

KITADAWA
KOHYO RIKAGAKU KOGYO
INSTRUCTION MANUAL
ETHYL CELLOSOLVE/METHYL CELLOSOLVE
DETECTOR TUBE
No.190U

(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 CAREFULLY THIS INSTRUCTION MANUAL AND THE INSTRUCTIONS OF THE ASPIRATING PUMP PRIOR TO USING THIS PRODUCT.
- ★ DO NOT DISCARD 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.

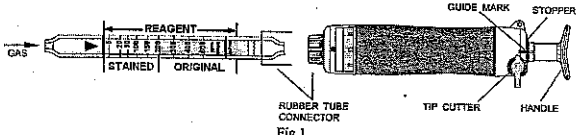
| Gases to Measured | Measuring Range | Number of pump stroke | Operating Temperature | Detectable Limit |
|---------------------------|-----------------|-----------------------|--------------------------|------------------|
| Butyl cellosolve | 10 - 1000 ppm | 3 (300mL) | 10 - 35 °C (50 - 95 °F) | 4 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**
- USE ONLY WITH PUMP MODELS AP-20, AP-20S, 400B, AP-1, AP-1S OR 400A. OTHERWISE, CONSIDERABLE ERROR IN INDICATION MAY OCCUR.
 - 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.
 - DO NOT USE THIS TUBE OUTSIDE THE STATED OPERATING TEMPERATURE RANGE.
 - 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.
 - PRIOR TO USE, READ CAREFULLY ITEM 10. USER RESPONSIBILITY.
 - READ THE CONCENTRATION IMMEDIATELY AFTER MEASUREMENT.

2. SAMPLING AND MEASUREMENT:



- Break both ends of the detector tube.
- CAUTION** SAFETY GLASSES AND GLOVES SHOULD BE WORN TO PREVENT INJURY FROM SPLINTERING GLASS.
- Insert the detector tube into the aspirating pump securely as shown in Fig.1. (Arrow mark shall point to the pump).
- Align the guide marks on the shaft and stopper of the aspirating pump.
- 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).
- 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 ③~⑤ twice more.
- 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 | | | | | | |
|---------------------|------------------------------|---------------|---------------|---------------|---------------|---------------|--|
| | 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 | 230 | 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:
 True concentration = Tube reading × $\frac{1013}{\text{Atmospheric pressure (in hPa)}}$

4. CONVERSION CHART AND TEMPERATURE CORRECTION TABLE:

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

ISOPRENE

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

ETHYL CELLOSOLVE ACETATE

| Conversion value (ppm) | Temperature Correction Table for Ethyl cellosolve acetate | | | | |
|------------------------|---|---------------|---------------|---------------|---------------|
| | 10 °C (50 °F) | 15 °C (59 °F) | 20 °C (68 °F) | 25 °C (77 °F) | 30 °C (86 °F) |
| 150 | 230 | 190 | 150 | 120 | 90 |
| 100 | 160 | 130 | 100 | 80 | 70 |
| 50 | 80 | 60 | 50 | 40 | 35 |
| 20 | 25 | 23 | 20 | 18 | 16 |
| 10 | 10 | 10 | 10 | 10 | 8 |
| 5 | 5 | 5 | 5 | 5 | 5 |

MESITYL OXIDE

| Conversion value (ppm) | Temperature Correction Table for Mesityl oxide | | | |
|------------------------|--|---------------|---------------|----------------|
| | 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) | Temperature Correction Table for Diacetone alcohol | | | | | | |
|------------------------|--|---------------|---------------|---------------|---------------|---------------|----------------|
| | 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 | 260 | 170 | 130 | 90 | 70 |
| 200 | 440 | 300 | 200 | 140 | 100 | 80 | 60 |
| 150 | 330 | 210 | 150 | 110 | 80 | 60 | 50 |
| 100 | 240 | 160 | 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) | Temperature Correction Table for Diacetone alcohol | | | |
|------------------------|--|---------------|---------------|----------------|
| | 0 °C (32 °F) | 10 °C (50 °F) | 20 °C (68 °F) | 40 °C (104 °F) |
| 100 | — | 100 | 85 | 77 |
| 80 | — | 80 | 70 | 63 |
| 60 | — | 60 | 53 | 50 |
| 40 | 75 | 60 | 40 | 35 |
| 20 | 30 | 23 | 20 | 18 |
| 10 | 13 | 11 | 10 | 9 |
| 5 | 5 | 5 | 5 | 5 |

FURFURAL

| Conversion value (ppm) | Temperature Correction Table for furfural | | | |
|------------------------|---|---------------|---------------|----------------|
| | 0 °C (32 °F) | 10 °C (50 °F) | 20 °C (68 °F) | 40 °C (104 °F) |
| 60 | — | — | 60 | 50 |
| 50 | — | 71 | 50 | 45 |
| 40 | — | 53 | 40 | 35 |
| 30 | 63 | 35 | 30 | 30 |
| 20 | 25 | 22 | 20 | 20 |
| 15 | 17 | 16 | 15 | 15 |
| 10 | 10 | 10 | 10 | 10 |
| 5 | 5 | 5 | 5 | 5 |
| 2 | 2 | 2 | 2 | 2 |

ISOPROPYL CELLOSOLVE

| Conversion value (ppm) | Temperature Correction Table for Diacetone alcohol | | | |
|------------------------|--|---------------|---------------|----------------|
| | 0 °C (32 °F) | 10 °C (50 °F) | 20 °C (68 °F) | 40 °C (104 °F) |
| 100 | — | — | 100 | 85 |
| 80 | — | 80 | 70 | 63 |
| 60 | — | 60 | 53 | 50 |
| 40 | 75 | 60 | 40 | 35 |
| 20 | 30 | 23 | 20 | 18 |
| 10 | 13 | 11 | 10 | 9 |
| 5 | 5 | 5 | 5 | 5 |

CROTONALDEHYDE

| Conversion value (ppm) | Temperature Correction Table for furfural | | | |
|------------------------|---|---------------|---------------|----------------|
| | 0 °C (32 °F) | 10 °C (50 °F) | 20 °C (68 °F) | 40 °C (104 °F) |
| 2 | 2 | 2 | 2 | 2 |

5. INTERFERENCE:
 Coexistence of Alcohols, Esters, Ethers, Ketones, aromatic hydrocarbons, Aliphatic hydrocarbon (more than C₆) or Halogenated hydrocarbon produce a similar stain and give higher readings.

6. CHEMICAL REACTION IN THE DETECTOR TUBE:

| | | | |
|---------------------------|----------------------------------|--|--|
| Ethyl cellosolve | <chem>CH3OCH2CH2OH</chem> | + C ₆ H ₆ + H ₂ O | → C ₆ H ₅ OCH ₂ CH ₂ OH |
| Methyl cellosolve | <chem>CH3OCH2CH3</chem> | + C ₆ H ₆ + H ₂ O | → C ₆ H ₅ OCH ₂ CH ₃ |
| Butyl cellosolve | <chem>CH3OCH2CH2CH2CH3</chem> | + C ₆ H ₆ + H ₂ O | → C ₆ H ₅ OCH ₂ CH ₂ CH ₂ CH ₃ |
| Isoprene | <chem>CH2=C(CH3)CH=CH2</chem> | + C ₆ H ₆ + H ₂ O | → C ₆ H ₅ CH ₂ C(CH ₃)=CH ₂ |
| Ethyl cellosolve acetate | <chem>CH3COOCH2CH2OH</chem> | + C ₆ H ₆ + H ₂ O | → C ₆ H ₅ COOCH ₂ CH ₂ OH |
| Mesityl oxide | <chem>CH3COCH=C(CH3)2</chem> | + C ₆ H ₆ + H ₂ O | → C ₆ H ₅ COCH=C(CH ₃)2 |
| Diacetone alcohol | <chem>(CH3)2C(OH)CH2COCH3</chem> | + C ₆ H ₆ + H ₂ O | → C ₆ H ₅ COCH ₂ CH ₂ OH |
| 1-Butanol | <chem>CH3CH2CH2CH2OH</chem> | + C ₆ H ₆ + H ₂ O | → C ₆ H ₅ CH ₂ CH ₂ CH ₂ CH ₂ OH |
| Furfural | <chem>C4H3O2</chem> | + C ₆ H ₆ + H ₂ O | → C ₆ H ₅ CHO |
| Isopropyl cellosolve | <chem>(CH3)2CHCO(CH2)2OH</chem> | + C ₆ H ₆ + H ₂ O | → C ₆ H ₅ CO(CH ₂)2OH |
| Crotonaldehyde | <chem>CH3CH=CHCHO</chem> | + C ₆ H ₆ + H ₂ O | → C ₆ H ₅ CH=CHCHO |
| Dicyclopentadiene | <chem>C10H16</chem> | + C ₆ H ₆ + H ₂ O | → C ₆ H ₅ H |
| Tetrahydrothiophene | <chem>C4H8S</chem> | + C ₆ H ₆ + H ₂ O | → C ₆ H ₅ H |
| 1-Propanol | <chem>CH3CH2CH2OH</chem> | + C ₆ H ₆ + H ₂ O | → C ₆ H ₅ CH ₂ CH ₂ OH |
| Methyl cellosolve acetate | <chem>CH3COCH2OCH3</chem> | + C ₆ H ₆ + H ₂ O | → C ₆ H ₅ COCH ₂ OCH ₃ |

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. ♦: 5 ppm | Explosion range in air: 2.3 - 24.5 % |
| Butyl cellosolve | T.L.V. ♦: 25 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. ♦: 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 | T.L.V. ♦: — | Explosion range in air: 0.8 - 6.3 % |
| Dicyclopentadiene | T.L.V. ♦: 5 ppm | Explosion range in air: 1.1 - 12.3 % |
| Tetrahydrothiophene | T.L.V. ♦: — | Explosion range in air: 2.1 - 13.5 % |
| 1-Propanol | T.L.V. ♦: 100 ppm | Explosion range in air: 1.5 - 12.3 % |
| 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, 2008.

- 9. INSPECTION OF ASPIRATING PUMP:**
 Checking for leaks:
 ① Insert a sealed, unbroken detector tube into the pump.
 ② Align the guide marks on the shaft and stopper of the pump.
 ③ Pull the handle to a full stroke and wait for 1 minute.
 ④ 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.
 ⑤ 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 which are either 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.