

(BUTYL CELLOSOLVE, ISOPRENE, ETHYL CELLOSOLVE ACETATE, MESITYL OXIDE, DIACETONE ALCOHOL, 1-BUTANOL, FURFURAL, ISOPROPYL CELLOSOLVE, CROTONALDEHYDE, DICYCLOPENTADIENE, TETRAHYDROTHIOPHENE, 1-PROPANOL, METHYL CELLOSOLVE ACETATE WITH RESPECTIVE CONVERSION CHARTS)

- ★ READ THIS INSTRUCTION MANUAL AND THE INSTRUCTIONS OF THE ASPIRATING PUMP PRIOR TO USING THIS PRODUCT.
- ★ DO NOT DISCARD CAREFULLY THIS INSTRUCTION MANUAL UNTIL ALL THE TUBES IN THIS BOX ARE USED UP.

### 1. PERFORMANCE:

Ethyl cellosolve / Methyl cellosolve

Measuring Range	: 5 - 500 ppm
and Pump Stroke	: 3 pump strokes
Sampling Time	: 1.5 minutes / 100mL
Colour Change	: Yellow → Pale blue
Detectable Limit	: 2 ppm (3 pump strokes)
Operating Temperature	: 10 - 35 °C (50 - 95°F)
Aspirating Pump	: Model AP-20, AP-20S, 400B, AP-1, AP-1S or 400A

※ By using conversion charts undermentioned (REFER TO ITEM 4. CONVERSION CHART), following gases can be detected.

Gases to Measured	Measuring Range	Number of pump stroke	Operating Temperature	Detectable Limit
Butyl cellosolve	10 - 1000 ppm	3 (300mL)	10 - 35 °C (50 - 95°F)	4 ppm
Isoprene	1 - 16 ppm	3 (300mL)	0 - 40 °C (32-104°F)	0.5 ppm
Ethyl cellosolve acetate	5 - 150 ppm	3 (300mL)	10 - 35 °C (50 - 95°F)	2 ppm
Mesityl oxide	5 - 100 ppm	2 (200mL)	0 - 40 °C (32-104°F)	1 ppm
Diacetone alcohol	10 - 250 ppm	3 (300mL)	10 - 40 °C (50 - 104°F)	1 ppm
1-Butanol	5 - 100 ppm	3 (300mL)	0 - 40 °C (32-104°F)	—
Furfural	2 - 60 ppm	3 (300mL)	0 - 40 °C (32-104°F)	0.5 ppm
Isopropyl cellosolve	5 - 350 ppm	3 (300mL)	*15 - 25 °C (59 - 77°F)	—
Crotonaldehyde	2 - 40 ppm	3 (300mL)	*15 - 25 °C (59 - 77°F)	—
Dicyclopentadiene	2 - 60 ppm	3 (300mL)	*15 - 25 °C (59 - 77°F)	—
Tetrahydrothiophene	4 - 100 ppm	3 (300mL)	*15 - 25 °C (59 - 77°F)	—
1-Propanol	20 - 300 ppm	1 (100mL)	*15 - 25 °C (59 - 77°F)	—
Methyl cellosolve acetate	3 - 120 ppm	3 (300mL)	*15 - 25 °C (59 - 77°F)	—

\*No temperature correction is necessary.

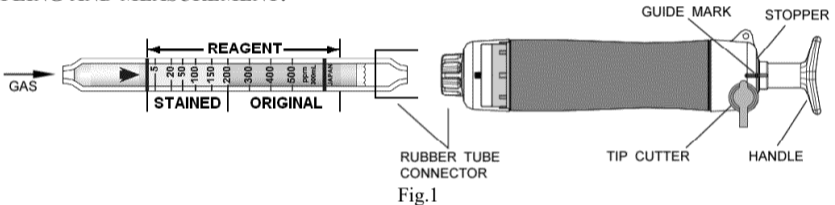
### ⚠ CAUTION

1. THE DETECTOR TUBE CONTAINS CHEMICAL REAGENTS.
2. DO NOT TOUCH THESE REAGENTS DIRECTLY ONCE TUBES WERE BROKEN.
3. KEEP THE TUBES OUT OF THE REACH OF CHILDREN.

#### NOTICE

1. USE ONLY WITH PUMP MODELS AP-20, AP-20S, 400B, AP-1, AP-1S OR 400A. OTHERWISE, CONSIDERABLE ERROR IN INDICATION MAY OCCUR.
2. BEFORE TESTING, CHECK THE ASPIRATING PUMP FOR LEAKS. (REFER TO ITEM 9. INSPECTION OF ASPIRATING PUMP.) ANY PUMPS SHOWING SIGNS OF LEAKAGE SHOULD BE CORRECTED BEFORE USE.
3. DO NOT USE THIS TUBE OUTSIDE THE STATED OPERATING TEMPERATURE RANGE.
4. STORE TUBES IN A COOL AND DARK PLACE (0-25 °C/32-77°F), AND USE BEFORE EXPIRATION DATE PRINTED ON THE TOP OF THE BOX.
5. PRIOR TO USE, READ ITEM 10. USER RESPONSIBILITY CAREFULLY.
6. READ THE CONCENTRATION IMMEDIATELY AFTER DRAWING THE SAMPLE.

### 2. SAMPLING AND MEASUREMENT:



- ① Break both ends of the detector tube.

**⚠ CAUTION SAFETY GLASSES AND GLOVES SHOULD BE WORN TO PREVENT INJURY FROM SPLINTERING GLASS.**

- ② Insert the detector tube into the aspirating pump securely as shown in Fig.1. (Arrow mark shall point to the pump.)
- ③ Align the guide marks on the shaft and stopper of the aspirating pump.
- ④ Pull the pump handle at a full stroke until it locks and wait for 1.5 minutes or until the completion of sampling is confirmed with the flow indicator of the pump. (See descriptions about the flow indicator in the instruction manual of the pump.)
- ⑤ Push back the handle without removing the detector tube from the rubber tube connector so that air in the pump will be discharged perfectly. Then repeat the step ③~④ twice more.
- ⑥ On completion of sampling, read the scale at the maximum point of the stained layer.

**SPECIAL NOTE:** I. The scale is calibrated at 20 °C (68°F), 50 %R.H. and 1013hPa. Readings obtained in other circumstances should be corrected. (REFER TO ITEM 3. CORRECTION FOR AMBIENT CONDITIONS.)  
 II. When the maximum point of the stained layer is unclear or oblique, read the scale at the centre between the longest and shortest points.

### 3. CORRECTION FOR AMBIENT CONDITIONS:

- ① Temperature: Correct the tube reading by following temperature correction table.

Tube Readings (ppm)	Temperature Correction Table					
	Corrected Concentration (ppm)					
	10 °C (50°F)	15 °C (59°F)	20 °C (68°F)	25 °C (77°F)	30 °C (86°F)	35 °C (95°F)
500	800	620	500	410	340	270
400	620	490	400	330	260	200
300	450	370	300	250	200	150
200	290	250	200	160	130	100
150	220	190	150	120	90	70
100	150	130	100	80	60	50
50	80	70	50	40	30	30
20	30	25	20	15	12	10
5	10	7	5	4	3	2

- ② Humidity: No correction is necessary.
- ③ Atmospheric Pressure:

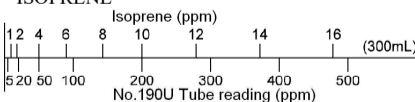
$$\text{True concentration} = \text{Tube reading} \times \frac{1013}{\text{Atmospheric pressure (in hPa)}}$$

### 4. CONVERSION CHART AND TEMPERATURE CORRECTION TABLE:

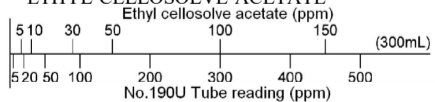
BUTYL CELLOSOLVE

Multiply the corrected value with Ethyl cellosolve temperature correction table by 2.

ISOPRENE



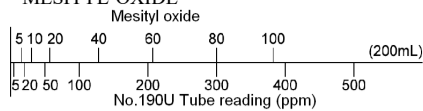
ETHYL CELLOSOLVE ACETATE



Conversion value (ppm)	Temperature Correction Table for Isoprene				
	Corrected Concentration (ppm)				
	0°C (32°F)	10°C (50°F)	20°C (68°F)	30°C (86°F)	40°C (104°F)
16	20.5	18.0	16.0	14.5	13.0
14	18.0	15.5	14.0	12.5	11.0
12	15.5	13.5	12.0	10.5	9.5
10	12.5	11.0	10.0	9.0	8.0
8	10.0	9.0	8.0	7.5	6.5
6	7.5	6.5	6.0	6.0	5.0
4	5.0	4.0	4.0	4.0	3.5
2	2.0	2.0	2.0	2.0	2.0
1	1.0	1.0	1.0	1.0	1.0

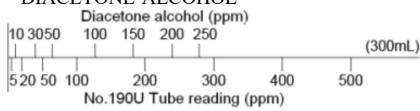
Conversion value (ppm)	Temperature Correction Table for Ethyl cellosolve acetate					
	Corrected Concentration (ppm)					
	10°C (50°F)	15°C (59°F)	20°C (68°F)	25°C (77°F)	30°C (86°F)	35°C (95°F)
150	230	190	150	120	90	75
100	160	130	100	80	70	60
50	80	60	50	40	35	30
30	43	35	30	25	22	19
10	10	10	10	10	8	7
5	5	5	5	5	5	5

### MESITYL OXIDE



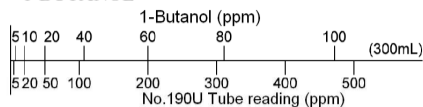
Conversion value (ppm)	Corrected Concentration (ppm)			
	0°C (32°F)	10°C (50°F)	20°C (68°F)	40°C (104°F)
100	—	—	—	100
80	—	95	—	80
60	100	70	—	60
40	60	45	—	40
20	30	25	—	20
10	15	12	—	10
5	7	6	—	5

### DIACETONE ALCOHOL



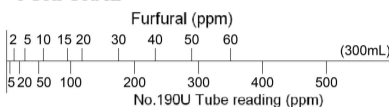
Conversion value (ppm)	Corrected Concentration (ppm)						
	10°C (50°F)	15°C (59°F)	20°C (68°F)	25°C (77°F)	30°C (86°F)	35°C (95°F)	40°C (104°F)
250	—	380	250	170	130	90	70
200	440	300	200	140	100	80	60
150	330	210	150	110	80	60	50
100	200	130	100	80	60	40	30
50	80	60	50	40	30	20	16
30	50	40	30	23	18	12	8
10	16	14	10	8	6	4	3

### 1-BUTANOL



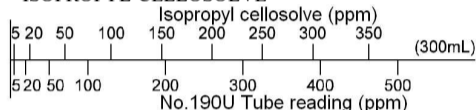
Conversion value (ppm)	Corrected Concentration (ppm)				
	0°C (32°F)	10°C (50°F)	20°C (68°F)	30°C (86°F)	40°C (104°F)
100	—	—	100	85	77
80	—	—	80	70	63
60	—	80	60	53	50
40	75	50	40	35	33
20	30	23	20	18	16
10	13	11	10	9	8
5	5	5	5	5	5

### FURFURAL

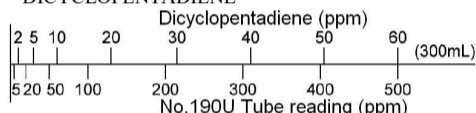


Conversion value (ppm)	Corrected Concentration (ppm)				
	0°C (32°F)	10°C (50°F)	20°C (68°F)	30°C (86°F)	40°C (104°F)
60	—	—	60	50	45
50	—	71	50	45	40
40	—	53	40	35	35
30	63	35	30	30	30
20	25	22	20	20	20
15	17	15	15	15	15
10	10	10	10	10	10
5	5	5	5	5	5
2	2	2	2	2	2

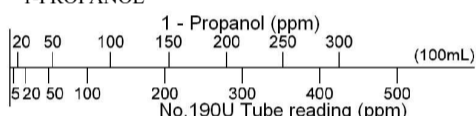
### ISOPROPYL CELLOSOLVE



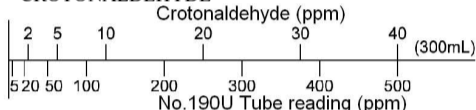
### DICYCLOPENTADIENE



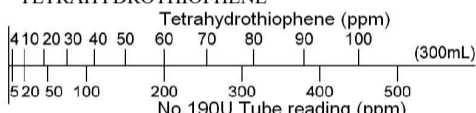
### 1-PROPANOL



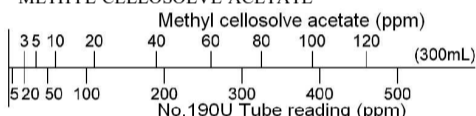
### CROTONALDEHYDE



### TETRAHYDROTHIOPHENE



### METHYL CELLOSOLVE ACETATE



## 5. INTERFERENCE:

Coexistence of Alcohols, Esters, Ethers, Ketones, aromatic hydrocarbons, Aliphatic hydrocarbon (more than C<sub>5</sub>) or Halogenated hydrocarbon produce a similar stain and give higher readings.

## 6. CHEMICAL REACTION IN THE DETECTOR TUBE:

Ethyl cellosolve	C <sub>2</sub> H <sub>5</sub> OCH <sub>2</sub> CH <sub>2</sub> OH	+ Cr <sup>6+</sup> + H <sub>2</sub> SO <sub>4</sub> → Cr <sup>3+</sup>
Methyl cellosolve	CH <sub>3</sub> OCH <sub>2</sub> CH <sub>2</sub> OH	+ Cr <sup>6+</sup> + H <sub>2</sub> SO <sub>4</sub> → Cr <sup>3+</sup>
Butyl cellosolve	C <sub>4</sub> H <sub>9</sub> OCH <sub>2</sub> CH <sub>2</sub> OH	+ Cr <sup>6+</sup> + H <sub>2</sub> SO <sub>4</sub> → Cr <sup>3+</sup>
Isoprene	CH <sub>2</sub> =C(CH <sub>3</sub> )CH=CH <sub>2</sub>	+ Cr <sup>6+</sup> + H <sub>2</sub> SO <sub>4</sub> → Cr <sup>3+</sup>
Ethyl cellosolve acetate	C <sub>2</sub> H <sub>5</sub> OC <sub>2</sub> H <sub>4</sub> OCOCH <sub>3</sub>	+ Cr <sup>6+</sup> + H <sub>2</sub> SO <sub>4</sub> → Cr <sup>3+</sup>
Mesityl oxide	CH <sub>3</sub> COCH=C(CH <sub>3</sub> ) <sub>2</sub>	+ Cr <sup>6+</sup> + H <sub>2</sub> SO <sub>4</sub> → Cr <sup>3+</sup>
Diacetone alcohol	(CH <sub>3</sub> ) <sub>2</sub> C(OH)CH <sub>2</sub> COCH <sub>3</sub>	+ Cr <sup>6+</sup> + H <sub>2</sub> SO <sub>4</sub> → Cr <sup>3+</sup>
1-Butanol	CH <sub>3</sub> (CH <sub>2</sub> ) <sub>3</sub> OH	+ Cr <sup>6+</sup> + H <sub>2</sub> SO <sub>4</sub> → Cr <sup>3+</sup>
Furfural	C <sub>5</sub> H <sub>4</sub> O	+ Cr <sup>6+</sup> + H <sub>2</sub> SO <sub>4</sub> → Cr <sup>3+</sup>
Isopropyl cellosolve	(CH <sub>3</sub> ) <sub>2</sub> CHO(CH <sub>2</sub> ) <sub>2</sub> OH	+ Cr <sup>6+</sup> + H <sub>2</sub> SO <sub>4</sub> → Cr <sup>3+</sup>
Crotonaldehyde	CH <sub>3</sub> CH=CHCHO	+ Cr <sup>6+</sup> + H <sub>2</sub> SO <sub>4</sub> → Cr <sup>3+</sup>
Dicyclopentadiene	C <sub>10</sub> H <sub>12</sub>	+ Cr <sup>6+</sup> + H <sub>2</sub> SO <sub>4</sub> → Cr <sup>3+</sup>
Tetrahydrothiophene	C <sub>4</sub> H <sub>8</sub> S	+ Cr <sup>6+</sup> + H <sub>2</sub> SO <sub>4</sub> → Cr <sup>3+</sup>
1-Propanol	CH <sub>3</sub> CH <sub>2</sub> CH <sub>2</sub> OH	+ Cr <sup>6+</sup> + H <sub>2</sub> SO <sub>4</sub> → Cr <sup>3+</sup>
Methyl cellosolve acetate	CH <sub>3</sub> CO <sub>2</sub> CH <sub>2</sub> CH <sub>2</sub> OCH <sub>3</sub>	+ Cr <sup>6+</sup> + H <sub>2</sub> SO <sub>4</sub> → Cr <sup>3+</sup>

## 7. DISPOSAL OF TUBES:

**USED TUBES SHOULD BE DISPOSED CAREFULLY ACCORDING TO RELEVANT REGULATIONS, IF ANY.**

## 8. HAZARDOUS AND DANGEROUS PROPERTIES OF:

Ethyl cellosolve	T.L.V.◆: 5 ppm	Explosion range in air: 1.8 - 14.0 %
Methyl cellosolve	T.L.V.◆: 0.1ppm	Explosion range in air: 2.3 - 24.5 %
Butyl cellosolve	T.L.V.◆: 20 ppm	Explosion range in air: 1.1 - 12.7 %
Isoprene	T.L.V.◆: —	Explosion range in air: 1.5 - 9.7 %
Ethyl cellosolve acetate	T.L.V.◆: 5 ppm	Explosion range in air: —
Mesityl oxide	T.L.V.◆: 15 ppm	Explosion range in air: —
Diacetone alcohol	T.L.V.◆: 50 ppm	Explosion range in air: 1.8 - 6.9 %
1-Butanol	T.L.V.◆: 20 ppm	Explosion range in air: 1.4 - 12.0 %
Furfural	T.L.V.◆: 0.2 ppm	Explosion range in air: 2.1 - 19.3 %
Isopropyl cellosolve	T.L.V.◆: 25 ppm	Explosion range in air: 1.5 - 13.0 %
Crotonaldehyde	STEL◆: C0.3 ppm	Explosion range in air: 2.1 - 15.5 %
Dicyclopentadiene	T.L.V.◆: 0.5 ppm	Explosion range in air: 0.8 - 6.3 %
Tetrahydrothiophene	T.L.V.◆: —	Explosion range in air: 1.1 - 12.3 %
1-Propanol	T.L.V.◆: 100 ppm	Explosion range in air: 2.1 - 13.5 %
Methyl cellosolve acetate	T.L.V.◆: 0.1 ppm	Explosion range in air: 1.5 - 12.3 %

◆ Threshold Limit Value established by the American Conference of Governmental Industrial Hygienists, 2019.

## 9. INSPECTION OF ASPIRATING PUMP:

Checking for leaks;

- Insert a sealed, unbroken detector tube into the pump.
- Align the guide marks on the shaft and stopper of the pump.
- Pull the handle to a full stroke and wait for 1 minute.
- Unlock the handle and allow it to return slowly into the pump by holding the cylinder and handle securely.

**CAUTION HANDLE WILL TEND TO SNAP BACK INTO THE PUMP QUICKLY.**

- If the handle returns completely to the original position, the performance is satisfactory. Otherwise, refer to maintenance procedures shown in the instruction manual of the pump to correct the leakage.

## 10. USER RESPONSIBILITY:

It is the sole responsibility of the user of this equipment to ensure that the equipment is operated, maintained, and repaired in strict accordance with these instructions and the instructions provided with each Model AP-20, AP-20S, 400B, AP-1, AP-1S or 400A aspirating pump, and that detector tubes are not used beyond their expiration date or have a colour change different to that stated in the Performance specifications.

The Manufacturer and Manufacturer's Distributors shall not be otherwise liable for any incorrect measurement or any damages, whether damages result from negligence or otherwise.

※ Product specifications are subject to change without any prior notice.