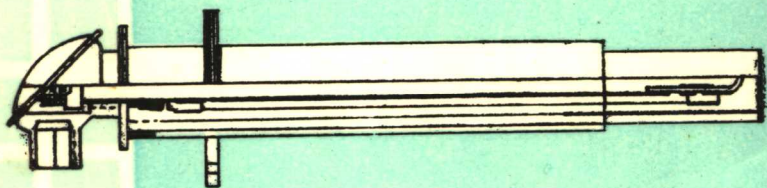




双 耐 牌

Zdingyangtantou

定氧探头



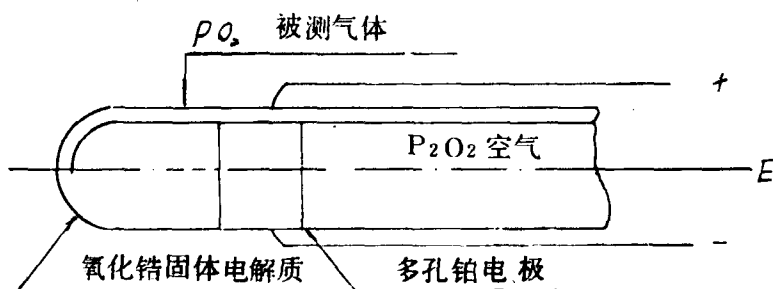
上海第二耐火材料厂

氧化锆探头是一种新型的测氧元件，它与氧量变送器及2次仪表组成一套测氧分析仪，与磁性氧量表、二氧化碳表、红外分析仪比较，具有结构简单，反应灵敏，维护量小，使用方便等优点。在一定温度下，可以用它来测定气体中的含氧量，所以用它来测定燃烧炉烟道气中的氧含量，以此控制锅炉最佳燃烧系数提高燃烧效率，达到节约燃料的目的。

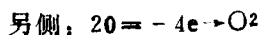
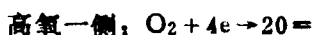
一、工 作 原 理

利用氧化锆材料添加一定量的稳定剂以后，通过高温烧成，在一定温度下，就成为氧离子的良导体。在该材料二侧焙烧上铂电极，当二侧间氧分压不同时，在两电极间产生浓差电动势，氧分压高的一侧经电极催化得到4个电子(e)，形成氧离子(O^{2-})，通过氧化锆电介质中氧空位传递到另一侧，又经电极催化失去4个电子(e)，使氧离子还原成氧(O_2)。

如图(1)



在电介质两侧反应如下：



根据奈斯脱(Nernst)公式

$$E = \frac{Rt}{4F} \ln \frac{P_1 O_2}{P_2 O_2}$$

式中 $R = 1.978 \text{ 卡} \cdot \text{度}^{-1} \cdot \text{克分子}^{-1}$ (气体常数)

$F = 23060 \text{ 卡} \cdot \text{伏}^{-1} \cdot \text{克当量}^{-1}$ (法拉第常数)

P_1 = 空气中的氧分压 T = 绝对温度 ($273 + t$)

P_2 = 待测气体中氧分压

已知固体电介质温度和参比气体氧分压，便可通过测量电动势计算出待测气体中的氧分压。

二、使用性能

1. 测量范围：

一、氧量：0.1~10% O_2

二、元件工作温度：600~850℃

2. 测量精度：

0.1~5% O_2 误差 $\pm 0.2\%$ O_2

5~10% O_2 误差 $\pm 0.3\%$ O_2

3. 高温阻值：800℃ < 50Ω 700℃ < 100Ω 600℃ < 1000Ω

4. 常温气密性 0.15 K_g/Cm^2 (标准大气压)

5. 零位电势：< 2 mV

三、规格型号

一、直接插入式：Zy

总长 1200% (内装有测温镍铬镍硅铠装热电偶)

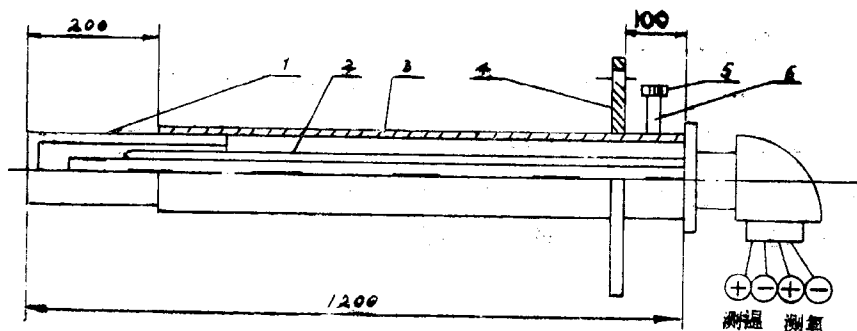
金属套管：φ40×1000% 过滤器：φ34×200%

按装法兰：φ130×8%

螺孔中心间距 φ100%

螺孔 M12%×4 孔

图二 Zy—1 如图(2)：



1. 过滤器 2. 铠装热电偶 3. 金属套管 4. 法兰
5. 螺帽 6. 取气管

二、定温插入式附加热器: Zy

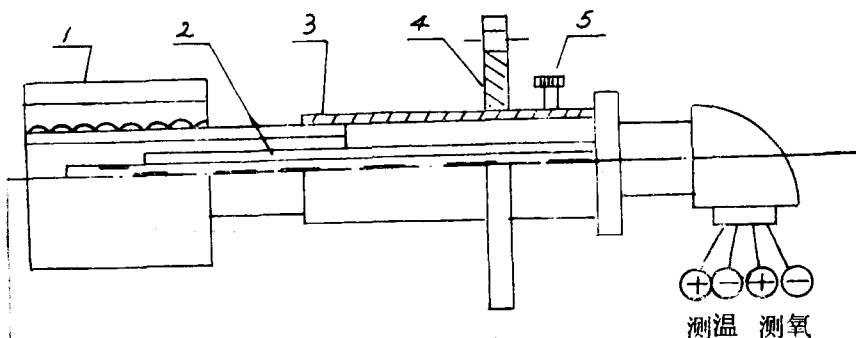
总 长 500% (内装有测温镍铬镍硅铠装热电偶)

加 热 器 $\phi 59 \times 150\%$ 电炉丝功率2000w

金属套管 $\phi 40 \times 260\%$

按装法兰 $\phi 180 \times 8$ (螺孔中心间距 $\phi 150\%$) 螺孔 M 12% $\times 6$ 孔

图三Zy-2 如图(3):



1. 加热器 2. 铠装热电偶 3. 金属套管 4. 法兰 5. 取气管

注: 特殊规格双方面议

四、 使用 安 装 方 法

氧探头在具体使用过程中测点的选择相当重要, 测点选择不当就会使指示波动大, 或偏高或偏低, 并且还影响探头的使用寿命, 为此测点要附合以下要求:

1. 燃烧必须完全, 不能遇到明火, 冲刷到可燃性气体(CO , H_2 , CH_4)有明火处表明燃烧仍在进行无法正确表示该处的氧量。
2. P烟接近P室即不能有附加的压力源。
3. 烟气流速要尽量平衡, 让探头两侧介质尽可能工作在自由扩散状态。
4. 使用氧探头, 一定要配置高阻抗($>100\text{K}\Omega$)的变送器。

5. 储存时放置在干燥通气处。

6. 搬运拆箱时应做到轻搬轻放，小心拆装。

一. 直接插入式：

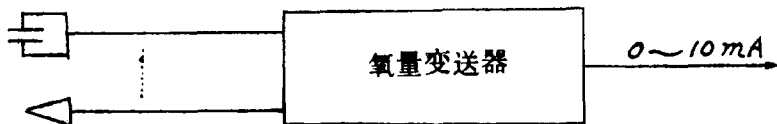
水平或垂直安装，按装时大小法兰应**严禁**泄漏，测点周围炉墙不能有漏风，否则会影响测量精度。测点处温度需在 $600\sim 850^{\circ}\text{C}$ 范围内。

二. 定温插入式：

用于待测气体温度较低($<600^{\circ}\text{C}$)的场合，使用时需由用户配置控热装置，加热器的电炉不宜直接接 220V ，加热器温度需控制在 700°C 左右。

五、氧化锆探头与仪表的配套

下图与氧化锆氧量变送器配套用



六、使用中可能出现的问题及其解决办法

1. 无信号输出

A. 铂丝断：可拧下四个螺丝，轻轻把芯子抽出来，焊接铂丝。

B. 锆管坏：报废。

2. 氧量指示偏高

锆管与瓷管封接处泄漏厉害，补封后仍可继续使用。

3. 氧量指示偏低：

被测气体中有可燃性气体，并且较多，如 CO 、 H_2 、 C_nH_m 等，需调整燃烧工况，排除后即可趋于正常。

4. 被测点的温度不符合使用要求。

A. 温度过低，内阻增大，造成电势偏差大。

B. 温度过高，影响电极寿命。

5. 输出信号波动大，频率高。

A. 取样点不很好。

B. 燃烧本身不稳定。

(与燃料及运行有关)

6. 加热器电炉温度不恒定, 影响氧探头正常工作。

A. 加热器电炉丝断。

B. 硅碳管因吸附烟灰阻值增大。

氧化锆氧量分析仪温度

与

氧浓差电势对照表续下

$\frac{\%O_2}{C_{mv}}$	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
600	100.20	87.16	79.54	74.13	69.93	66.50	63.60	61.09	58.88	56.90
605	100.77	87.66	79.99	74.55	70.33	66.88	63.97	61.44	59.21	57.22
610	101.35	88.16	80.45	74.98	70.73	67.26	64.33	61.79	59.55	57.55
615	101.92	88.66	80.91	75.40	71.13	67.65	64.70	62.14	59.89	57.87
620	102.50	89.16	81.36	75.83	71.53	68.03	65.06	62.49	60.23	58.20
625	103.07	89.66	81.82	76.25	71.93	68.41	65.43	62.84	60.56	58.53
630	103.64	90.16	82.27	76.68	72.33	68.79	65.79	63.19	60.90	58.85
635	104.22	90.66	82.73	77.10	72.74	69.17	66.15	63.54	61.24	59.18
640	104.79	91.16	83.18	77.52	73.14	69.55	66.52	63.89	61.57	59.50
645	105.36	91.66	83.64	77.95	73.54	69.93	66.88	64.24	61.91	59.83
650	105.94	92.16	84.09	78.37	73.94	70.31	67.25	64.59	62.25	60.15
655	106.51	92.66	84.55	78.80	74.34	70.69	67.61	64.94	62.59	60.48
660	107.09	93.15	85.00	79.22	74.74	71.07	67.97	65.29	62.92	60.81
665	107.66	93.65	85.46	79.65	75.14	71.45	68.34	65.64	63.26	61.13
670	108.23	94.15	85.92	80.07	75.54	71.83	68.70	65.99	63.60	61.46
675	108.81	94.65	86.37	80.50	75.94	72.22	69.07	66.34	63.94	61.78
680	109.38	95.15	86.83	80.92	76.34	72.60	69.43	66.69	64.27	62.11
685	109.95	95.65	87.28	81.35	76.74	72.98	69.80	67.04	64.61	62.43
690	110.53	96.15	87.74	81.77	77.14	73.36	70.16	67.39	64.95	62.76
695	111.10	96.65	88.19	82.19	77.54	73.74	70.52	67.74	65.28	63.09
700	111.68	97.15	88.65	82.62	77.94	74.12	70.89	68.09	65.62	63.41
705	112.25	97.65	89.10	83.04	78.34	74.50	71.25	68.44	65.96	63.74
710	112.82	98.15	89.56	83.47	78.74	74.88	71.62	68.79	66.30	64.06
715	113.40	98.64	90.01	83.89	79.14	75.26	71.98	69.14	66.63	64.39
720	113.97	99.14	90.47	84.32	79.54	75.64	72.35	69.49	66.97	64.72
725	114.55	99.64	90.93	84.74	79.94	76.02	72.71	69.84	67.31	65.04

$\frac{\%O_2}{^\circ C^{mv}}$	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
600	55.10	53.47	51.96	50.57	49.27	48.06	46.92	45.84	44.82	43.86
605	55.42	53.77	52.26	50.86	49.55	48.33	47.19	46.10	45.08	44.11
610	55.73	54.08	52.56	51.15	49.84	48.61	47.45	46.37	45.34	44.36
615	56.05	54.39	52.85	51.44	50.12	48.88	47.72	46.63	45.60	44.61
620	56.37	54.69	53.15	51.73	50.40	49.16	47.99	46.89	45.85	44.86
625	56.68	55.00	53.45	52.02	50.68	49.43	48.26	47.15	46.11	45.12
630	57.00	55.30	53.75	52.31	50.96	49.71	48.53	47.42	46.37	45.37
635	57.31	55.61	54.04	52.60	51.25	49.98	48.80	47.68	46.62	45.62
640	57.63	55.92	54.34	52.88	51.53	50.26	49.07	47.94	46.88	45.87
645	57.94	56.22	54.64	53.17	51.81	50.53	49.33	48.20	47.14	46.12
650	58.26	56.53	54.94	53.46	52.09	50.81	49.60	48.47	47.39	46.37
655	58.57	56.84	55.24	53.75	52.37	51.08	49.87	48.73	47.65	46.62
660	58.89	57.14	55.53	54.04	52.66	51.36	50.14	48.99	47.91	46.87
665	59.21	57.45	55.83	54.33	52.94	51.63	50.41	49.25	48.16	47.13
670	59.52	57.75	56.13	54.62	53.22	51.91	50.68	49.52	48.42	47.38
675	59.84	58.06	56.43	54.91	53.50	52.18	50.95	49.78	48.68	47.63
680	60.15	58.37	56.72	55.20	53.78	52.46	51.22	50.04	48.93	47.88
685	60.47	58.67	57.02	55.49	54.07	52.74	51.48	50.30	49.19	48.13
690	60.78	58.98	57.32	55.78	54.35	53.01	51.75	50.57	49.45	48.38
695	61.10	59.28	57.62	56.07	54.63	53.29	52.02	50.83	49.70	48.63
700	61.41	59.59	57.91	56.36	54.91	53.56	52.29	51.09	49.96	48.88
705	61.73	59.90	58.21	56.65	55.20	53.84	52.56	51.35	50.22	49.13
710	62.05	60.20	58.51	56.94	55.48	54.11	52.83	51.62	50.47	49.39
715	62.36	60.51	58.81	57.23	55.76	54.39	53.10	51.88	50.73	49.64
720	62.68	60.82	59.10	57.52	56.04	54.66	53.36	52.14	50.99	49.89
725	62.99	61.12	59.40	57.81	56.32	54.94	53.63	52.40	51.24	50.14

$\frac{\%O_2}{^\circ C/mv}$	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0
600	42.94	42.07	41.23	40.43	39.66	38.92	38.22	37.53	36.87	36.23
605	43.19	42.31	41.47	40.66	39.89	39.15	38.44	37.75	37.08	36.44
610	43.43	42.55	41.70	40.89	40.12	39.37	38.65	37.96	37.29	36.65
615	43.68	42.79	41.94	41.13	40.35	39.59	38.87	38.18	37.51	36.86
620	43.93	43.03	42.18	41.36	40.57	39.82	39.09	38.39	37.72	37.06
625	44.17	43.27	42.41	41.59	40.80	40.04	39.31	38.61	37.93	37.27
630	44.42	43.51	42.65	41.82	41.03	40.26	39.53	38.82	38.14	37.48
635	44.66	43.75	42.88	42.05	41.25	40.49	39.75	39.04	38.35	37.69
640	44.91	43.99	43.12	42.28	41.48	40.71	39.97	39.25	38.56	37.89
645	45.16	44.24	43.36	42.52	41.71	40.93	40.19	39.47	38.77	38.10
650	45.40	44.48	43.59	42.75	41.93	41.16	40.40	39.68	38.98	38.31
655	45.65	44.72	43.83	42.98	42.16	41.38	40.62	39.90	39.19	38.52
660	45.89	44.92	44.07	43.21	42.39	41.60	40.84	40.11	39.41	38.72
665	46.14	45.20	44.30	43.44	42.62	41.82	41.06	40.33	39.62	38.93
670	46.39	45.44	44.54	43.67	42.84	42.05	41.28	40.54	39.83	39.14
675	46.63	45.68	44.77	43.90	43.07	42.27	41.50	40.76	40.04	39.35
680	46.88	45.92	45.01	44.14	43.30	42.49	41.72	40.97	40.25	39.55
685	47.12	46.16	45.25	44.37	43.52	42.72	41.94	41.19	40.46	39.76
690	47.37	46.40	45.48	44.60	43.75	42.94	42.16	41.40	40.67	39.97
695	47.61	46.64	45.72	44.83	43.98	43.16	42.37	41.62	40.88	40.18
700	47.86	46.89	45.95	45.06	44.21	43.38	42.59	41.83	41.10	40.38
705	48.11	47.13	46.19	45.29	44.43	43.61	42.81	42.05	41.31	40.59
710	48.35	47.37	46.43	45.52	44.66	43.83	43.03	42.26	41.52	40.80
715	48.60	47.61	46.66	45.76	44.89	44.05	43.25	42.48	41.73	41.01
720	48.84	47.85	46.90	45.99	45.11	44.28	43.47	42.69	41.94	41.21
725	49.09	48.09	47.13	46.22	45.34	44.50	43.69	42.91	42.15	41.42

$\frac{\%O_2}{C_{mv}}$	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0
600	35.62	35.02	34.44	33.88	33.34	32.81	32.29	31.79	31.30	30.82
605	35.82	35.22	34.64	34.07	33.53	32.99	32.48	31.97	31.48	31.00
610	36.03	35.42	34.84	34.27	33.72	33.18	32.66	32.15	31.66	31.18
615	36.23	35.62	35.03	34.46	33.91	33.37	32.85	32.34	31.84	31.35
620	36.43	35.82	35.23	34.66	34.10	33.56	33.03	32.52	32.02	31.53
625	36.64	36.02	35.43	34.85	34.29	33.75	33.22	32.70	32.20	31.71
630	36.84	36.22	35.63	35.04	34.48	33.93	33.40	32.88	32.38	31.88
635	37.05	36.42	35.82	35.24	34.67	34.12	33.58	33.06	32.56	32.06
640	37.25	36.63	36.02	35.43	34.86	34.31	33.77	33.25	32.73	32.24
645	37.45	36.83	36.22	35.63	35.05	34.50	33.95	33.43	32.91	32.41
650	37.66	37.03	36.41	35.82	35.24	34.68	34.14	33.61	33.09	32.59
655	37.86	37.23	36.61	36.02	35.44	34.87	34.32	33.79	33.27	32.77
660	38.07	37.43	36.81	36.21	35.63	35.06	34.51	33.97	33.45	32.94
665	38.27	37.63	37.01	36.40	35.82	35.25	34.69	34.16	33.63	33.12
670	38.47	37.83	37.20	36.60	36.01	35.44	34.88	34.34	33.81	33.30
675	38.68	38.03	37.40	36.79	36.20	35.62	35.06	34.52	33.99	33.47
680	38.88	38.23	37.60	36.99	36.39	35.81	35.25	34.70	34.17	33.65
685	39.09	38.43	37.80	37.18	36.58	36.00	35.43	34.88	34.35	33.83
690	39.29	38.63	37.99	37.37	36.77	36.19	35.62	35.07	34.53	34.00
695	39.49	38.83	38.19	37.57	36.92	36.38	35.80	35.25	34.71	34.18
700	39.70	39.03	38.39	37.76	37.15	36.56	35.99	35.43	34.89	34.35
705	39.90	39.23	38.58	37.96	37.34	36.75	36.17	35.61	35.06	34.53
710	40.11	39.43	38.78	38.15	37.54	36.94	36.36	35.79	35.24	34.71
715	40.31	39.63	38.98	38.34	37.73	37.13	36.54	35.98	35.42	34.88
720	40.51	39.83	39.18	38.54	37.92	37.31	36.73	36.16	35.60	35.06
725	40.72	40.03	39.37	38.73	38.11	37.50	36.91	36.34	35.78	35.24

$\frac{\%O_2}{^\circ C_{mv}}$	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0
600	30.36	29.91	29.46	29.03	28.61	28.20	27.79	27.40	27.01	26.63
605	30.53	30.08	29.63	29.20	28.77	28.36	27.95	27.55	27.16	26.78
610	30.71	30.25	29.80	29.36	28.94	28.52	28.11	27.71	27.32	26.93
615	30.88	30.42	29.97	29.53	29.10	28.68	28.27	27.87	27.47	27.09
620	31.06	30.59	30.14	29.70	29.26	28.84	28.43	28.02	27.63	27.24
625	31.23	30.76	30.31	29.86	29.43	29.00	28.59	28.18	27.78	27.39
630	31.40	30.93	30.48	30.03	29.59	29.16	28.75	28.34	27.94	27.54
635	31.58	31.11	30.65	30.20	29.76	29.33	28.91	28.49	28.09	27.70
640	31.75	31.28	30.81	30.36	29.92	29.49	29.06	28.65	28.24	27.85
645	31.92	31.45	30.98	30.53	30.08	29.65	29.22	28.81	28.40	28.00
650	32.10	31.62	31.15	30.69	30.25	29.81	29.38	28.96	28.55	28.15
655	32.27	31.79	31.32	30.86	30.41	29.97	29.54	29.12	28.71	28.31
660	32.45	31.96	31.49	31.03	30.58	30.13	29.70	29.28	28.86	28.46
665	32.62	32.13	31.66	31.19	30.74	30.29	29.86	29.43	29.02	28.61
670	32.79	32.30	31.83	31.36	30.90	30.46	30.02	29.59	29.17	28.76
675	32.97	32.48	32.00	31.53	31.07	30.62	30.18	29.75	29.33	28.91
680	33.14	32.65	32.16	31.69	31.23	30.78	30.34	29.91	29.48	29.07
685	33.32	32.82	32.33	31.86	31.39	30.94	30.50	30.06	29.64	29.22
690	33.49	32.99	32.50	32.02	31.56	31.10	30.66	30.22	29.79	29.37
695	33.66	33.16	32.67	32.19	31.72	31.26	30.82	30.38	29.95	29.52
700	33.84	33.33	32.84	32.36	31.89	31.43	30.97	30.53	30.10	29.68
705	34.01	33.50	33.01	32.52	32.05	31.59	31.13	30.69	30.26	29.83
710	34.18	33.67	33.18	32.69	32.21	31.75	31.29	30.85	30.41	29.98
715	34.36	33.85	33.34	31.86	32.38	31.91	31.45	31.00	30.56	30.13
720	34.53	34.02	33.51	33.02	32.54	32.07	31.61	31.16	30.72	30.29
725	34.71	34.19	33.68	33.19	32.70	32.23	31.77	31.32	30.87	30.44

	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.8	5.9	6.0
600	26.26	25.89	25.53	25.18	24.84	24.50	24.16	23.84	23.51	23.20
605	26.41	26.04	25.68	25.32	24.98	24.64	24.30	23.97	23.65	23.33
610	26.56	26.19	25.82	25.47	25.12	24.78	24.44	24.11	23.78	23.46
615	26.71	26.33	25.97	25.61	25.26	24.92	24.58	24.25	23.92	23.60
620	26.86	26.48	26.12	25.76	25.40	25.06	24.72	24.38	24.05	23.73
625	27.01	26.63	26.26	25.90	25.55	25.20	24.86	24.52	24.19	23.86
630	27.16	26.78	26.41	26.05	25.69	25.34	24.99	24.66	24.32	24.00
635	27.31	26.93	26.56	26.19	25.83	25.48	25.13	24.79	24.46	24.13
640	27.46	27.08	26.70	26.33	25.97	25.62	25.27	24.93	24.59	24.26
645	27.61	27.22	26.85	26.48	26.12	25.76	25.41	25.06	24.73	24.39
650	27.76	27.37	26.99	26.62	26.26	25.90	25.55	25.20	24.86	24.53
655	27.91	27.52	27.14	26.77	26.40	26.04	25.69	25.34	25.00	24.66
660	28.06	27.67	27.29	26.91	26.54	26.18	25.82	25.47	25.13	24.79
663	28.21	27.82	27.43	27.05	26.68	26.32	25.96	25.61	25.27	24.93
670	28.36	27.97	27.58	27.20	26.83	26.46	26.10	25.75	25.40	25.06
675	28.51	28.11	27.72	27.34	26.97	26.60	26.22	25.88	25.53	25.19
680	28.66	28.26	27.87	27.49	27.11	26.74	26.38	26.02	25.67	25.32
685	28.81	28.41	28.02	27.63	27.25	26.88	26.52	26.16	25.80	25.46
690	28.96	28.56	28.16	27.78	27.40	27.02	26.65	26.29	25.94	25.59
695	29.11	28.71	28.31	27.92	27.54	27.16	26.79	26.43	26.07	25.72
700	29.26	28.86	28.43	28.06	27.68	27.30	26.93	26.57	26.21	25.86
705	29.41	29.00	28.60	28.21	27.82	27.44	27.07	26.70	26.34	25.99
710	29.56	29.15	28.75	28.35	27.96	27.58	27.21	26.84	26.48	26.12
715	29.71	29.30	28.89	28.50	28.11	27.72	27.35	26.98	26.61	26.25
720	29.86	29.45	29.04	28.64	28.25	27.86	27.48	27.11	26.75	26.39
725	30.01	29.60	29.19	28.79	28.39	28.00	27.62	27.25	26.88	26.52

$\frac{\%O_2}{^\circ C^{mv}}$	6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8	6.9	7.0
600	22.89	22.58	22.28	21.99	21.69	21.41	21.12	20.84	20.57	20.30
605	23.02	22.71	22.41	22.11	21.82	21.53	21.24	20.96	20.69	20.42
610	23.15	22.84	22.54	22.24	21.94	21.65	21.37	21.08	20.81	20.53
615	23.28	22.97	22.66	22.36	22.07	21.77	21.49	21.20	20.92	20.65
620	23.41	23.10	22.79	22.49	22.19	21.90	21.61	21.32	21.04	20.76
625	23.54	23.23	22.92	22.61	22.31	22.02	21.73	21.44	21.16	20.88
630	23.67	23.36	23.05	22.74	22.44	22.14	21.85	21.56	21.28	21.00
635	23.81	23.49	23.17	22.87	22.56	22.26	21.97	21.68	21.39	21.11
640	23.94	23.62	23.30	22.99	22.69	22.39	22.09	21.80	21.51	21.23
645	24.07	23.75	23.43	23.12	22.81	22.51	22.21	21.92	21.63	21.35
650	24.20	23.88	23.56	23.24	22.94	22.63	22.33	22.04	21.75	21.46
655	24.33	24.00	23.68	23.37	23.06	22.75	22.45	22.16	21.87	21.58
660	24.46	24.13	23.81	23.50	23.18	22.88	22.58	22.28	21.98	21.69
665	24.59	24.26	23.94	23.62	23.31	23.00	22.70	22.40	22.10	21.81
670	24.72	24.39	24.07	23.75	23.43	23.12	22.82	22.52	22.22	21.93
675	24.85	24.52	24.20	23.87	23.56	23.25	22.94	22.64	22.34	22.04
680	24.99	24.65	24.32	24.00	23.68	23.37	23.06	22.75	22.46	22.16
685	25.12	24.78	24.45	24.13	23.81	23.49	23.18	22.87	22.57	22.28
690	25.25	24.91	24.58	24.25	23.93	23.61	23.30	22.99	22.69	22.39
690	25.38	25.04	24.71	24.38	24.05	23.74	23.42	23.11	22.81	22.51
700	25.51	25.17	24.83	24.50	24.18	23.86	23.54	23.23	22.93	22.62
705	25.64	25.30	24.96	24.63	24.30	23.98	23.66	23.35	23.04	22.74
710	25.77	25.43	25.09	24.75	24.43	24.10	23.78	23.47	23.16	22.86
715	25.90	25.56	25.22	24.88	24.55	24.23	23.91	23.59	23.28	22.97
720	26.03	25.69	25.34	25.01	24.67	24.35	24.03	23.71	23.40	23.09
725	26.16	25.82	25.47	25.13	24.80	24.47	24.15	23.83	23.52	23.21

$\frac{\%O_2}{C_{mv}}$	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9	8.0
600	20.03	19.77	19.51	19.25	19.00	18.75	18.51	18.26	18.03	17.79
605	20.15	19.88	19.62	19.36	19.11	18.86	18.61	18.37	18.13	17.89
610	20.26	20.00	19.73	19.48	19.22	18.97	18.72	18.47	18.23	17.99
615	20.38	20.11	19.85	19.59	19.33	19.08	18.83	18.58	18.33	18.09
620	20.49	20.22	19.96	19.70	19.44	19.18	18.93	18.68	18.44	18.20
625	20.61	20.34	20.07	19.81	19.55	19.29	19.04	18.79	18.54	18.30
630	20.72	20.45	20.18	19.92	19.66	19.40	19.14	18.89	18.64	18.40
635	20.84	20.56	20.29	20.03	19.76	19.50	19.25	19.00	18.75	18.50
640	20.95	20.68	20.40	20.14	19.87	19.61	19.36	19.10	18.85	18.60
645	21.07	20.79	20.52	20.25	19.98	19.72	19.46	19.21	18.95	18.71
650	21.18	20.90	20.63	20.36	20.09	19.83	19.57	19.31	19.06	18.81
655	21.29	21.02	20.74	20.47	20.20	19.93	19.67	19.42	19.16	18.91
660	21.41	21.13	20.85	20.58	20.31	20.04	19.78	19.52	19.26	19.01
665	21.52	21.24	20.96	20.69	20.42	20.15	19.89	19.62	19.37	19.11
670	21.64	21.35	21.07	20.80	20.53	20.26	19.99	19.73	19.47	19.21
675	21.75	21.47	21.19	20.91	20.63	20.36	20.10	19.83	19.57	19.32
680	21.87	21.58	21.30	21.02	20.74	20.47	20.20	19.94	19.68	19.42
685	21.98	21.69	21.41	21.13	20.85	20.58	20.31	20.04	19.78	19.52
690	22.10	21.81	21.52	21.24	20.96	20.69	20.41	20.15	19.88	19.62
695	22.21	21.92	21.63	21.35	21.07	20.79	20.52	20.25	19.99	19.72
700	22.33	22.03	21.75	21.46	21.18	20.90	20.63	20.36	20.09	19.83
705	22.44	22.15	21.86	21.57	21.29	21.01	20.73	20.46	20.19	19.93
710	22.56	22.26	21.97	21.68	21.40	21.12	20.84	20.57	20.30	20.03
715	22.67	22.37	22.08	21.79	21.50	21.22	20.94	20.67	20.40	20.13
720	22.70	22.49	22.19	21.90	21.61	21.33	21.05	20.77	20.50	20.23
725	22.90	22.60	22.30	22.01	21.72	21.44	21.16	20.88	20.61	20.34

$\frac{\%O_2}{C_{mv}}$	8.1	8.2	8.3	8.4	8.5	8.6	8.7	8.8	8.9	9.0
600	17.55	17.32	17.10	16.87	16.65	16.43	16.21	16.00	15.78	15.57
605	17.66	17.42	17.19	16.97	16.74	16.52	16.30	16.09	15.87	15.66
610	17.76	17.52	17.29	17.06	16.84	16.62	16.40	16.18	15.96	15.75
615	17.86	17.62	17.39	17.16	16.93	16.71	16.49	16.27	16.05	15.84
620	17.96	17.72	17.49	17.26	17.03	16.80	16.58	16.36	16.15	15.93
625	18.06	17.82	17.59	17.35	17.12	17.90	16.68	16.45	16.24	16.02
630	18.16	17.92	17.68	17.45	17.22	16.99	16.77	16.55	16.33	16.11
635	18.26	18.02	17.78	17.55	17.32	17.09	16.86	16.64	16.42	16.20
640	18.36	18.12	17.88	17.64	17.41	17.18	16.95	16.73	16.51	16.29
645	18.46	18.22	17.98	17.74	17.51	17.28	17.05	16.82	16.60	16.38
650	18.56	18.32	18.08	17.84	17.60	17.37	17.14	16.91	16.69	16.47
655	18.66	18.42	18.17	17.93	17.70	17.46	17.23	17.00	16.78	16.55
660	18.76	18.51	18.27	18.03	17.79	17.56	17.32	17.10	16.87	16.64
665	18.86	18.61	18.37	18.13	17.89	17.65	17.42	17.19	16.90	16.73
670	18.96	18.71	18.47	18.22	17.98	17.75	17.51	17.28	17.05	16.82
675	19.06	18.81	18.56	18.32	18.08	17.84	17.60	17.37	17.14	16.91
680	19.16	18.91	18.66	18.42	18.17	17.93	17.70	17.46	17.23	17.00
685	19.26	19.01	18.76	18.51	18.27	18.03	17.79	17.55	17.32	17.09
690	19.36	19.11	18.86	18.61	18.36	18.12	17.88	17.64	17.41	17.18
695	19.46	19.21	18.96	18.71	18.46	18.22	17.97	17.74	17.50	17.27
700	19.57	19.31	19.05	18.80	18.55	18.31	18.07	17.83	17.59	17.36
705	19.67	19.41	19.15	18.90	18.65	18.40	18.16	17.92	17.68	17.45
710	19.77	19.51	19.25	19.00	18.75	18.50	18.25	18.01	17.77	17.54
715	19.87	19.61	19.35	19.09	18.84	18.59	18.35	18.10	17.86	17.62
720	19.97	19.70	19.45	19.19	18.94	18.69	18.44	18.19	17.95	17.71
725	20.07	19.80	19.54	19.29	19.03	18.78	18.53	18.29	18.04	17.80

$\frac{\%O_2}{^\circ C \text{ mv}}$	9.1	9.2	9.3	9.4	9.5	9.6	9.7	9.8	9.9	10
600	15.37	15.16	14.96	14.76	14.56	14.36	14.16	13.97	13.78	13.59
605	15.45	15.25	15.04	14.84	14.64	14.44	14.25	14.05	13.86	13.67
610	15.54	15.33	15.13	14.92	14.72	14.52	14.33	14.13	13.94	13.75
615	15.63	15.42	15.21	15.01	14.81	14.61	14.41	14.21	14.02	13.83
620	15.72	15.51	15.30	15.09	14.89	14.69	14.49	14.29	14.10	13.90
625	15.81	15.59	15.38	15.18	14.97	14.77	14.57	14.37	14.18	13.98
630	15.89	15.68	15.47	15.26	15.06	14.85	14.65	14.45	14.25	14.06
635	15.98	15.77	15.56	15.35	15.14	14.94	14.73	14.53	14.33	14.14
640	16.07	15.85	15.64	15.43	15.22	15.02	14.81	14.61	14.41	14.21
645	16.16	15.94	15.73	15.52	15.31	15.10	14.89	14.69	14.49	14.29
650	16.25	16.03	15.81	15.60	15.39	15.18	14.98	14.77	14.57	14.37
655	16.33	16.11	15.90	15.68	15.47	15.26	15.06	14.85	14.65	14.45
660	16.42	16.20	15.98	15.77	15.56	15.35	15.14	14.93	14.73	14.53
665	16.51	16.29	16.07	15.85	15.64	15.43	15.22	15.01	14.81	14.60
670	16.60	16.38	16.16	15.94	15.72	15.51	15.30	15.09	14.89	14.68
675	16.69	16.46	16.24	16.02	15.81	15.59	15.38	15.17	14.96	14.76
680	16.77	16.55	16.33	16.11	15.89	15.68	15.46	15.25	15.04	14.84
685	16.86	16.64	16.41	16.19	15.97	15.76	15.54	15.33	15.12	14.91
690	16.95	16.72	16.50	16.28	16.06	15.84	15.62	15.41	15.20	14.99
695	17.04	16.81	16.58	16.36	16.14	15.92	15.71	15.49	15.28	15.07
700	17.13	16.90	16.67	16.45	16.22	16.00	15.79	15.57	15.36	15.15
705	17.21	16.98	16.76	16.53	16.31	16.09	15.87	15.65	15.44	15.23
710	17.30	17.07	16.84	16.61	16.39	16.17	15.95	15.73	15.52	15.30
715	17.39	17.16	16.93	16.70	16.47	16.25	16.03	15.81	15.60	15.38
720	17.48	17.24	17.01	16.78	16.56	16.33	16.11	15.89	15.67	15.46
725	17.57	17.33	17.10	16.87	16.64	16.42	16.19	15.97	15.75	15.54

$\frac{\%O_2}{C_{mv}}$	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
730	115.12	100.14	91.38	85.17	80.34	76.40	73.07	70.19	67.64	65.37
735	115.69	100.64	91.84	85.59	80.74	76.79	73.44	70.54	67.98	65.69
740	116.27	101.14	92.29	86.01	81.14	77.17	73.80	70.89	68.32	66.02
745	116.84	101.64	92.75	86.44	81.55	77.55	74.17	71.24	68.66	66.34
750	117.41	102.14	93.20	86.86	81.95	77.93	74.53	71.59	68.99	66.67
755	117.99	102.64	93.66	87.29	82.35	78.31	74.89	71.94	69.33	67.00
760	118.56	103.14	94.11	87.71	82.75	78.69	75.26	72.29	69.67	67.32
765	119.14	103.64	94.57	88.14	83.15	79.07	75.62	72.64	70.00	67.65
770	119.71	104.14	95.03	88.56	83.55	79.45	75.99	72.99	70.34	67.97
775	120.28	104.63	95.48	88.99	83.94	79.83	76.35	73.34	70.68	68.30
780	120.86	105.13	95.94	89.41	84.35	80.21	76.72	73.69	71.02	68.63
785	121.43	105.63	96.39	89.83	84.75	80.59	77.08	74.04	71.35	68.95
790	122.00	106.13	96.85	90.26	85.15	80.97	77.44	74.39	71.69	69.28
795	122.58	106.63	97.30	90.68	85.55	81.36	77.81	74.74	72.02	69.60
800	123.15	107.13	97.76	91.11	85.95	81.74	78.17	75.09	72.36	69.93
805	123.73	107.63	98.21	91.53	86.35	82.12	78.54	75.44	72.70	70.25
810	124.30	108.13	98.67	91.96	86.75	82.50	78.90	75.79	73.04	70.53
815	124.87	108.63	99.12	92.38	87.15	82.88	79.27	76.14	73.38	70.91
820	125.45	109.13	99.58	92.81	87.55	83.26	79.63	76.49	73.71	71.23
825	126.06	109.63	100.04	93.23	87.95	83.64	79.99	76.84	74.05	71.56
830	126.59	110.12	100.49	93.66	88.35	84.02	80.36	77.19	74.39	71.88
835	127.17	110.62	100.95	94.08	88.75	84.40	80.72	77.54	74.72	72.21
845	127.74	111.12	101.40	94.55	89.15	84.78	81.09	77.89	75.06	72.53
845	128.32	111.62	101.86	94.93	89.55	85.16	81.45	78.23	75.40	72.86
850	128.89	112.12	102.31	95.35	89.95	85.54	81.82	78.58	75.74	73.19