

Date	19 February 2019
Time	11:56:15
Test Number	HRSG Test 50
Mixture Composition	60% H2 40% CO
Ambient Temperature	6 °C
Ambient Pressure	978 mbar
Wind Speed	5 m/s
Wind direction	WNW
Relative Humidity	80.00%
Mass Flow	9.9840 kg/s
Equivalence Ratio	0.36

General Comments: (weather, rig configuration)

Weather: Light wind and overcast.

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 60% H2 40% CO at an intended EQR of 0.35

Test gave a very weak combustion event. Many of the sensors did not give a strong response to the event.

Ionisation Probes

Ionisation Rakes

Optical Probes

Max overpressure
72 mbar

Max. gas temperature
694 °C

Max. flame speed
89 m/s

Max. flame speed
102 m/s

Max. flame speed
135 m/s

Initial gas temperature
336 °C

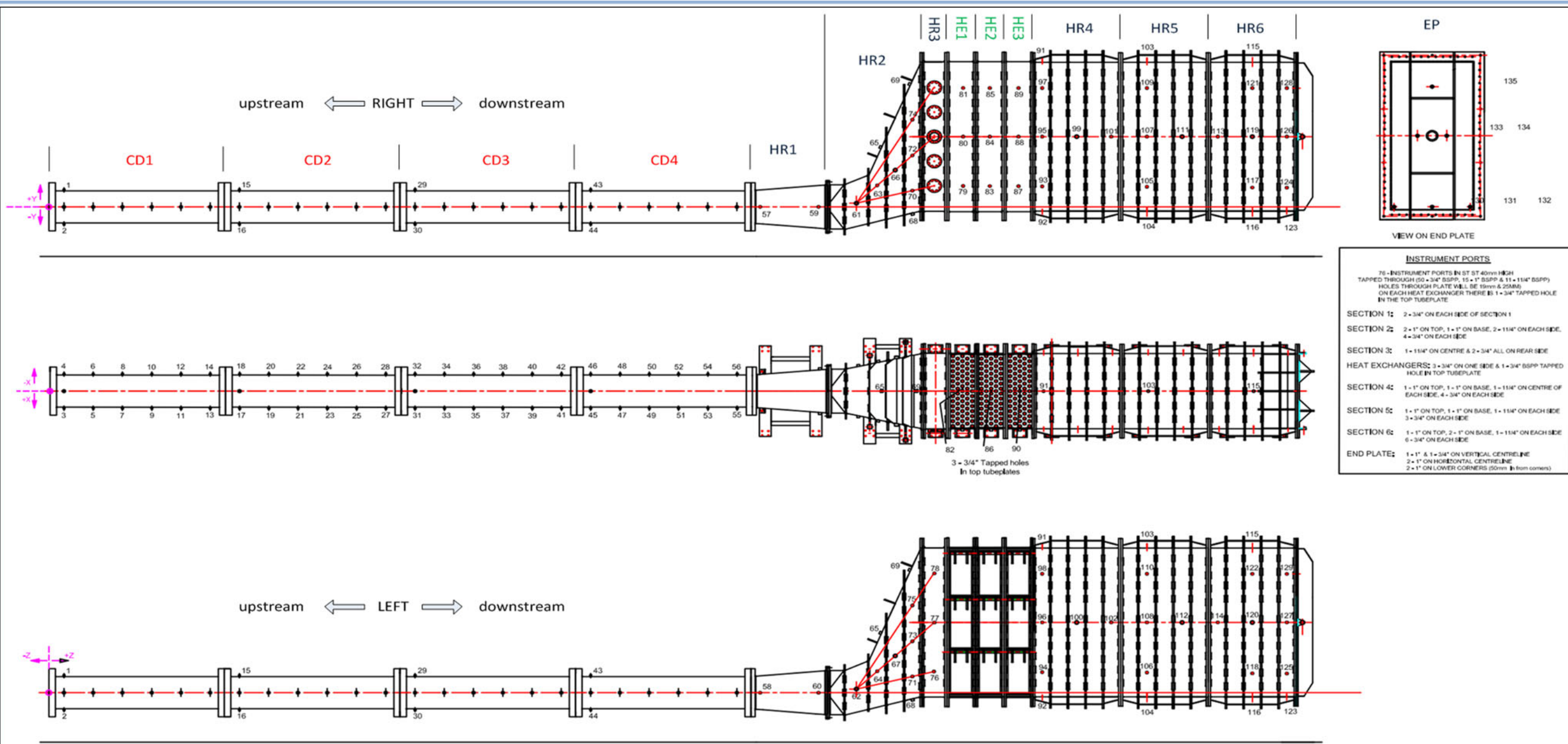
Location of Max. Overpressure
sensor KU1
label CD4-R2
distance 9758 mm

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 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	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

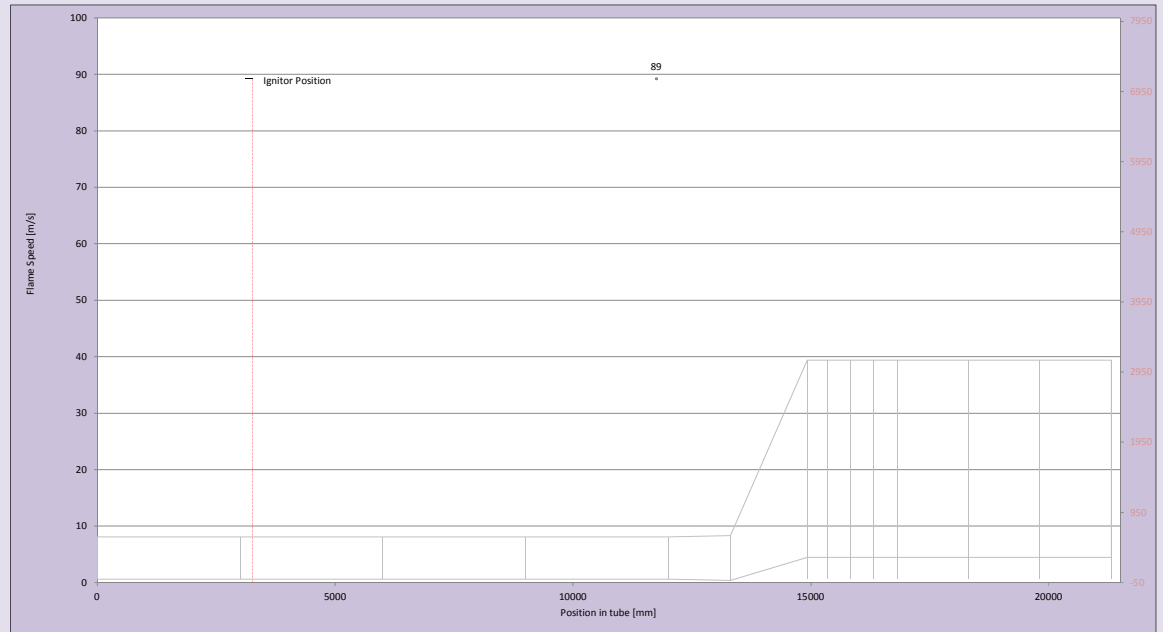
- 4 circular duct sections (CD1 to CD4)
- 6 HRSG sections (HR1 to HR6)
- 3 heat exchanger sections (HE1 to HE3) located between HR3 and HR4

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	18.29997	89
IP1	HR2-L5L	Ionisation probe 1	14745	ND	
IP2	HR2-L5M	Ionisation probe 2	14745	ND	
IP3	HR2-L5U	Ionisation probe 3	14745	ND	
IP4	HR3-R1L	Ionisation probe 4	15140	ND	
IP5	HR3-R1LM	Ionisation probe 5	15140	ND	
IP6	HR3-R1M	Ionisation probe 6	15140	ND	
IP7	HR3-R1U	Ionisation probe 7	15140	ND	
IP8	HR3-L1U	Ionisation probe 8	15140	ND	
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	ND	
IP16	HR4-L5M	Ionisation probe 16	18165	ND	
IP17	HR4-L5U	Ionisation probe 17	18165	ND	
IP18	HR4-R5M	Ionisation probe 18	18165	ND	
IP19	HR5-L2L	Ionisation probe 19	18775	ND	
IP20	HR5-L2M	Ionisation probe 20	18775	ND	
IP21	HR5-L2U	Ionisation probe 21	18775	ND	
IP22	HR5-R2U	Ionisation probe 22	18775	ND	
IP23	HR6-L1M	Ionisation probe 23	19985	ND	

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

Only a weak responses from IP sensors. Most sensors did not give a response to the combustion event - some did give a very weak response but flame arrival time was not easily identified. Further analysis required

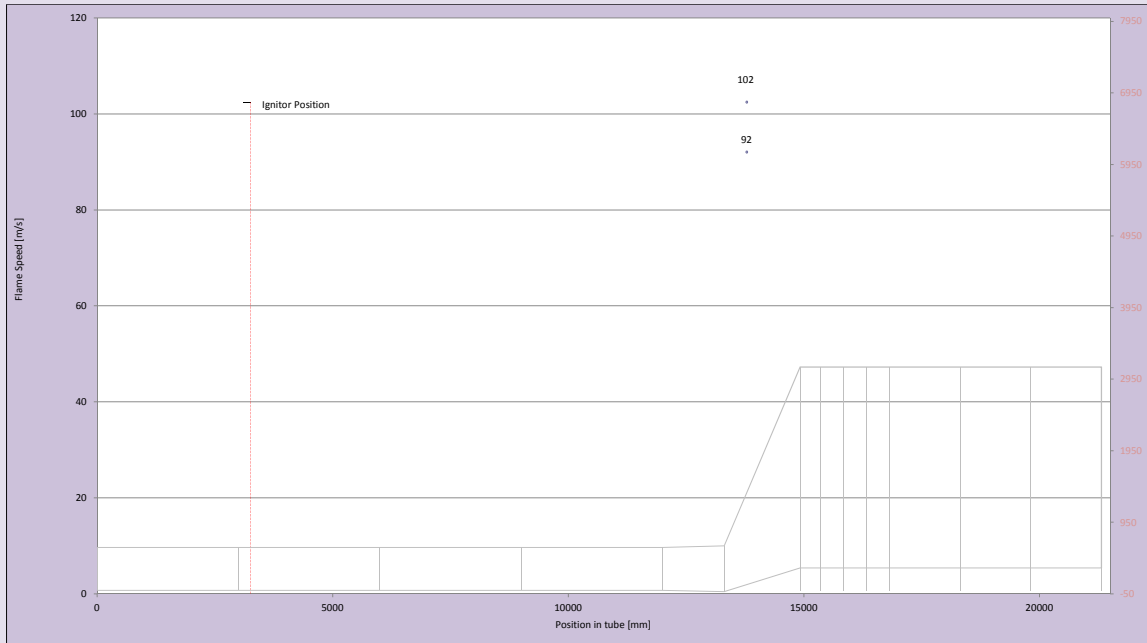


Location of igniter 3258 mm Time of ignition 18.2047 seconds

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	ND	
RA1	IP25	HR2-R2M	IP25	13785	18.3074	102
RA1	IP26	HR2-R2M	IP26	13785	18.3191	92
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	HR4-R3L	IP33	17575	ND	
RA4	IP34	HR4-R3L	IP34	17575	ND	
RA4	IP35	HR4-R3L	IP35	17575	ND	

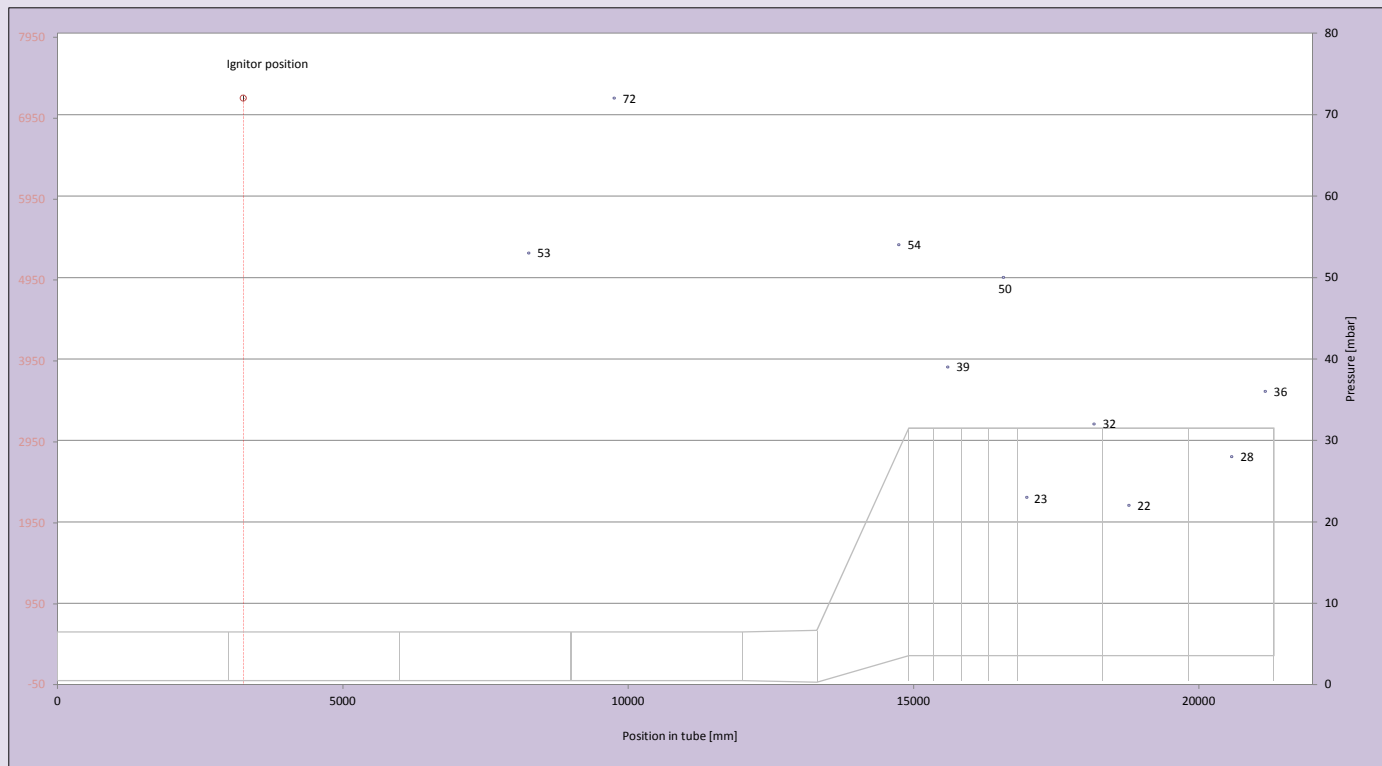
KEY: ND - not detected - sensor working but flame too weak to be picked up
 NW - not working - sensor not working.

A very weak combustion event.



Location of igniter 3258 mm

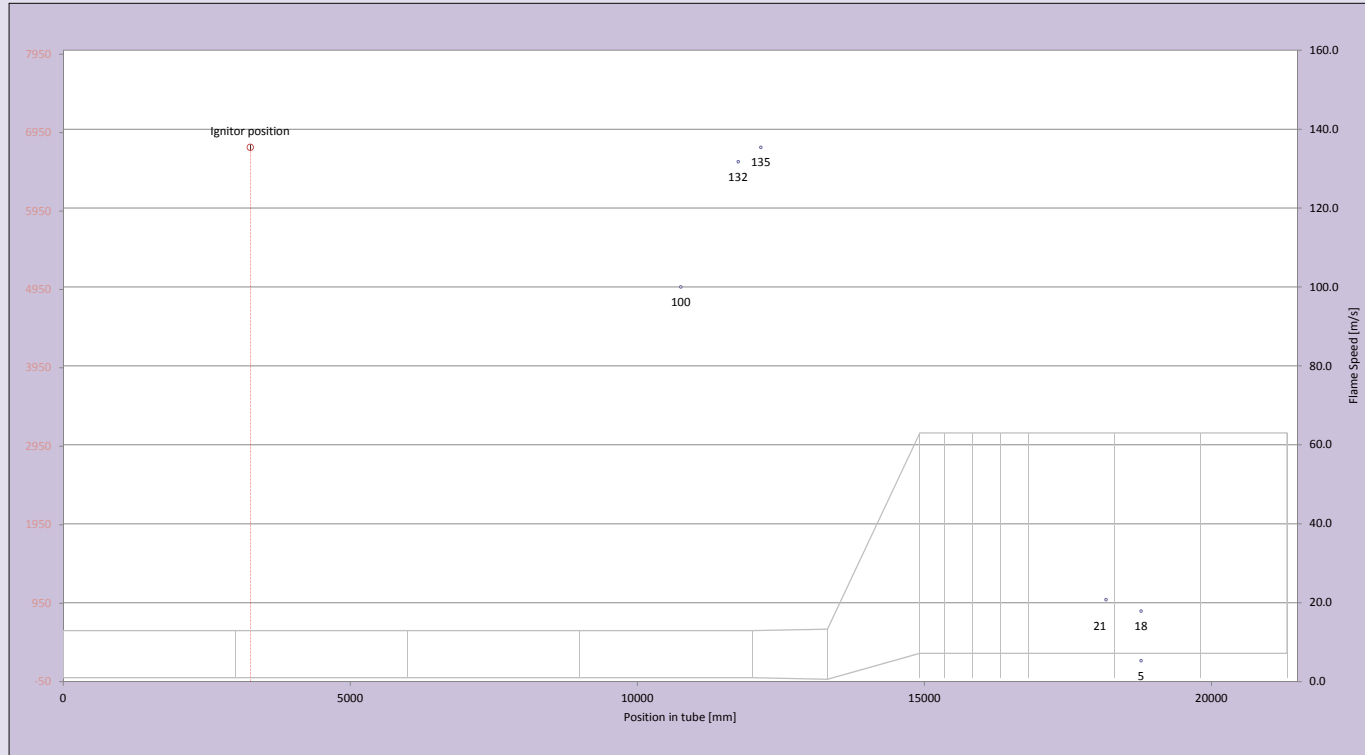
Transducer number	Location	Position in tube [mm]	ΔP_{max} [mbar]	Time ΔP_{max} [sec]
KU0	CD3-R5	8258	53	18.3611
KU1	CD4-R2	9758	72	18.3688
KU2	HR2-T5	14745	54	18.3902
KU3	HR3-L1L	15140		
KU4	HE1-R1U	15600	39	18.3519
KU5	HE3-R1L	16580	50	18.3250
KU6	HR4-R1L	16985	23	18.3546
KU7	HR4-R5U	18165	32	18.3438
KU8	HR5-R2L	18775	22	18.3435
KU9	HR6-R3L	20575	28	18.3491
KU10	HR6-LSL	21165	36	18.3546



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	18.2797	100.0
OP1	CD4-R6	11758	18.2873	131.8
OP2	HR1-R1	12152	18.2902	135.4
OP3	HR2-R5M	14745		
OP4	HE1-T1	15600		
OP5	HE2-T1	16090		
OP6	HE3-T1	16580		
OP7	HR4-T1	16985		
OP8	HR4-R1M	16985		
OP9	HR4-R5L	18165	18.5797	20.8
OP10	HR5-T2	18775	18.6601	17.9
OP11	HR5-R2M	18775	18.6942	5.3

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

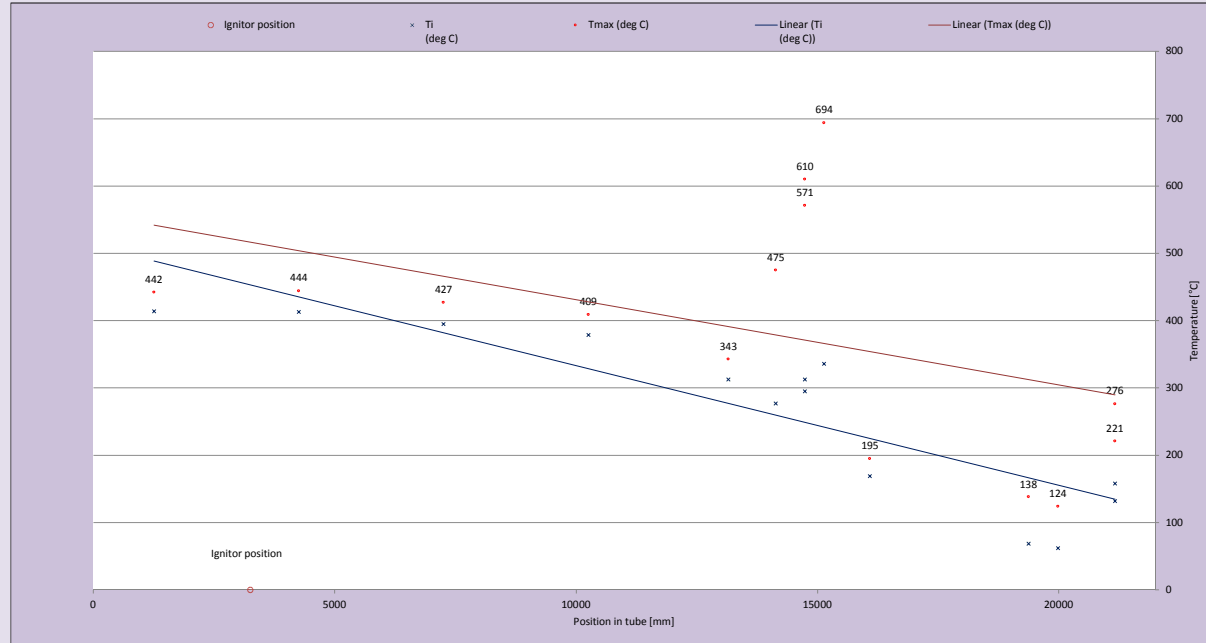


Location of igniter mm Time of ignition seconds

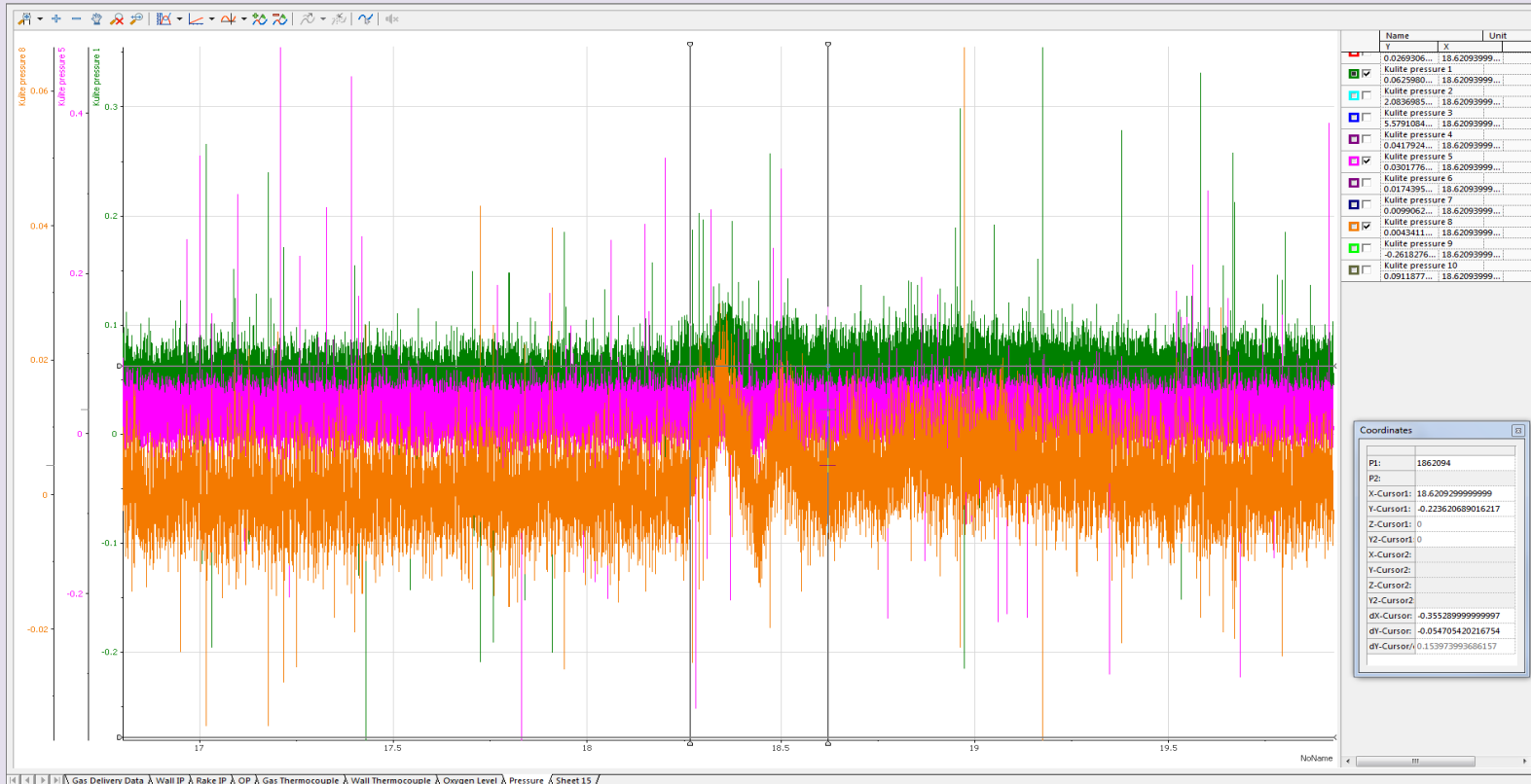
Thermocouple number	Location	Position in tube (mm)	T _{max} (deg C)	T _i (deg C)
TC0	CD1-R3	1258	442	414
TC2	CD2-R3	4258	444	413
TC4	CD3-R3	7258	427	395
TC6	CD4-R3	10258	409	379
TC8	HR1-R2	13160	343	313
TC12	CD3-T1	6258	400	390
TC13	CD3-L1	6258	435	410
TC14	CD3-B1	6258		
TC15	CD3-R1	6258	450	424
TC16	HR2-R3M	14140	475	277
TC17	HR2-R5L	14745	610	313
TC18	HR2-R5U	14745	571	295
TC19	HR3-L1M	15140	694	336
TC20	HE2-R1L	16090		
TC21	HE2-R1U	16090	195	169
TC22	HR5-R4M	19375	138	69
TC23	HR6-R1M	19985	124	62
TC24	HR6-R5L	21165	221	132
TC25	HR6-R5U	21165	276	158

surface thermocouples [not plotted]

TC1	CD1-T2	1508	49	38
TC3	CD2-T2	4508	39	29
TC5	CD3-T2	7508	39	30
TC7	CD4-T2	10508	25	20



Pressure

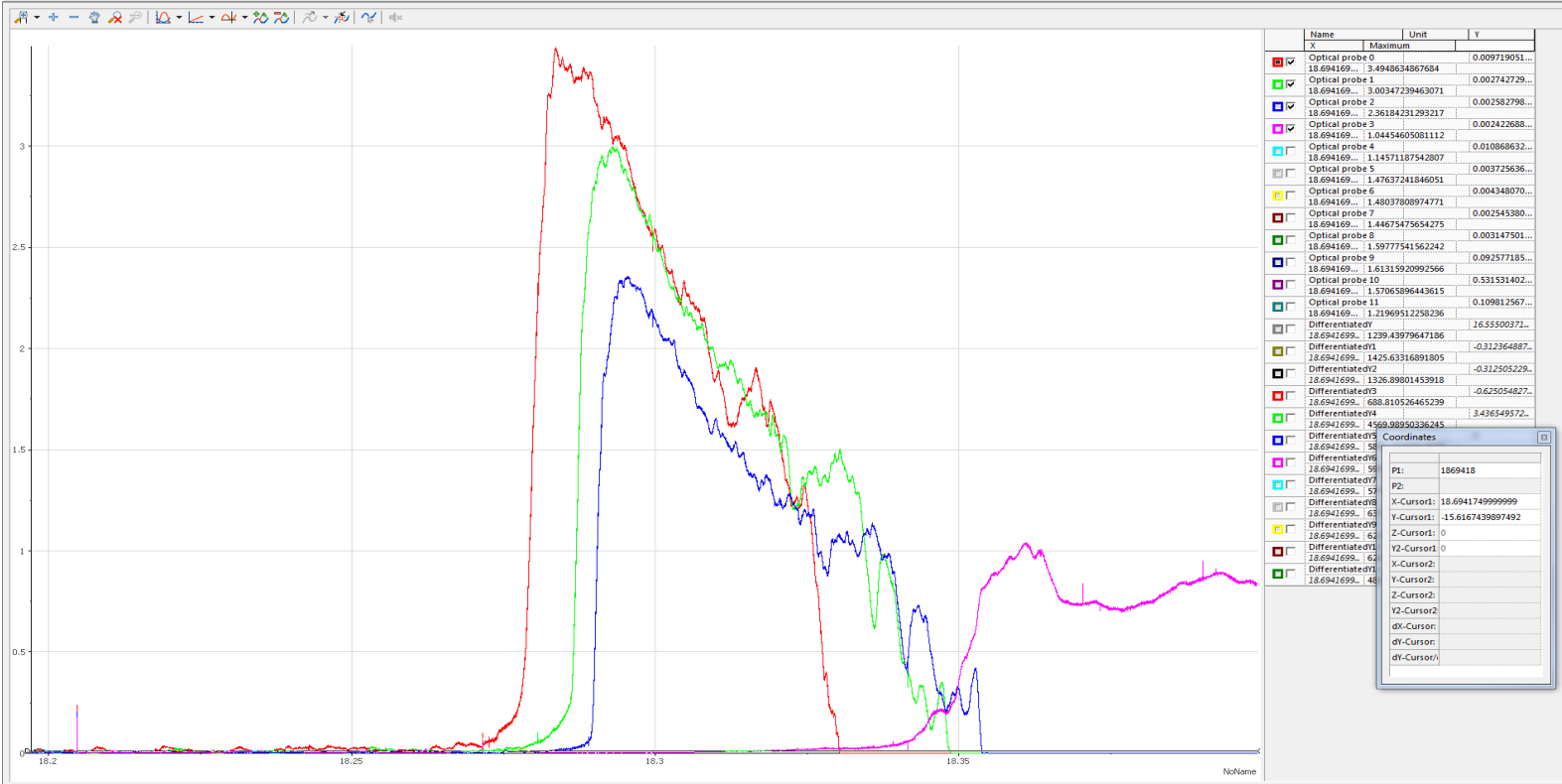


Name	X	Unit
0.0269306... 18.62093999...		
<input checked="" type="checkbox"/> Kulite pressure 1	18.62093999...	
0.0625980... 18.62093999...		
<input checked="" type="checkbox"/> Kulite pressure 2	18.62093999...	
2.0836965... 18.62093999...		
<input type="checkbox"/> Kulite pressure 3	18.62093999...	
5.5791084... 18.62093999...		
<input type="checkbox"/> Kulite pressure 4	18.62093999...	
0.0417924... 18.62093999...		
<input checked="" type="checkbox"/> Kulite pressure 5	18.62093999...	
0.0391776... 18.62093999...		
<input type="checkbox"/> Kulite pressure 6	18.62093999...	
0.0174395... 18.62093999...		
<input type="checkbox"/> Kulite pressure 7	18.62093999...	
0.0059062... 18.62093999...		
<input checked="" type="checkbox"/> Kulite pressure 8	18.62093999...	
0.0043411... 18.62093999...		
<input checked="" type="checkbox"/> Kulite pressure 9	18.62093999...	
-0.2618276... 18.62093999...		
<input type="checkbox"/> Kulite pressure 10	18.62093999...	
0.0911877... 18.62093999...		

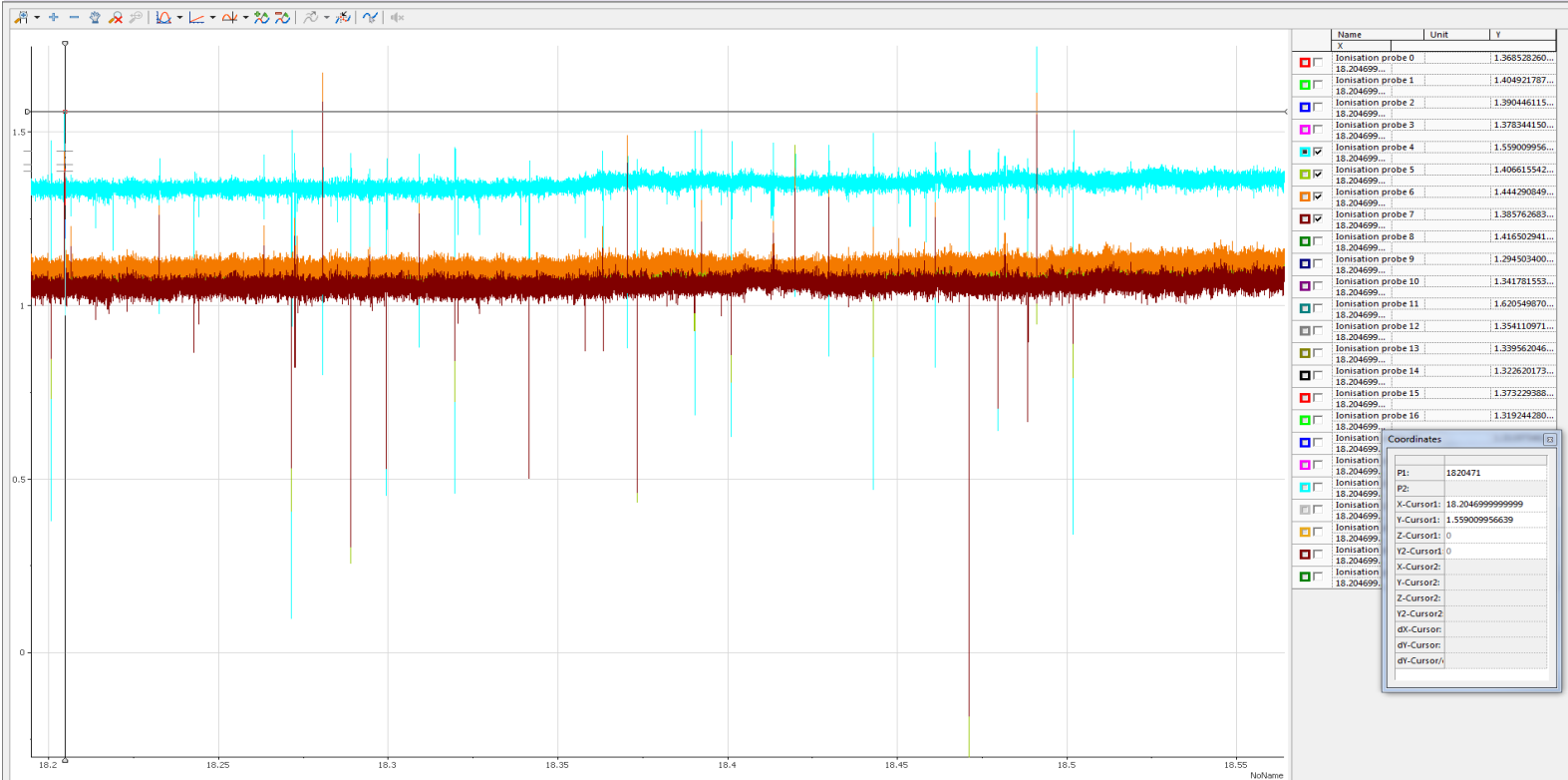
Coordinates

P1:	1862094
P2:	
X-Cursor1:	18.6209399999999
Y-Cursor1:	-0.223620689016217
Z-Cursor1:	0
Y2-Cursor1:	0
X-Cursor2:	
Y-Cursor2:	
Z-Cursor2:	
Y2-Cursor2:	
dY-Cursor:	-0.355289999999997
dY-Cursor:	-0.054705420216754
dY-Cursor:	0.153973993686157

Optical Probes



Ionisation Probes



Name	Unit	Y
Ionisation probe 0		1.368528260...
Ionisation probe 1		1.404921787...
Ionisation probe 2		1.390446115...
Ionisation probe 3		1.378344150...
Ionisation probe 4		1.559009956...
Ionisation probe 5		1.406615542...
Ionisation probe 6		1.444290849...
Ionisation probe 7		1.385762683...
Ionisation probe 8		1.416502941...
Ionisation probe 9		1.294503400...
Ionisation probe 10		1.341781553...
Ionisation probe 11		1.620549870...
Ionisation probe 12		1.354110971...
Ionisation probe 13		1.339562046...
Ionisation probe 14		1.322620173...
Ionisation probe 15		1.373229388...
Ionisation probe 16		1.319244280...

Coordinates

P1: 1820471

P2:

X-Cursor1: 18.204699999999999

Y-Cursor1: 1.559009956639

Z-Cursor1: 0

Y2-Cursor1: 0

X-Cursor2:

Y-Cursor2:

Z-Cursor2:

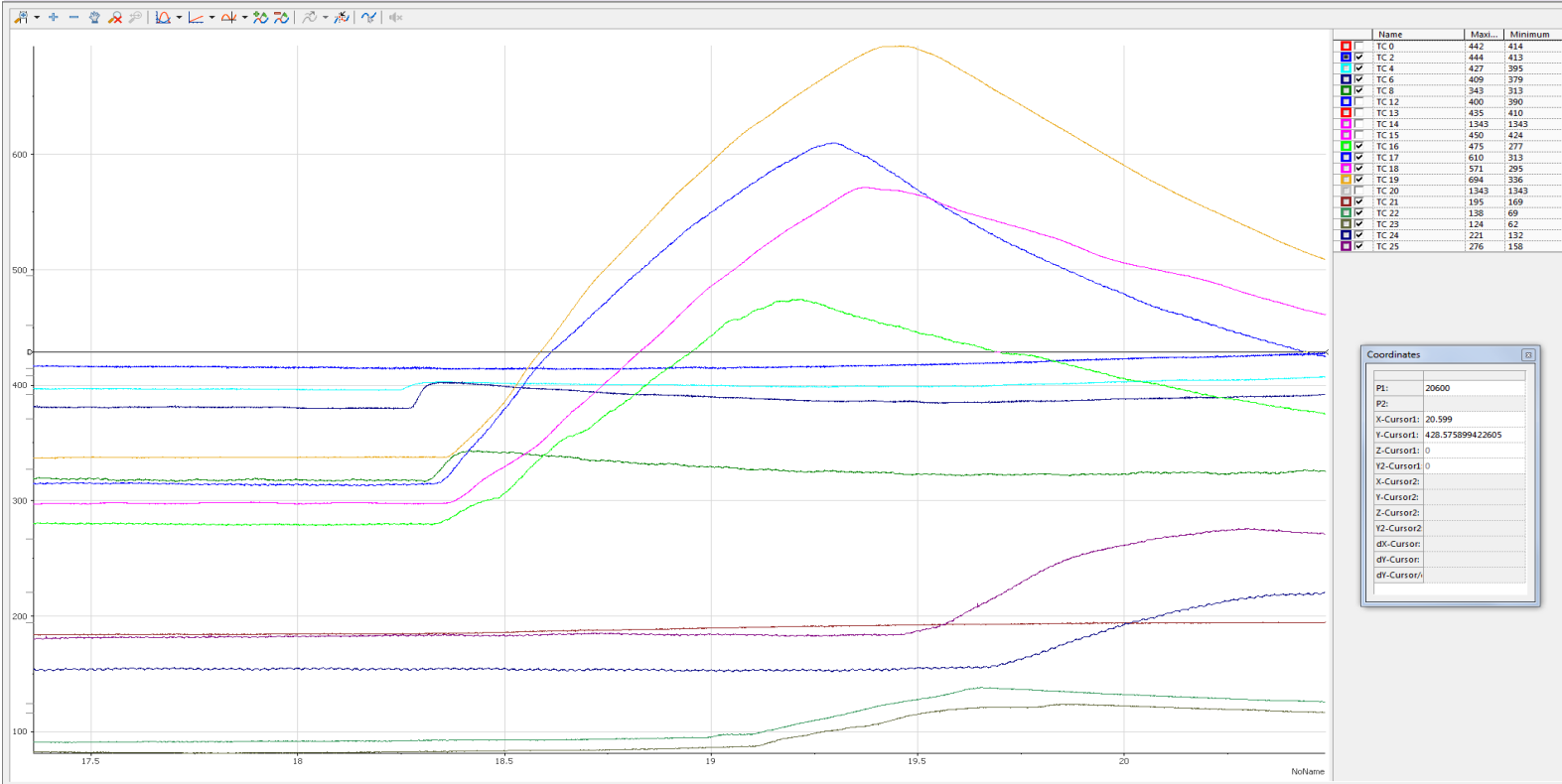
Y2-Cursor2:

dx-Cursor:

dY-Cursor:

dY-Cursor/:

Temperature



Coordinates

P1: 20600

P2:

X-Cursor1: 20.599

Y-Cursor1: 428.575899422605

Z-Cursor1: 0

Y2-Cursor1: 0

X-Cursor2:

Y-Cursor2:

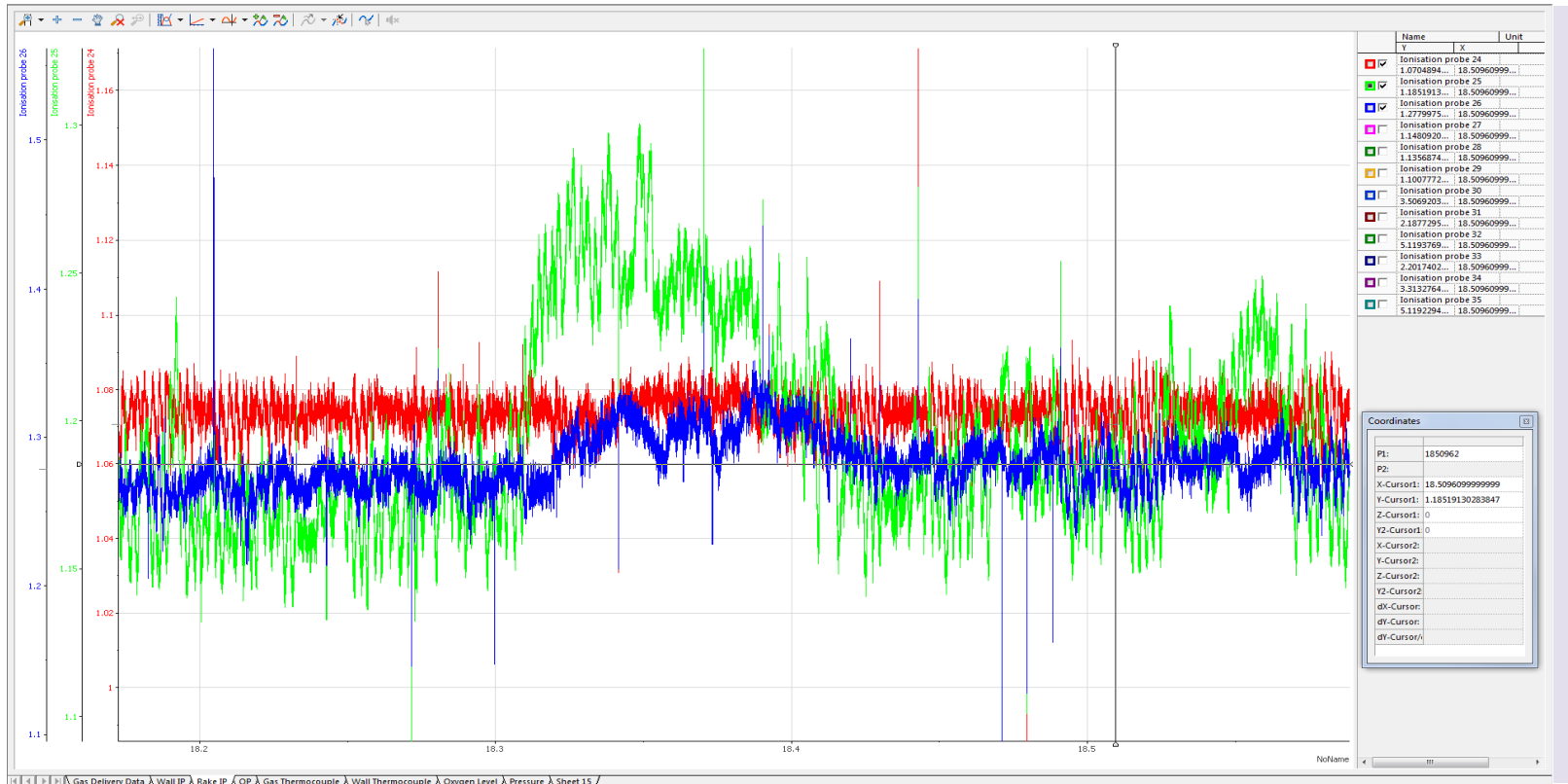
Z-Cursor2:

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
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

