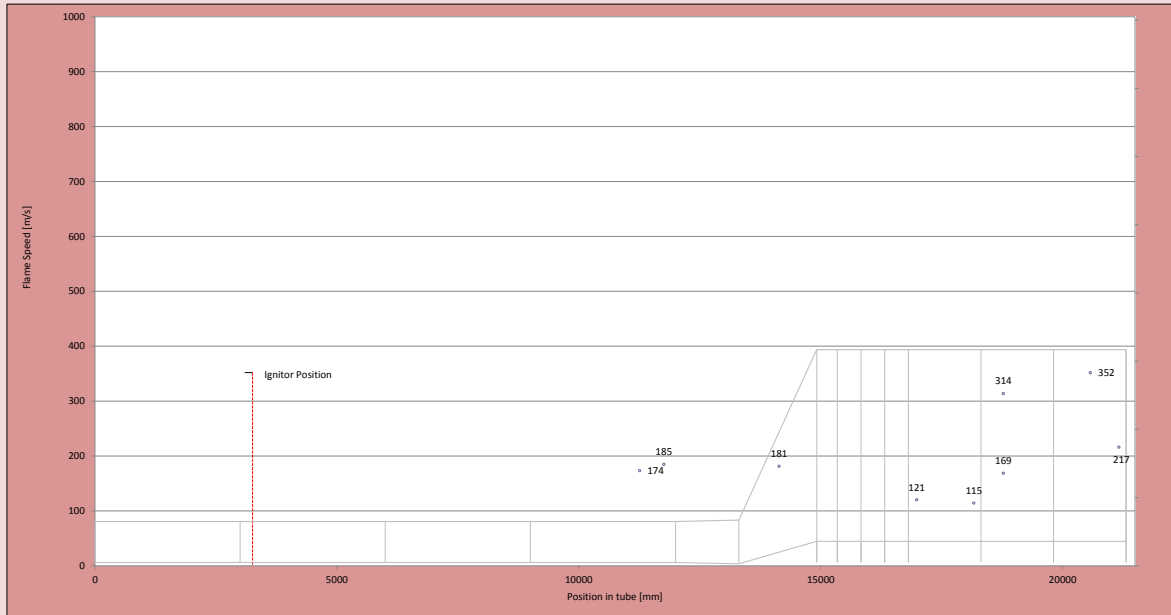
- 4 circular duct sections (CD1 to CD4)
- 6 HRSG sections (HR1 to HR6)
- 3 heat exchanger sections (HE1 to HE3) located between HR3 and HR4

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)
IP4	CD4-L1	Flameion_4	9258		
IP5	CD4-R1	Flameion_5	9258		
IP2	CD4-L5	Flameion_2	11258		
IP3	CD4-R5	Flameion_3	11258	20.2136	174
IP0	CD4-L6	Flameion_0	11758		
IP1	CD4-R6	Flameion_1	11758	20.2163	185
IP6	HR1-R2	Flameion_6	13160	20.1960	
IP7	HR2-R3M	Flameion_7	14140	20.2014	181
IP8	HR2-R5M	Flameion_8	14745		
IP10	HE2-R1M	Flameion_10	16090	20.2355	
IP12	HR4-R1M	Flameion_12	16985	20.2250	121
IP13	HR4-L1L	Flameion_13	16985	20.2356	
IP14	HR4-R5M	Flameion_14	18165	20.2353	115
IP15	HR5-R2M	Flameion_15	18775	20.2356	169
IP16	HR5-L2L	Flameion_16	18775	20.2413	314
IP17	HR6-R1M	Flameion_17	19985	20.2447	
IP19	HR6-L3L	Flameion_19	20575	20.2458	352
IP18	HR6-R5M	Flameion_18	21165	20.2443	217
IP20	HR6-L5L	Flameion_20	21165	20.2440	
IP9	#N/A	Flameion_9	#N/A		
IP11	#N/A	Flameion_11	#N/A		
IP21	#N/A	Flameion_21	#N/A		
IP22	#N/A	Flameion_22	#N/A		
IP23	#N/A	Flameion_23	#N/A		

The behaviour of the flame after the HE is complex and the flame speeds are indicative values.e.g. flame apparently arrives at IP15 ahead of IP14, which is further upstream

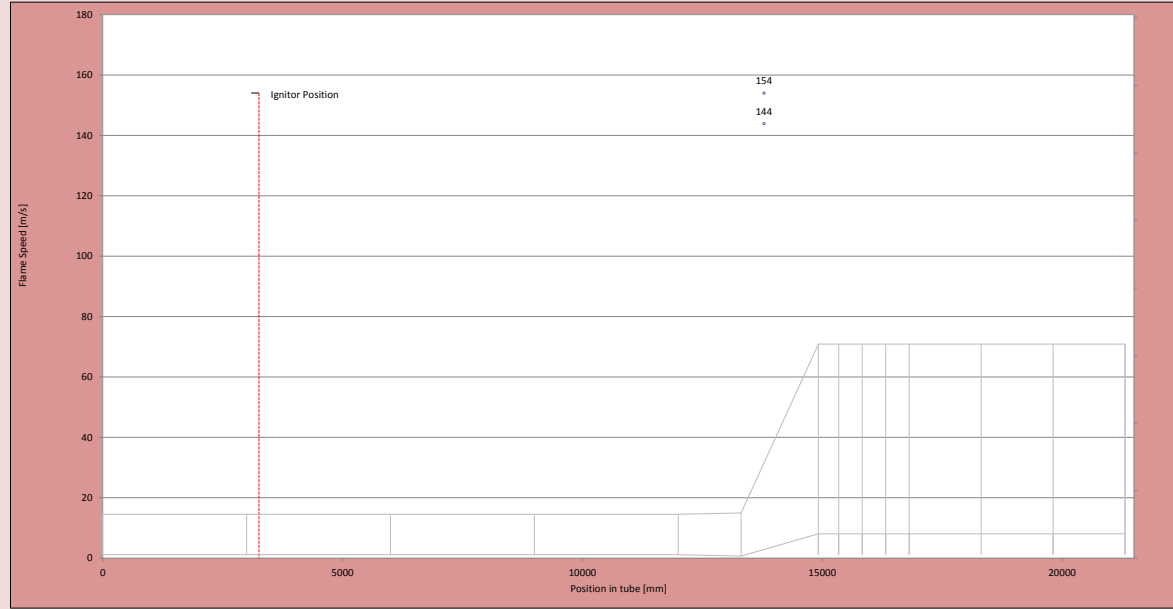


Location of igniter 3258 mm

Time of ignition 20.16756 seconds

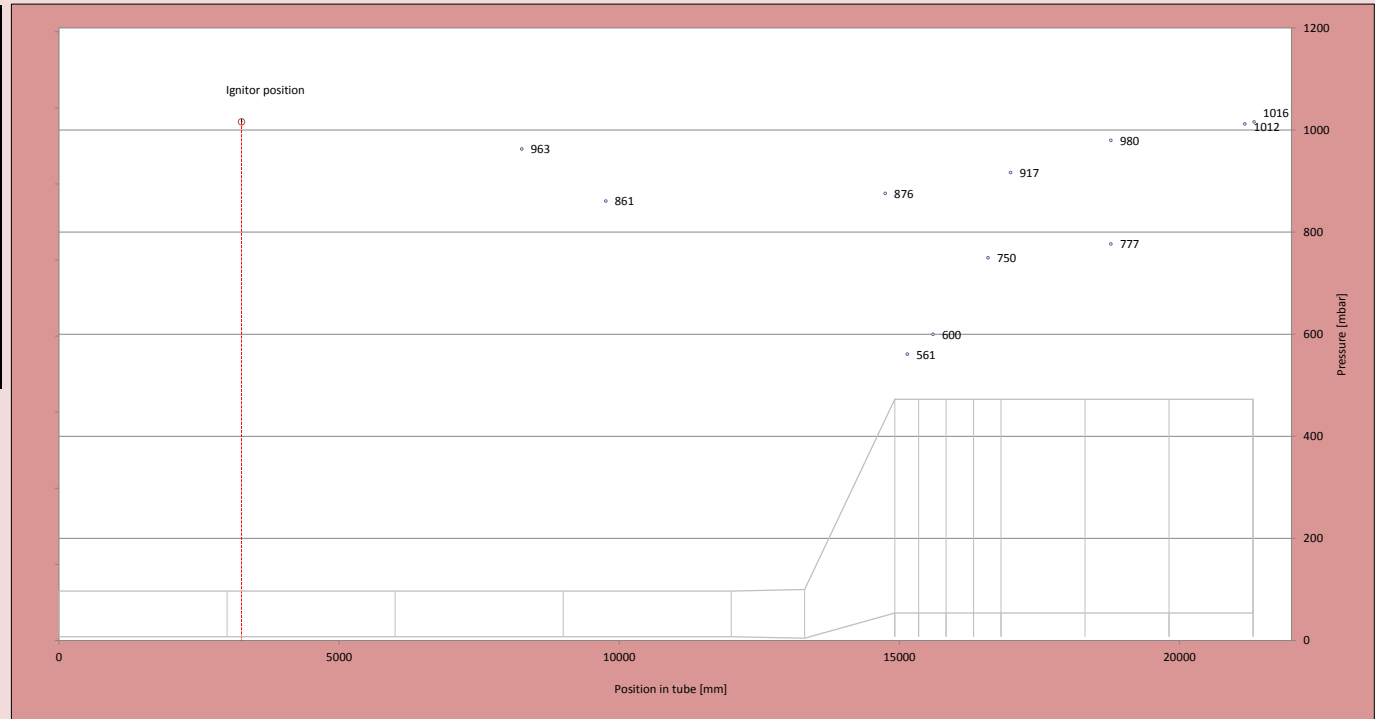
Rake Number	IP Number	Location label	Data Name	Position in tube (mm)	Flame arrival time (s)	Avg Flame speed from last sensor (m/s)
RA1	IP24	HR2-R2M	IP24	13785	20.2359	154
RA1	IP25	HR2-R2M	IP25	13785	ND	
RA1	IP26	HR2-R2M	IP26	13785	20.2407	144
RA2	IP27	HR2-R4M	IP27	14475	ND	
RA2	IP28	HR2-R4M	IP28	14475	ND	
RA2	IP29	HR2-R4M	IP29	14475	ND	
RA3	IP30	HR4-R3M	IP30	17575	ND	
RA3	IP31	HR4-R3M	IP31	17575	ND	
RA3	IP32	HR4-R3M	IP32	17575	ND	
RA4	IP33	HR5-R4M	IP33	19375	ND	
RA4	IP34	HR5-R4M	IP34	19375	ND	
RA4	IP35	HR5-R4M	IP35	19375	ND	

RA2 was not working. None of the working rakes gave signals that were easily analysed.



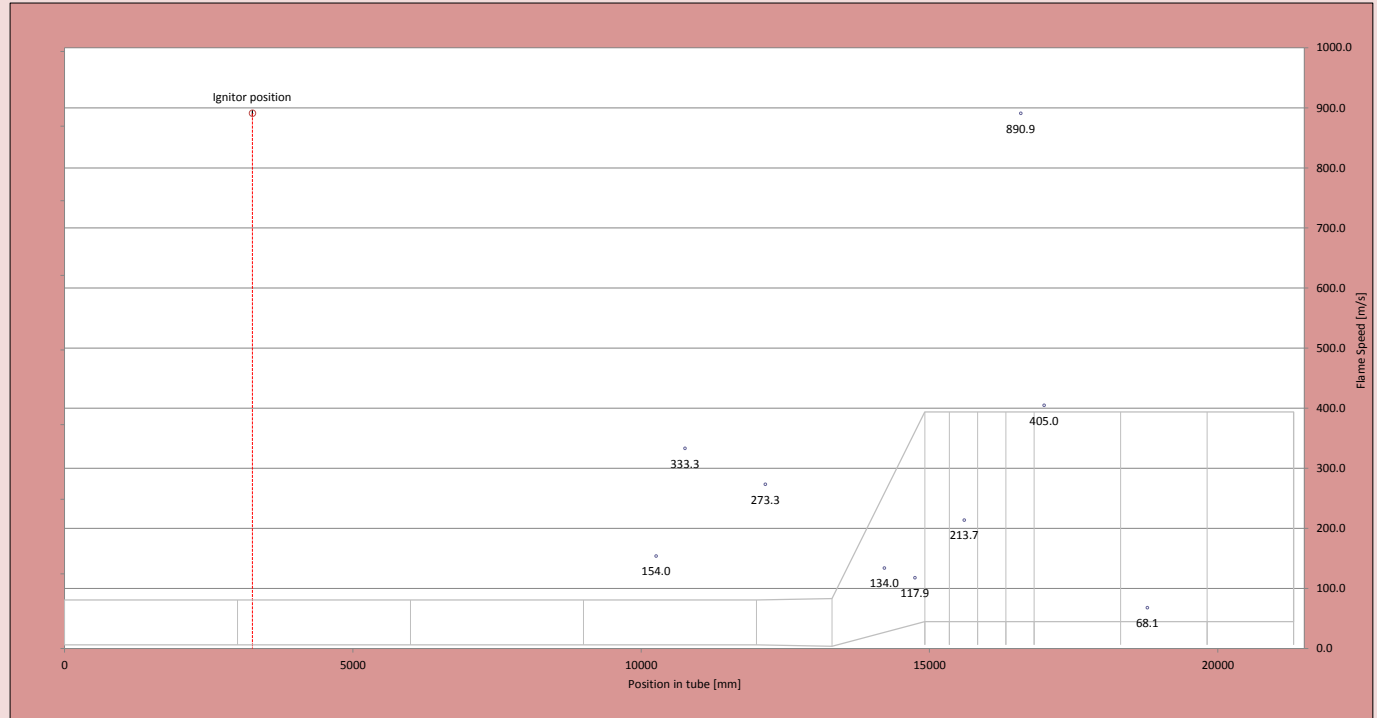
Location of igniter  mm

Transducer number	Location	Position in tube [mm]	$\Delta P_{max}$ [mbar]	Time $\Delta P_{max}$ [mbar]
KU6	CD3-R5	8258	963	20.2648
KU7	CD4-R2	9758	861	20.2624
KU8	HR2-T5	14745	876	20.2791
KU9	HR3-L1L	15140	561	20.2570
KU0	HE1-R1U	15600	600	20.2366
KU1	HE3-R1L	16580	750	20.2359
KU2	HR4-R1U	16985	917	20.2389
KU3	HR5-R2L	18775	777	20.2509
KU4	HR5-L2M	18775	980	20.2426
KU5	HR6-L5M	21165	1012	20.2454
PCB	EP-1M	21330	1016	20.2457
KU10	#N/A	#N/A		
KU11	#N/A	#N/A		



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)
OP11	CD4-L3	10258	20.2130	154.0
OP10	CD4-R4	10758	20.2145	333.3
OP0	HR1-R1	12152	20.2196	273.3
OP1	HR2-T3	14215	20.2350	134.0
OP2	HR2-LSM	14745	20.2350	117.9
OP3	HE1-T1	15600	20.2390	213.7
OP4	HE3-T1	16580	20.2401	890.9
OP5	HR4-R1L	16985	20.2411	405.0
OP6	HR4-T1	16985	20.2402	
OP7	HR5-T2	18775	20.2665	68.1
OP8	HR6-T3	20575	#N/A	
OP9	HR6-RSU	21165	#N/A	
OP12	#N/A	#N/A		
OP13	#N/A	#N/A		
OP14	#N/A	#N/A		
OP15	#N/A	#N/A		

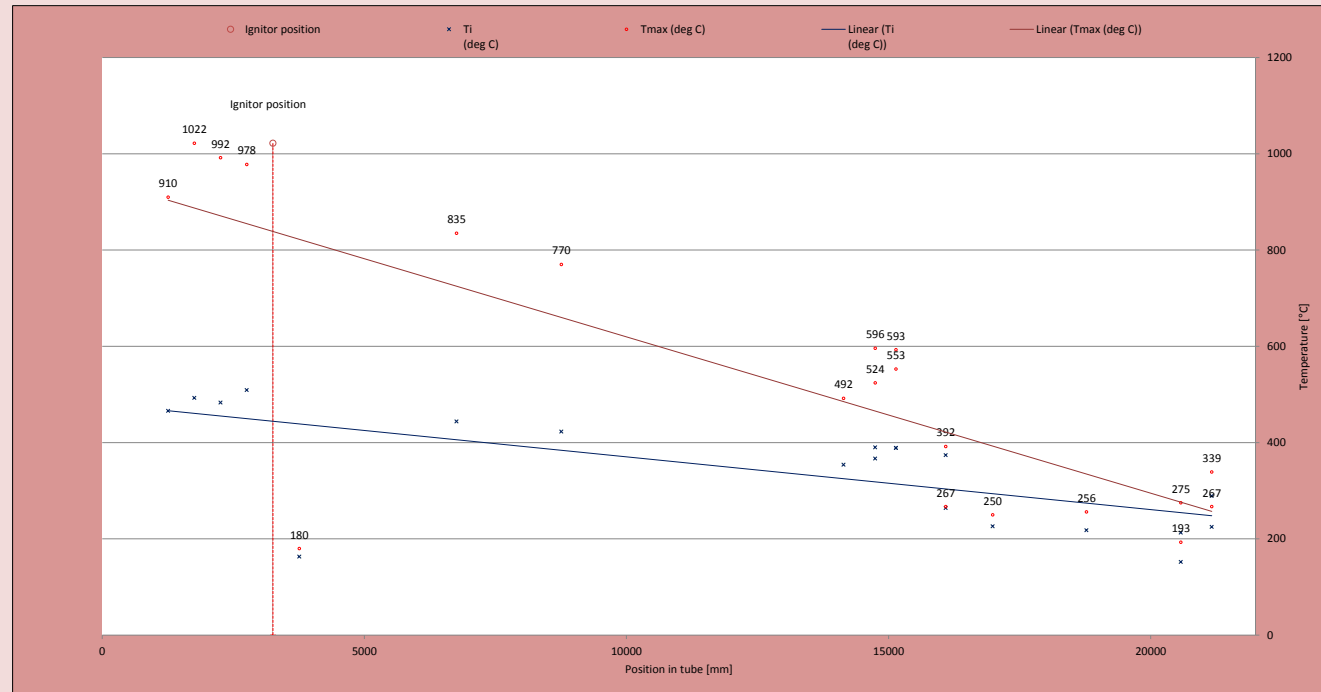


Location of igniter 3258 mm

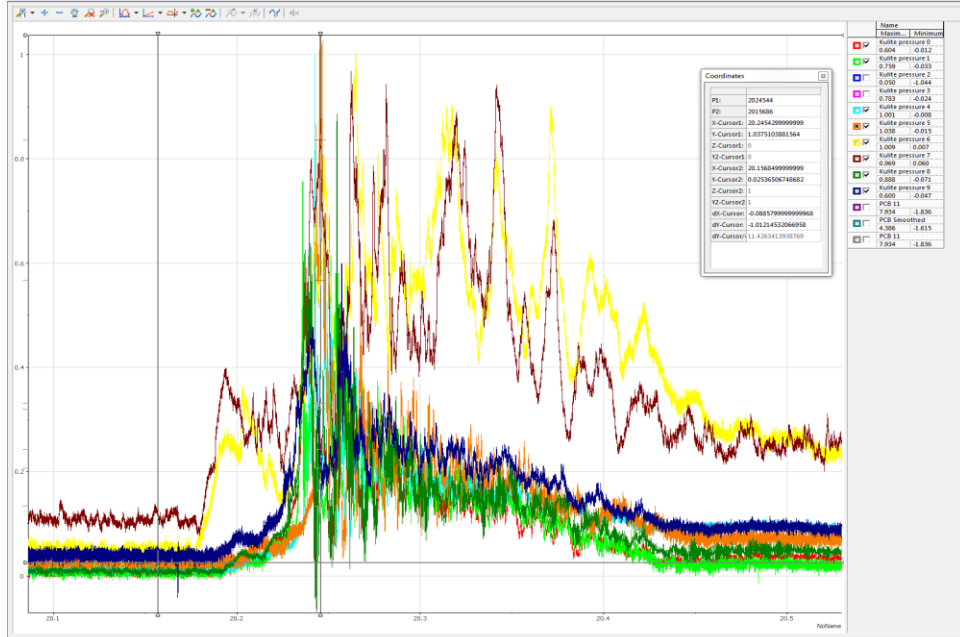
Thermocouple number	Location	Position in tube (mm)	T <sub>max</sub> (deg C)	T <sub>i</sub> (deg C)
TC0	CD1-R3	1258	910	466
TC2	CD1-R4	1758	1022	493
TC3	CD1-R5	2258	992	483
TC4	CD1-R6	2758	978	509
TC5	CD2-R2	3758	180	163
TC7	CD3-R2	6758	835	444
TC9	CD3-R6	8758	770	423
TC11	#N/A	#N/A	911	400
TC12	#N/A	#N/A		
TC13	#N/A	#N/A		
TC14	#N/A	#N/A		
TC15	#N/A	#N/A		
TC16	HR2-R5L	14745	596	390
TC17	HE2-R1U	16090	267	264
TC18	HR6-R3L	20575	193	152
TC19	#N/A	#N/A		
TC20	HE2-R1L	16090	392	374
TC22	#N/A	#N/A		
TC23	HR6-R5L	21165	267	225
TC24	HR2-L3M	14140	492	354
TC25	HR2-L5L	14745	524	367
TC26	HR3-L1M	15140	593	389
TC27	HR3-L1U	15140	553	389
TC28	HR4-L1M	16985	250	226
TC29	HR5-L2U	18775	256	218
TC30	HR6-L3U	20575	275	213
TC31	HR6-L5U	21165	339	289

surface thermocouples [not plotted]

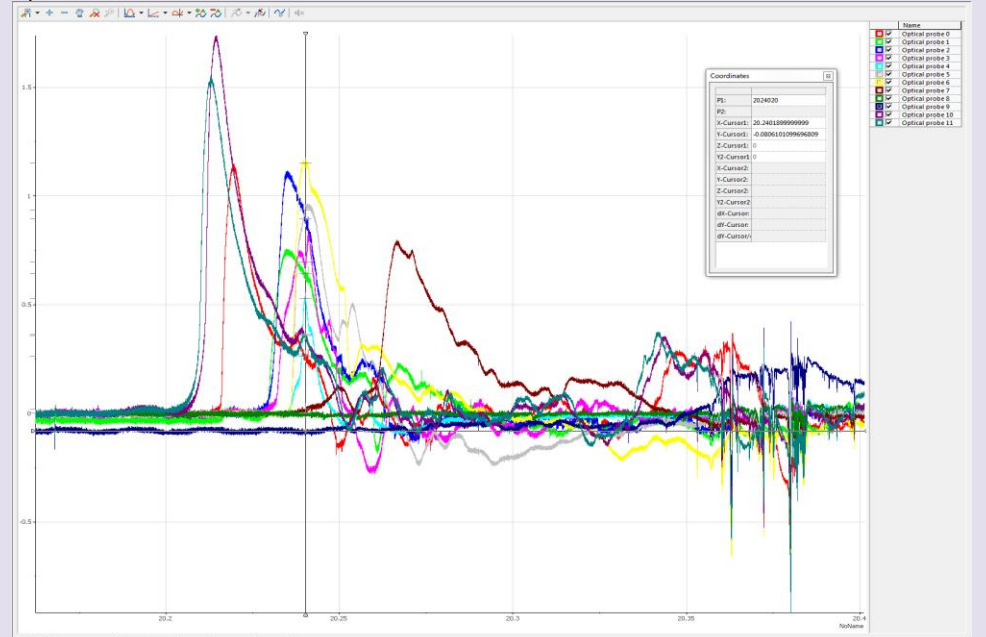
TC1	CD1-T2	1508		
TC6	CD2-T2	4508	135	121
TC8	CD3-T2	7508	150	136
TC10	CD4-T2	10508	85	75
TC21	HR5-R1M	18455	24	22



### Pressure

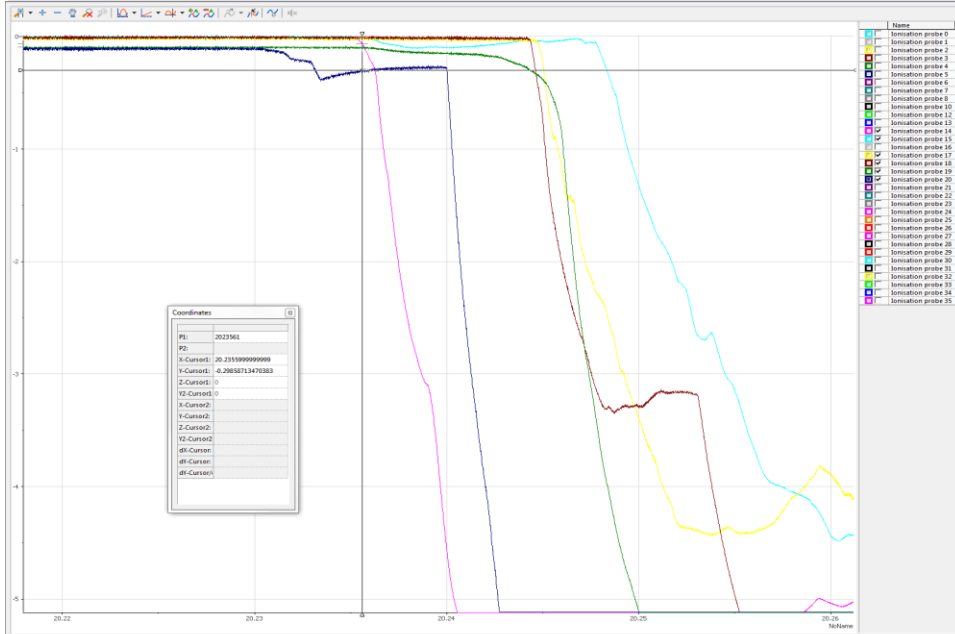


### Optical Probes

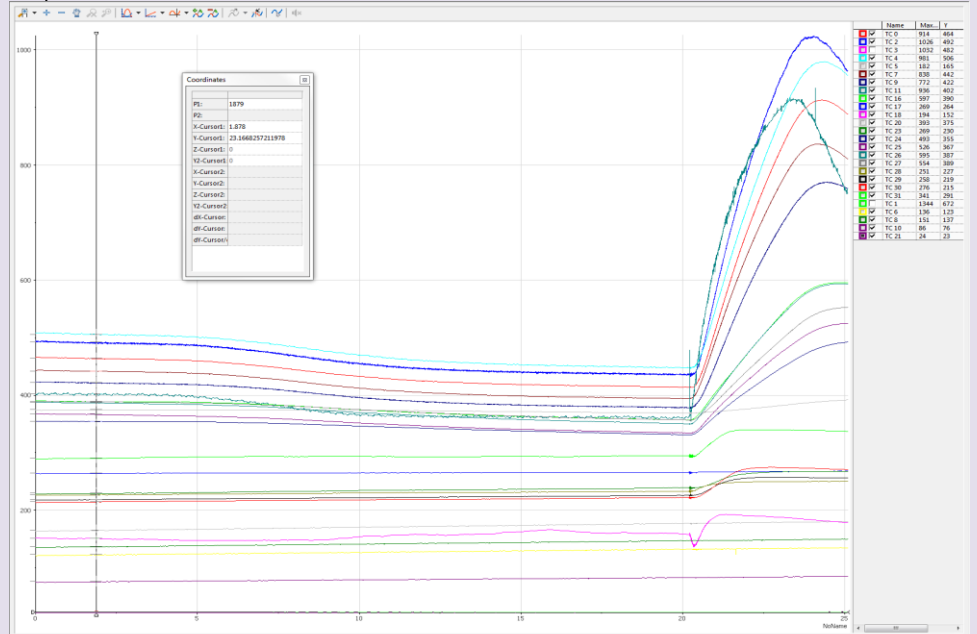




### Ionisation Probes



### 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
TC2	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
TC3	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
TC4	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
TC6	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
TC5	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
-	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
-		CD3-T1	CD	3	T	1		29	1" BSPP	0	298	6258
TC8	TS1-1	CD3-T2	CD	3	T	2		NA	SURFACE	0	298	7508
-		CD3-B1	CD	3	B	1		30	1" BSPP	0	-298	6258
-	NS3-1	CD3-R1	CD	3	R	1		31	3/4" BSPP	298	0	6258
-	FS3-1	CD3-L1	CD	3	L	1		32	3/4" BSPP	-298	0	6258
TC7	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
-	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
KU6	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
TC9	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
TC10	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
IP5	NS4-1	CD4-R1	CD	4	R	1		45	3/4" BSPP	298	0	9258
IP4	FS4-1	CD4-L1	CD	4	L	1		46	3/4" BSPP	-298	0	9258
KU7	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
-	NS4-3	CD4-R3	CD	4	R	3		49	3/4" BSPP	298	0	10258
OP11	FS4-3	CD4-L3	CD	4	L	3		50	3/4" BSPP	-298	0	10258
OP10	NS4-4	CD4-R4	CD	4	R	4		51	3/4" BSPP	298	0	10758
-	FS4-4	CD4-L4	CD	4	L	4		52	3/4" BSPP	-298	0	10758
IP3	NS4-5	CD4-R5	CD	4	R	5		53	3/4" BSPP	298	0	11258
IP2	FS4-5	CD4-L5	CD	4	L	5		54	3/4" BSPP	-298	0	11258
IP1	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
OP0		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
IP6		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
IP7		HR2-R3M	HR	2	R	3	M	63	3/4" BSPP	528	410	14140
TC24		HR2-L3M	HR	2	L	3	M	64	3/4" BSPP	-528	410	14140
OP1		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
KU8		HR2-T5	HR	2	T	5		69	1" BSPP	0	2315	14745
TC16		HR2-R5L	HR	2	R	5	L	70	3/4" BSPP	662	310	14745
TC25		HR2-L5L	HR	2	L	5	L	71	3/4" BSPP	-662	310	14745
IP8		HR2-R5M	HR	2	R	5	M	72	3/4" BSPP	662	975	14745
OP2		HR2-L5M	HR	2	L	5	M	73	3/4" BSPP	-662	975	14745
-		HR2-R5U	HR	2	R	5	U	74	3/4" BSPP	662	1660	14745
-		HR2-L5U	HR	2	L	5	U	75	3/4" BSPP	-662	1660	14745
KU9		HR3-L1L	HR	3	L	1	L	76	3/4" BSPP	-700	400	15140
TC26		HR3-L1M	HR	3	L	1	M	77	11/4" BSPP	-700	1335	15140
TC27		HR3-L1U	HR	3	L	1	U	78	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
KU0		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
IP10		HE2-R1M	HE	2	R	1	M	84	3/4" BSPP	700	1335	16090
TC17		HE2-R1U	HE	2	R	1	U	85	3/4" BSPP	700	2270	16090
KU1		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
OP3		HE1-T1	HE	1	T	1		82	3/4" BSPP HOLE	-47	2735	15600
-		HE2-T1	HE	2	T	1		86	3/4" BSPP HOLE	0	2735	16090
OP4		HE3-T1	HE	3	T	1		90	3/4" BSPP HOLE	-47	2735	16580
OP6		HR4-T1	HR	4	T	1		91	1" BSPP	0	2735	16985
-		HR4-B1	HR	4	B	1		92	1" BSPP	0	-65	16985
OP5		HR4-R1L	HR	4	R	1	L	93	3/4" BSPP	700	400	16985
IP13		HR4-L1L	HR	4	L	1	L	94	3/4" BSPP	-700	400	16985
IP12		HR4-R1M	HR	4	R	1	M	95	3/4" BSPP	700	1335	16985
TC28		HR4-L1M	HR	4	L	1	M	96	3/4" BSPP	-700	1335	16985
KU2		HR4-R1U	HR	4	R	1	U	97	3/4" BSPP	700	2270	16985
-		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
IP14		HR4-R5M	HR	4	R	5	M	101	3/4" BSPP	700	1335	18165
-		HR4-L5M	HR	4	L	5	M	102	3/4" BSPP	-700	1335	18165
TC21		HR5-R1M	HR	5	R	1	M	NA	SURFACE	700	1200	18455
OP7		HR5-T2	HR	5	T	2		103	1" BSPP	0	2735	18775
-		HR5-B2	HR	5	B	2		104	1" BSPP	0	-65	18775
KU3		HR5-R2L	HR	5	R	2	L	105	3/4" BSPP	700	400	18775
IP16		HR5-L2L	HR	5	L	2	L	106	3/4" BSPP	-700	400	18775
IP15		HR5-R2M	HR	5	R	2	M	107	3/4" BSPP	700	1335	18775
KU4		HR5-L2M	HR	5	L	2	M	108	3/4" BSPP	-700	1335	18775
-		HR5-R2U	HR	5	R	2	U	109	3/4" BSPP	700	2270	18775
TC29		HR5-L2U	HR	5	L	2	U	110	3/4" BSPP	-700	2270	18775
RA4		HR5-R4M	HR	5	R	4	M	111	11/4" BSPP	700	1335	19375
RA4		HR5-L4M	HR	5	L	4	M	112	11/4" BSPP	-700	1335	19375
IP17		HR6-R1M	HR	6	R	1	M	113	3/4" BSPP	700	1335	19985

Sensor	OLD DESIGNATION	NEW DESIGNATION	Section	Section Number	Side	Horizontal Location	Vertical Location	PORT REF	SIZE	"X"	"Y"	"Z"
-		HR6-L1M	HR	6	L	1	M	114	3/4" BSPP	-700	1335	19985
OP8		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
TC18		HR6-R3L	HR	6	R	3	L	117	3/4" BSPP	700	400	20575
IP19		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
TC30		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
TC23		HR6-R5L	HR	6	R	5	L	124	3/4" BSPP	700	400	21165
IP20		HR6-L5L	HR	6	L	5	L	125	3/4" BSPP	-700	400	21165
IP18		HR6-R5M	HR	6	R	5	M	126	3/4" BSPP	700	1335	21165
KU5		HR6-L5M	HR	6	L	5	M	127	3/4" BSPP	-700	1335	21165
OP9		HR6-R5U	HR	6	R	5	U	128	3/4" BSPP	700	2270	21165
TC31		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
PCB		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