

Date	17 May 2019
Time	15:14:14
Test Number	HRSG Test 65
Mixture Composition	40% CO 60% H2
Ambient Temperature	12.4 °C
Ambient Pressure	980 mbar
Wind Speed	2.86 m/s
Wind direction	N
Relative Humidity	85.00%
Mass Flow	9.4820 kg/s
Equivalence Ratio	0.30

**General Comments: (weather, rig configuration)**

Weather: Light wind. Cloudy with sunny spells.

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: 12.3%; 8,100 rpm

Test on 60% H2 40% CO at an intended EQR of 0.30

LOW TEMPERATURE TESTS (NOMINAL 320 oC)

Test gave a moderate combustion event which gave a good response on most sensors. Maximum overpressure of 402 mbar on KU1 in CD4

**Ionisation Probes**

**Ionisation Rakes**

**Optical Probes**

Max overpressure  
402 mbar

Max. gas temperature  
919 °C

Max. flame speed  
136 m/s

Max. flame speed  
110 m/s

Max. flame speed  
224 m/s

Initial gas temperature  
288 °C

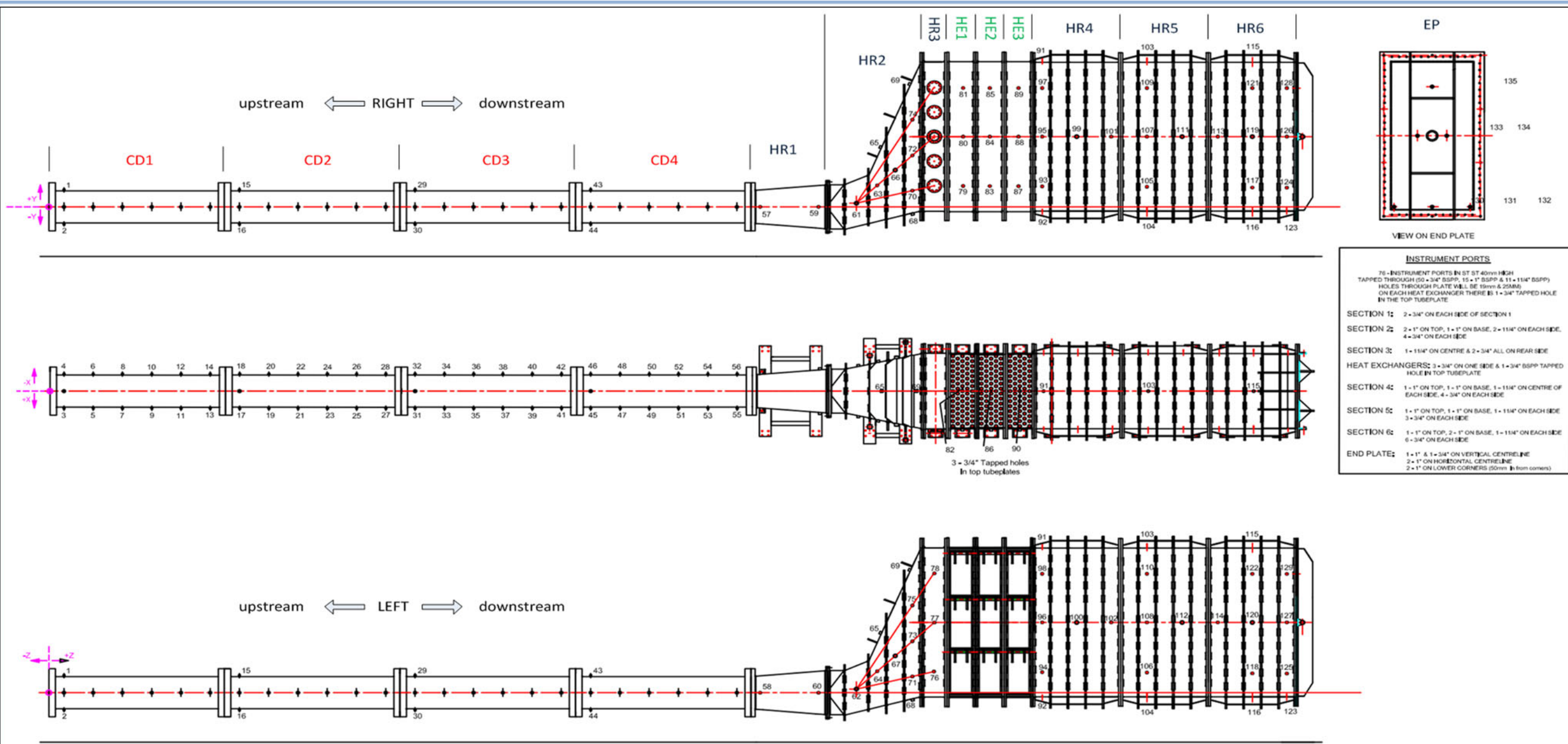
Location of Max. Overpressure  
sensor KU1  
label CD4-R2  
distance 9758 mm

Location of Max. Temperature  
sensor TC4  
label CD3-R3  
distance 7258 mm

Location of Max. Flame Speed  
sensor IP10  
label HR4-L1L  
distance 16985 mm

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

Location of Max. Flame Speed  
sensor OP2  
label HR1-R1  
distance 12152 mm



**Naming Convention**

Section Identifier  
i.e. HE, HR, CD or EP

Section Number (1-6)  
Numbered from downstream to upstream

Vertical position in section (sides only) i.e. U, M or L.  
Absence of letter denotes centreline

Longitudinal position in section (numbered from 1)

Side  
i.e. R, L, T or B

**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

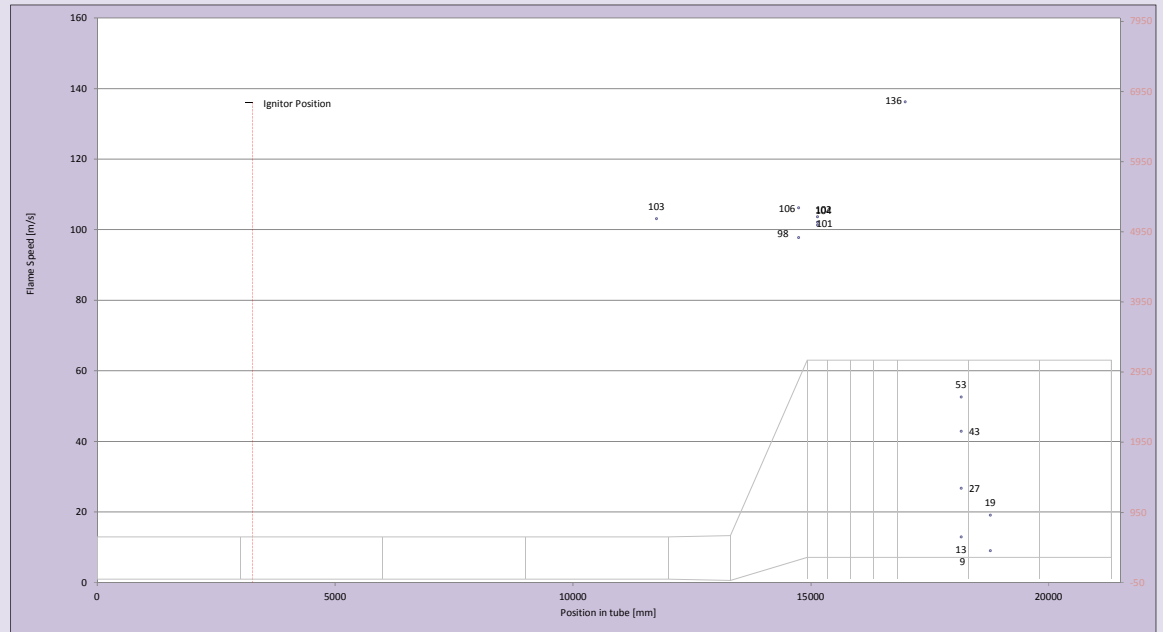
- 4 circular duct sections (CD1 to CD4)
- 6 HRSG sections (HR1 to HR6)
- 3 heat exchanger sections (HE1 to HE3) located between HR3 and HR4

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	30.09729	103
IP1	HR2-L5L	Ionisation probe 1	14745	30.12308	106
IP2	HR2-L5M	Ionisation probe 2	14745	30.13240	98
IP3	HR2-L5U	Ionisation probe 3	14745		
IP4	HR3-R1L	Ionisation probe 4	15140	30.13128	102
IP5	HR3-R1LM	Ionisation probe 5	15140	30.12950	104
IP6	HR3-R1M	Ionisation probe 6	15140	30.13216	101
IP7	HR3-R1U	Ionisation probe 7	15140	30.14568	
IP8	HR3-L1U	Ionisation probe 8	15140	30.14155	
IP9	HE2-R1M	Ionisation probe 9	16090	30.14153	
IP10	HR4-L1L	Ionisation probe 10	16985	30.13953	136
IP11	HR4-L1M	Ionisation probe 11	16985	30.14146	
IP12	HR4-L1U	Ionisation probe 12	16985	30.14466	
IP13	HR4-R1U	Ionisation probe 13	16985		
IP14	HR4-R3U	Ionisation probe 14	17575		
IP15	HR4-L5L	Ionisation probe 15	18165	30.16710	43
IP16	HR4-L5M	Ionisation probe 16	18165	30.18569	27
IP17	HR4-L5U	Ionisation probe 17	18165	30.23628	13
IP18	HR4-R5M	Ionisation probe 18	18165	30.18101	53
IP19	HR5-L2L	Ionisation probe 19	18775		
IP20	HR5-L2M	Ionisation probe 20	18775	30.21771	19
IP21	HR5-L2U	Ionisation probe 21	18775	30.30438	9
IP22	HR5-R2U	Ionisation probe 22	18775		
IP23	HR6-L1M	Ionisation probe 23	19985		

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

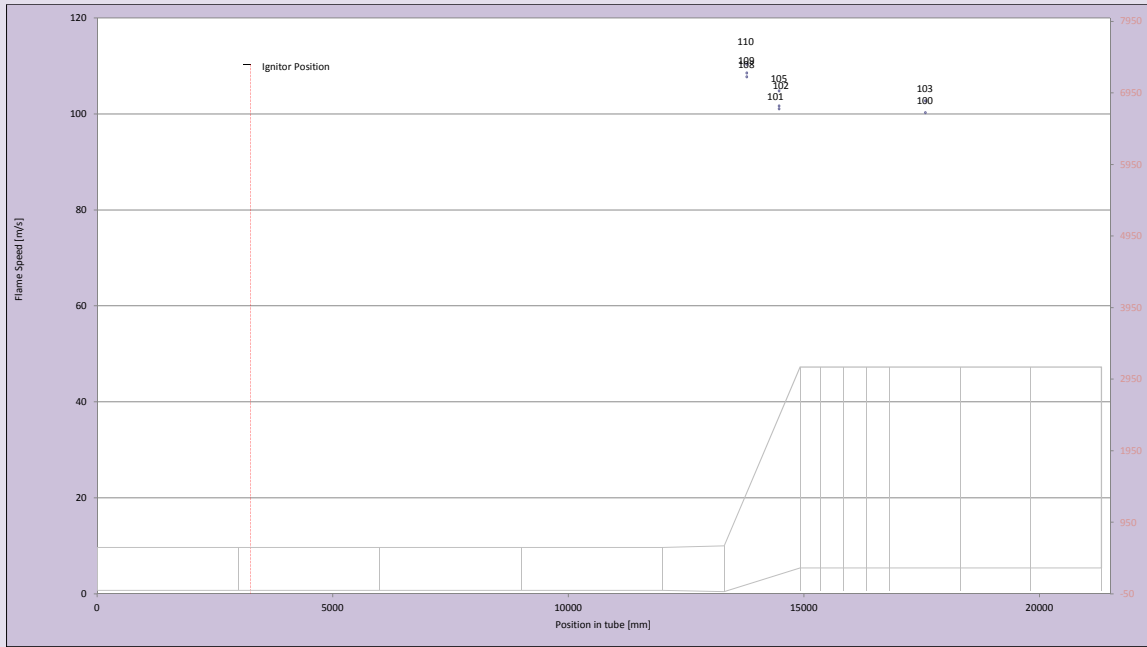
Only a weak responses from sensors after the HE. Many responses too weak to accurately pick out flame arrival time. Further analysis required



Location of igniter 3258 mm Time of ignition 30.01483 seconds

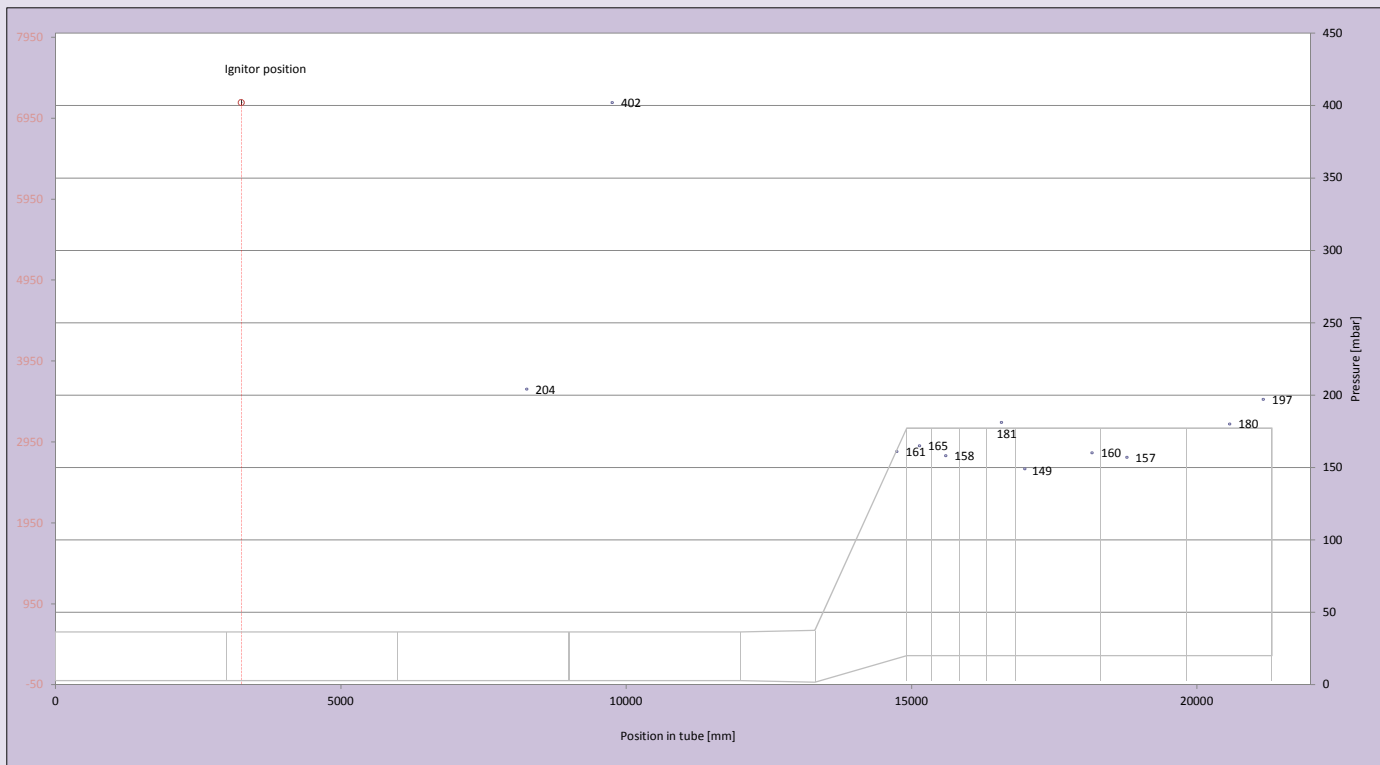
Rake Number	IP Number	Location label	Data Name	Position in tube (mm)	Flame arrival time (s)	Avg Flame speed from last sensor (m/s)
RA1	IP24	HR2-R2M	IP24	13785	30.1118	109
RA1	IP25	HR2-R2M	IP25	13785	30.1102	110
RA1	IP26	HR2-R2M	IP26	13785	30.1125	108
RA2	IP27	HR2-R4M	IP27	14475	30.1218	105
RA2	IP28	HR2-R4M	IP28	14475	30.1251	102
RA2	IP29	HR2-R4M	IP29	14475	30.1258	101
RA3	IP30	HR4-R3M	IP30	17575		
RA3	IP31	HR4-R3M	IP31	17575	NW	
RA3	IP32	HR4-R3M	IP32	17575	NW	
RA4	IP33	HR4-R3L	IP33	17575	30.1520	103
RA4	IP34	HR4-R3L	IP34	17575	30.1528	100
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

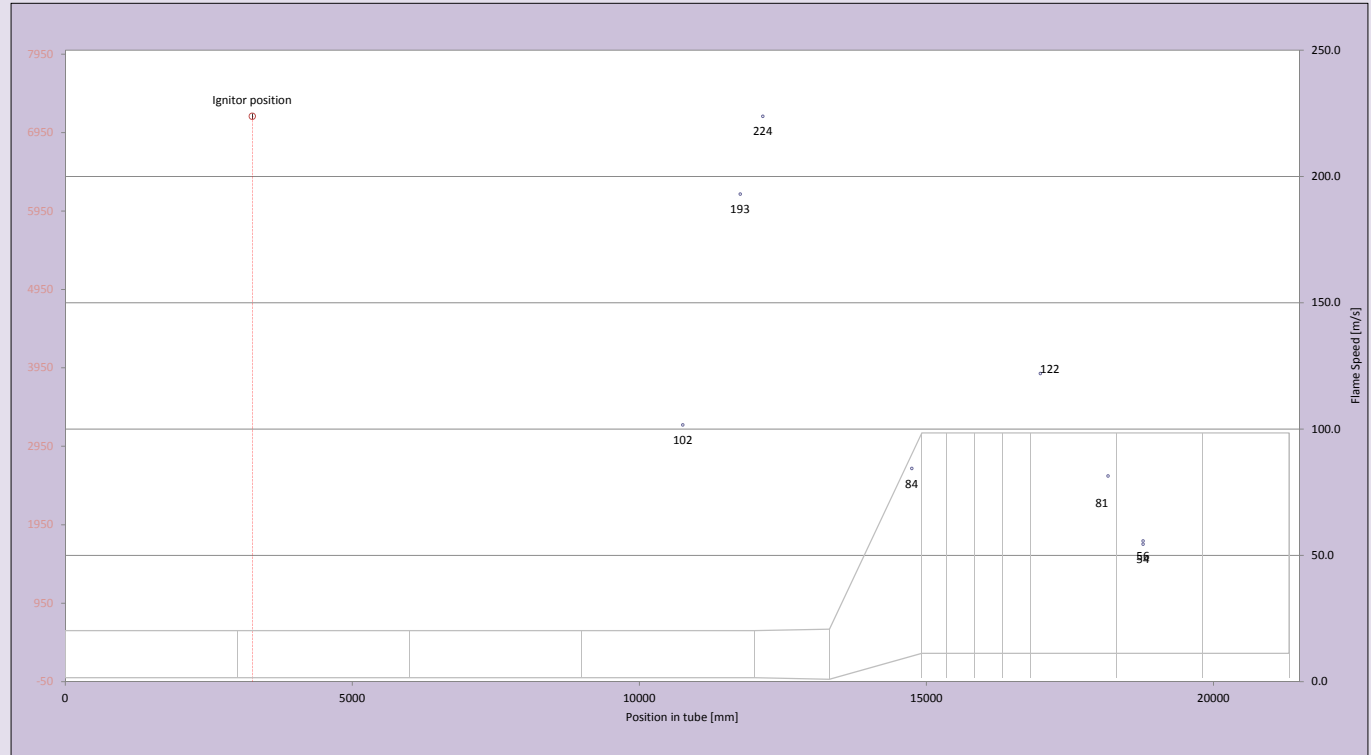
Transducer number	Location	Position in tube [mm]	$\Delta P_{max}$ [mbar]	Time $\Delta P_{max}$ [sec]
KU0	CD3-R5	8258	204	30.4809
KU1	CD4-R2	9758	402	30.4823
KU2	HR2-T5	14745	161	30.1356
KU3	HR3-L1L	15140	165	30.1632
KU4	HE1-R1U	15600	158	30.1651
KU5	HE3-R1L	16580	181	30.1553
KU6	HR4-R1L	16985	149	30.1637
KU7	HR4-R5U	18165	160	30.1608
KU8	HR5-R2L	18775	157	30.1566
KU9	HR6-R3L	20575	180	30.1543
KU10	HR6-LSL	21165	197	30.1517



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	30.0886	101.7
OP1	CD4-R6	11758	30.0938	193.1
OP2	HR1-R1	12152	30.0955	223.9
OP3	HR2-R5M	14745	30.1263	84.4
OP4	HE1-T1	15600	30.1863	
OP5	HE2-T1	16090	30.2116	
OP6	HE3-T1	16580	30.2201	
OP7	HR4-T1	16985	30.2020	
OP8	HR4-R1M	16985	30.1446	122.0
OP9	HR4-R5L	18165	30.1682	81.5
OP10	HR5-T2	18775	30.1986	55.7
OP11	HR5-R2M	18775	30.2003	54.4

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

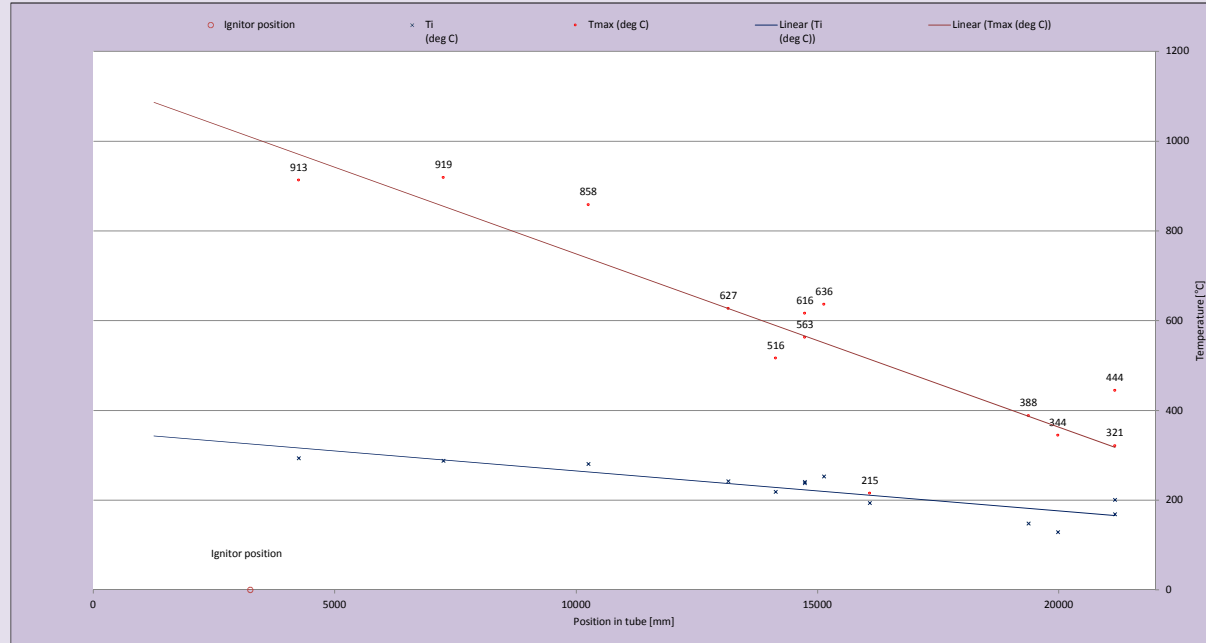


Location of igniter  mm      Time of ignition  seconds

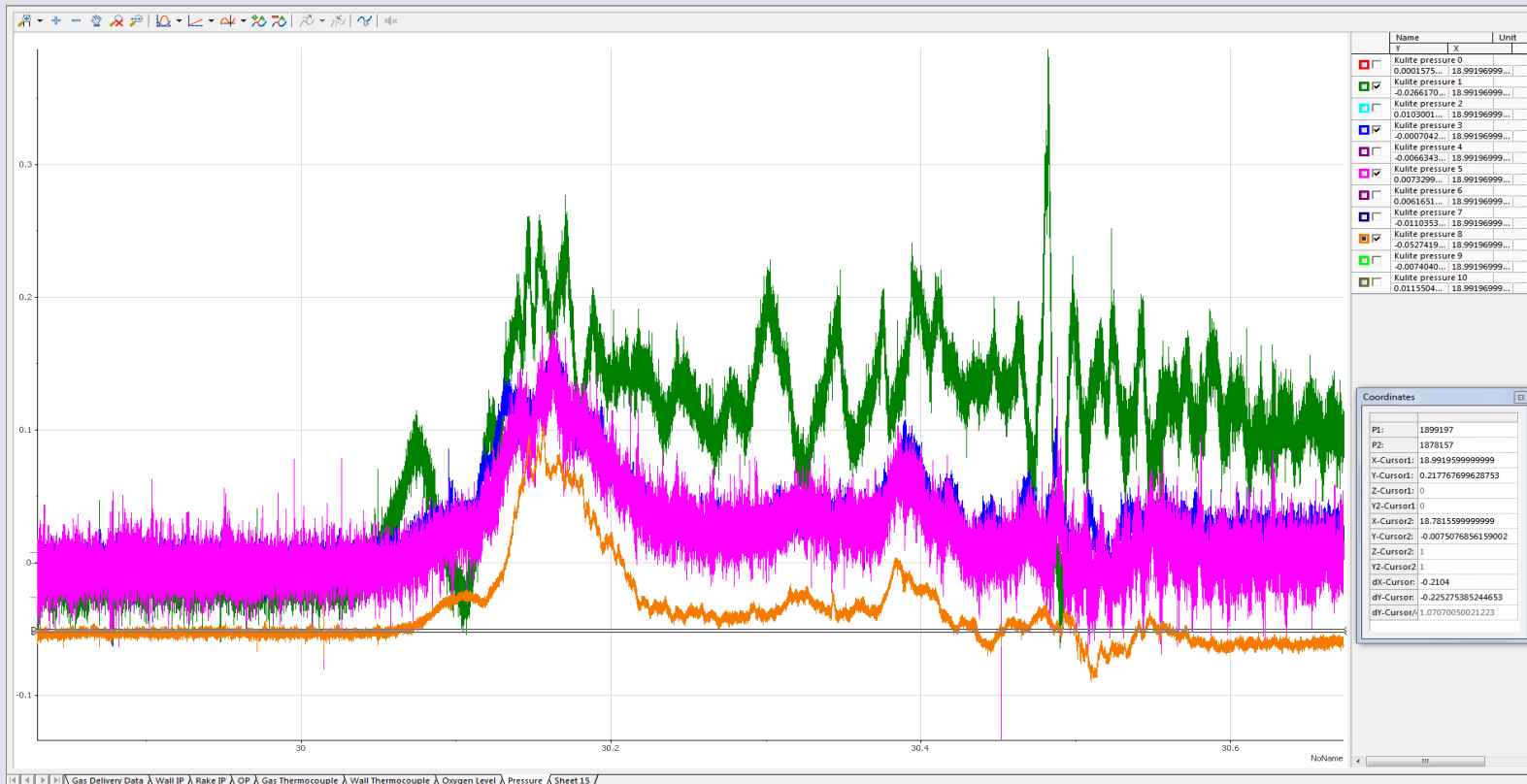
Thermocouple number	Location	Position in tube (mm)	T <sub>max</sub> (deg C)	T <sub>i</sub> (deg C)
TC0	CD1-R3	1258		
TC2	CD2-R3	4258	913	294
TC4	CD3-R3	7258	919	288
TC6	CD4-R3	10258	858	281
TC8	HR1-R2	13160	627	242
TC12	CD3-T1	6258	490	290
TC13	CD3-L1	6258	499	289
TC14	CD3-B1	6258		
TC15	CD3-R1	6258	513	300
TC16	HR2-R3M	14140	516	219
TC17	HR2-R5L	14745	616	241
TC18	HR2-R5U	14745	563	238
TC19	HR3-L1M	15140	636	253
TC20	HE2-R1L	16090		
TC21	HE2-R1U	16090	215	194
TC22	HR5-R4M	19375	388	148
TC23	HR6-R1M	19985	344	129
TC24	HR6-R5L	21165	321	169
TC25	HR6-R5U	21165	444	201

surface thermocouples [not plotted]

TC1	CD1-T2	1508	141	128
TC3	CD2-T2	4508	117	106
TC5	CD3-T2	7508	115	104
TC7	CD4-T2	10508		

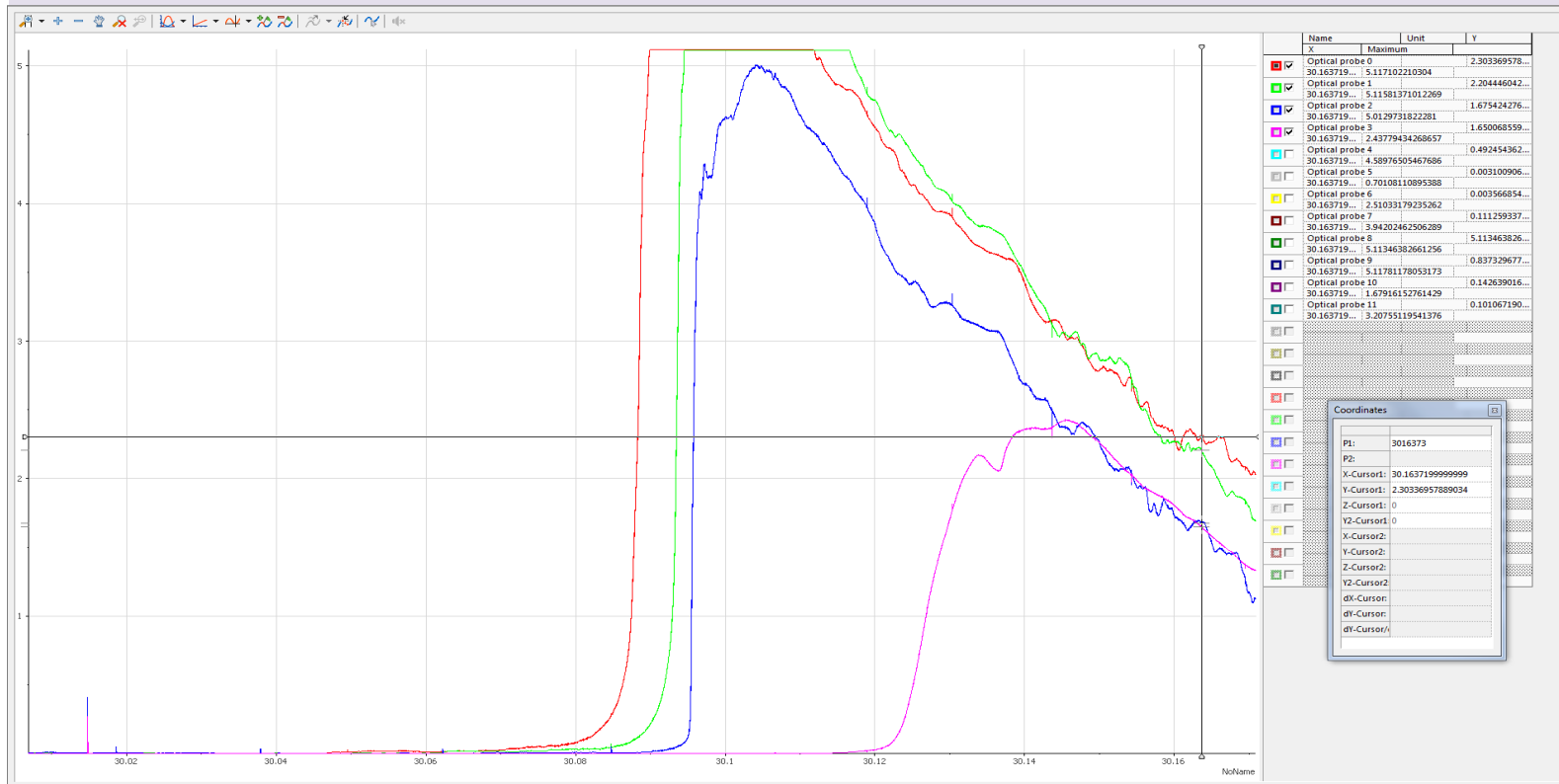


# Pressure





# Optical Probes

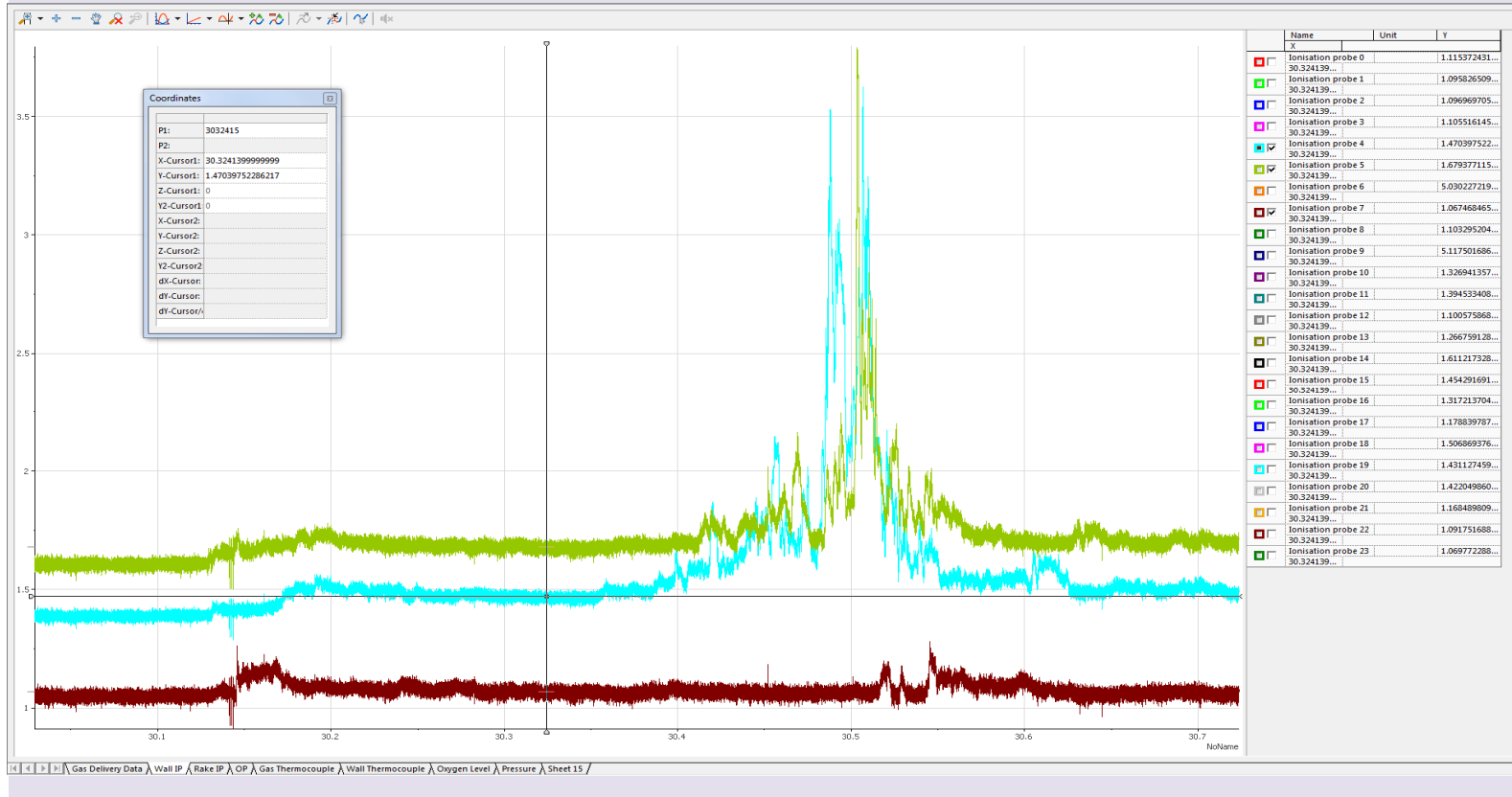


Name	Unit	Y
X	Maximum	
Optical probe 0		2.303369578...
30.163719...	5.117102210304	
Optical probe 1		2.204446042...
30.163719...	5.11581371012269	
Optical probe 2		1.675424276...
30.163719...	5.0129731822281	
Optical probe 3		1.650068559...
30.163719...	2.43779434268657	
Optical probe 4		0.492454362...
30.163719...	4.58976505467686	
Optical probe 5		0.003100906...
30.163719...	0.70108110895388	
Optical probe 6		0.003566854...
30.163719...	2.51033179235262	
Optical probe 7		0.111259337...
30.163719...	3.94202462506289	
Optical probe 8		5.113463826...
30.163719...	5.11346382661256	
Optical probe 9		0.837329677...
30.163719...	5.11781178053173	
Optical probe 10		0.142639016...
30.163719...	1.67916152761429	
Optical probe 11		0.101067190...
30.163719...	3.20755119541376	

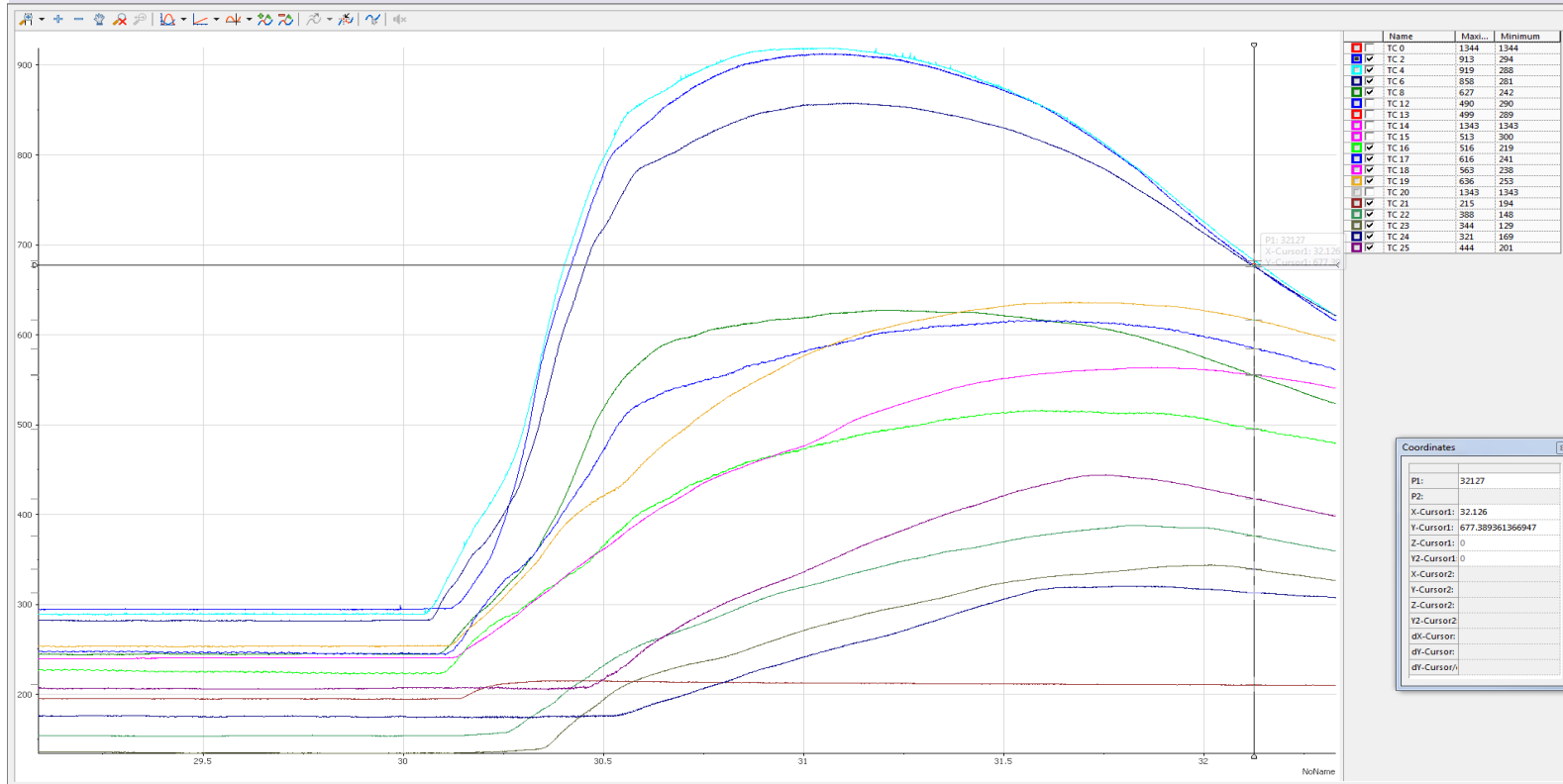
  

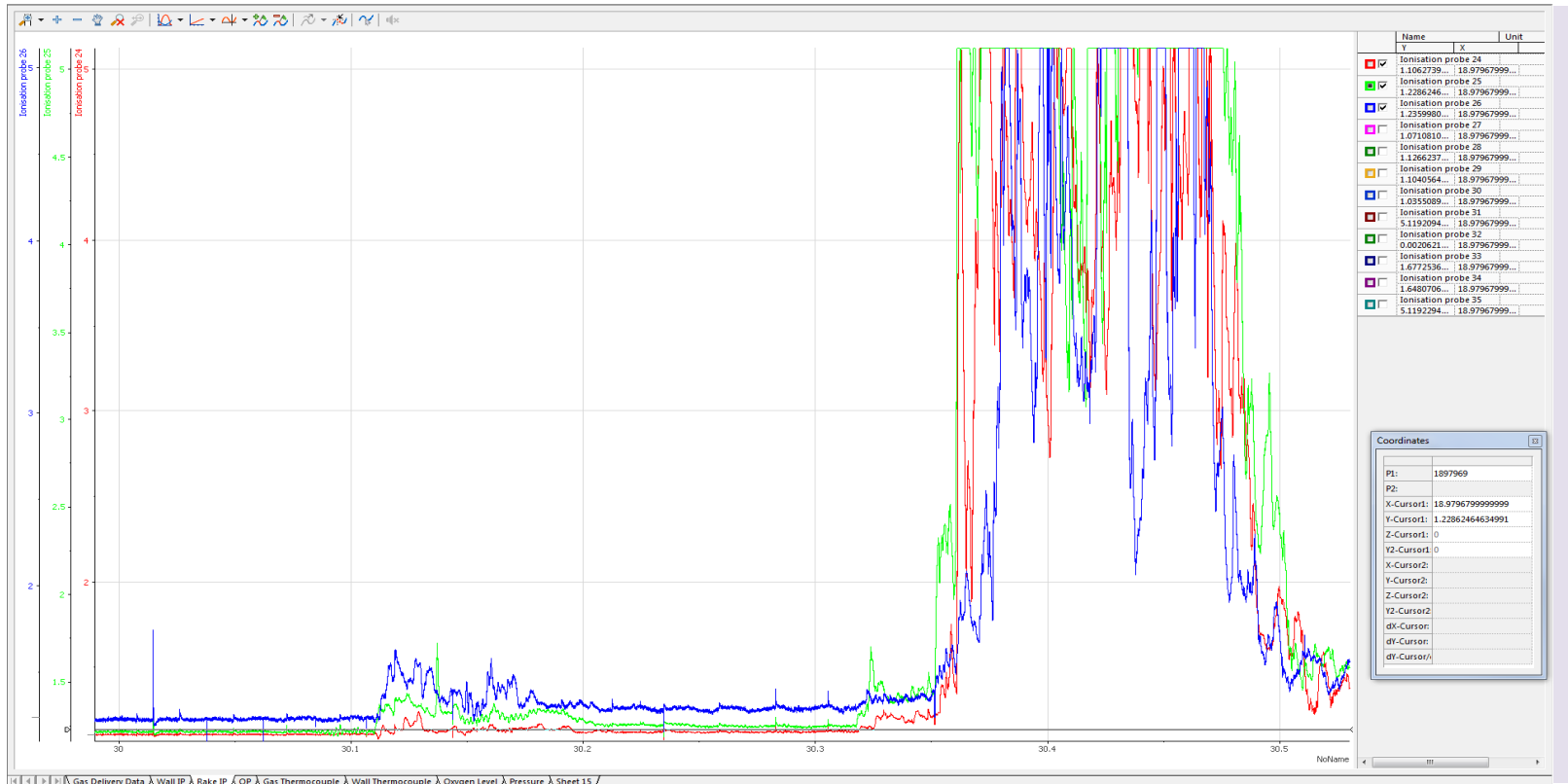
P1:	3016373
P2:	
X-Cursor1:	30.1637199999999
Y-Cursor1:	2.30336957889034
Z-Cursor1:	0
Y2-Cursor1:	0
X-Cursor2:	
Y-Cursor2:	
Z-Cursor2:	
Y2-Cursor2:	
dx-Cursor:	
dY-Cursor:	
dZ-Cursor:	

# Ionisation Probes



# Temperature





Name	Y	X	Unit
<input checked="" type="checkbox"/> Ionisation probe 24	1.1062739...	18.97967999...	
<input checked="" type="checkbox"/> Ionisation probe 25	1.2286246...	18.97967999...	
<input checked="" type="checkbox"/> Ionisation probe 26	1.2399880...	18.97967999...	
<input checked="" type="checkbox"/> Ionisation probe 27	1.0710810...	18.97967999...	
<input checked="" type="checkbox"/> Ionisation probe 28	1.1286237...	18.97967999...	
<input checked="" type="checkbox"/> Ionisation probe 29	1.1040564...	18.97967999...	
<input checked="" type="checkbox"/> Ionisation probe 30	1.0355069...	18.97967999...	
<input checked="" type="checkbox"/> Ionisation probe 31	5.1192094...	18.97967999...	
<input checked="" type="checkbox"/> Ionisation probe 32	0.0020621...	18.97967999...	
<input checked="" type="checkbox"/> Ionisation probe 33	1.6772536...	18.97967999...	
<input checked="" type="checkbox"/> Ionisation probe 34	1.6480706...	18.97967999...	
<input checked="" type="checkbox"/> Ionisation probe 35	5.1192294...	18.97967999...	

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

