

### Set-up for Viscosity of Bitumen by Vacuum Capillary Viscometer

ASTM D2171 - IP 222 - EN 12596 - AASHTOT 202



**Reaches vacuum within 15 seconds**  
**High accuracy**  
**Extremely small footprint**  
**Low noise pump, long lifetime**  
**Four positions**  
**Easy calibration**  
**Digital vacuum controller**

#### General

The ASTM D2171 method covers procedures for the determination of viscosity of asphalt binder (bitumen) by vacuum capillary viscometers at 60°C. It is applicable to materials having viscosities in the range from 0.0036 to over 20,000 Pa-s.

#### Construction

The Tamson Vacuum System (TVS) is a digital vacuum controller designed to offer a precise preselected negative pressure, i.e. - 300 mm Hg for ASTM D2171. The TVS offers a range from 20 .. 320 mm Hg [30 .. 430 mBar]. An internal pump provides vacuum which can be set using the up/down key on the front panel. The set point is stored in memory and automatically set after power up. Internal pneumatics regulate the vacuum around this set point. In case of leakage or volume fluctuations, the electronic feedback system will maintain the pre-set vacuum. The pre-set vacuum is reached in a very fast way, less than 15 seconds are needed to reach the required vacuum.

A simple menu offers easy calibration for zero and span when a calibrated reference vacuum meter is available. Via this menu, readout in mm Hg, mBar or PSI can be selected.

| Item         | Unit                              | TV4000MKII                                                     |
|--------------|-----------------------------------|----------------------------------------------------------------|
| P/N          |                                   | 00T0772                                                        |
| 230V/50-60Hz |                                   |                                                                |
| P/N          |                                   | 00T0774                                                        |
| 115V/60Hz    |                                   |                                                                |
| Range        | [°C/°F]                           | Ambient..230°C /446°F                                          |
| Setting      | [°C]                              | 0.01                                                           |
| Stability ±  | [°C]                              | 0.01                                                           |
| Bath volume  | [L]                               | 40                                                             |
| Opening bath | [mm]                              | 260 x 240                                                      |
| Depth bath   | [mm]                              | 300                                                            |
| Item         | Unit                              | Tamson Vacuum System (TVS)                                     |
| Part number  | [V]                               | 00T0940 (85~250 wide input range)                              |
| Range        | [mm Hg]<br>[mBar]                 | 20 to 320 (negative pressure)<br>30 to 430 (negative pressure) |
| Readout      |                                   | mm Hg, mBar, PSI<br>selectable via setup                       |
| Accuracy ±   | [mBar]                            | 0.5                                                            |
| Linearity    | [%F.S.]                           | < 0.5                                                          |
| L x W x H    | [mm]                              | 280 x 178 x 205                                                |
| Weight       | [kg]                              | 4                                                              |
| Item         | Unit                              | Tamson Vacuum Manifold                                         |
| Part number  |                                   | 00T0941                                                        |
| L x W x H    | [mm]                              | 320 x 195 x 170                                                |
| Weight       | [kg]                              | 3                                                              |
| CE           | Product conforms to CE regulation |                                                                |

In asphalt laboratories the TVS may be used in conjunction with Cannon-Manning, Asphalt Institute, and Modified Koppers Vacuum Viscometers for the viscosity determination of highly viscous materials such as asphalt cement at 60°C (140°F) according to ASTM D2171. The TVS also is useful in other laboratory systems where accurate measurement and control of vacuum is required.

#### Advantages

One of the main advantages of the TVS is the extremely small footprint compared to the few other vacuum systems available in the market, saving important workbench space. The system further offers high precision and a feedback regulation on the vacuum. This control keeps the vacuum within 0.5 mm Hg of its set point. The TVS is capable to reach the pre-set vacuum within a very short period of time. Within 15 seconds after switching on the internal pump of the TVS, the vacuum applied by the TVS is stable and at the pre-set vacuum. The TVS uses quick connectors which allow for a quick and easy mounting and dismounting of the tubes.

### Set-up for Viscosity of Bitumen by Vacuum Capillary Viscometer

ASTM D2171 - IP 222 - EN 12596 - AASHTOT 202

#### TVS

The digital vacuum controller is very quiet and the inside vacuum pump can be switched-off by a single button on the front of the instrument. With this practical button, the low noise of the vacuum pump is eliminated between tests and will increase the lifetime of the vacuum pump. When using small tubing, vacuum almost instantaneous builds up; no need to wait until vacuum is available. Fluid traps prevent fluid to be sucked into the system accidentally.

The "Tamson Vacuum System" is small, reliable, silent and offers versatile applications to general vacuum system for viscosity determination of the mentioned specific "ASTM D2171 bitumen" method.

In addition to our TVS, you can use the Tamson TV4000MKII viscometer bath, which has defined the worldwide standard in the petrochemical market for manual kinematic viscosity determinations. In conjunction with this bath, Tamson has developed a Tamson Vacuum Manifold (TVM).

This TVM can be easily mounted on our TV4000MKII by using the standard holes in the top plate. The manifold offers four positions and is delivered with  $\varnothing$  4 mm blue PU-tubing between TVM and TVS.

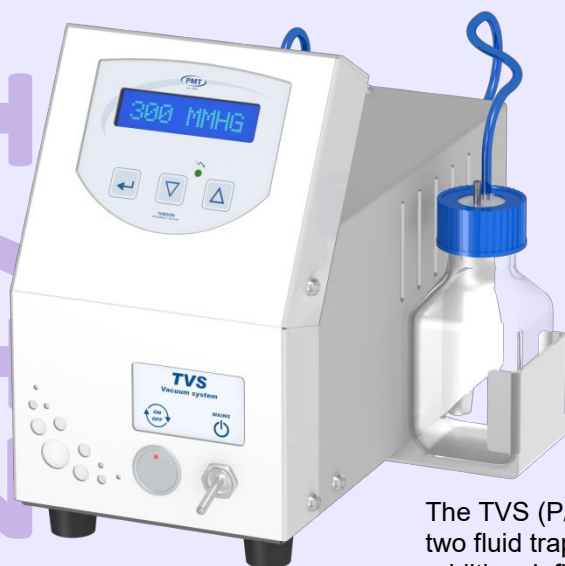
Additional silicone tubing (P/N 24T0046) between the TVM and vacuum viscometers can be found in the table with accessories.

#### Apparatus

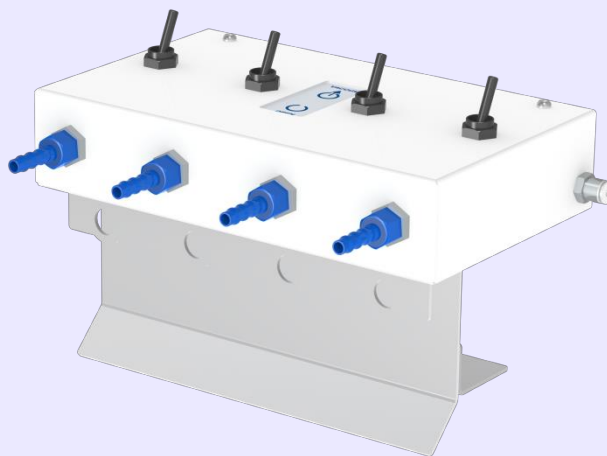
For Viscosity determinations such as ASTM D2171 or equivalent test methods, the use of following three instruments is advised:

- TV4000MKII viscometer bath
- TVS
- TVM

Tamson also supplies all other necessary test accessories such as vacuum viscometers, vacuum viscometer holders, reference standards, etc. These items can be found on the following pages.



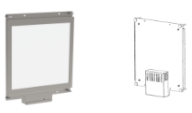
The TVS (P/N 00T0940) has standard two fluid traps on the backside and an additional fluid trap mounted on the sidepanel as shown in the picture.

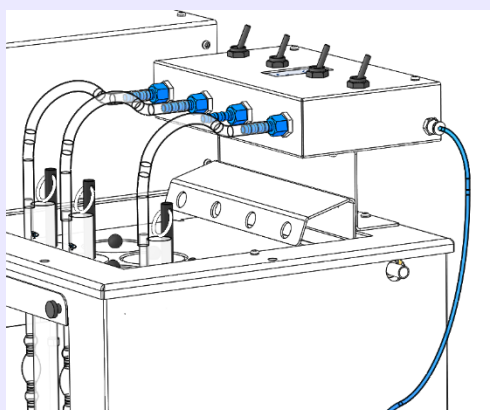


The Tamson Vacuum Manifold (P/N 00T0941) offers four positions. The TVM fits on all existing TV4000 viscosity baths younger than 10 years. No modification is needed for mounting the TVM on a TV4000.

### Set-up for Viscosity of Bitumen by Vacuum Capillary Viscometer

Necessary set-up

| Set-up for ASTM D2171 |                                                                                     |                    |                                                                                                                                                                                                                                                                             |
|-----------------------|-------------------------------------------------------------------------------------|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Part number           | Picture                                                                             | Suggested quantity | Description                                                                                                                                                                                                                                                                 |
| 00T0940               |    | 1                  | Tamson Vacuum System (TVS)                                                                                                                                                                                                                                                  |
| 00T0941               |    | 1                  | Tamson Vacuum Manifold (TVM) for TV4000mkII (includes 2 m of tubing between TVM and TVS)                                                                                                                                                                                    |
| 00T0772               |    | 1                  | TV4000mkII (230V/50-60Hz) (Please see specification sheet "tvseries")                                                                                                                                                                                                       |
| 00T0774               |                                                                                     |                    | TV4000mkII (115V/60Hz) (Please see specification sheet "tvseries")                                                                                                                                                                                                          |
| 00T0908               |   | 1                  | Illuminator "Z41" backpanel (85 ~ 230V/50-60Hz)                                                                                                                                                                                                                             |
| 24T0039               |  | 3                  | Silicon tubing 7 (inner diameter) x 15 mm (optional accessory to connect viscometer tube and manifold)                                                                                                                                                                      |
| 10T6090               |  | 1                  | Timer, 8 positions                                                                                                                                                                                                                                                          |
| 10T6094               |  | 1                  | Tamson TT3B thermometer with external probe, three decimal reading, precision $\pm 0.01^{\circ}\text{C}$ , short PT-100 probe with range $-40 \dots +140^{\circ}\text{C}$ including a works calibration certificate.<br>(Please see specification sheet "TT3B thermometer") |
| 14T0303               |  | 1                  | Adapter to insert a TT3B thermometer in the opening of the cover                                                                                                                                                                                                            |



Set-up for practical use of the manifold on a TV4000

### Set-up for Viscosity of Bitumen by Vacuum Capillary Viscometer

#### Optional accessories

| Optional accessories          |                                                                                     |                    |                                                                         |
|-------------------------------|-------------------------------------------------------------------------------------|--------------------|-------------------------------------------------------------------------|
| Part number                   | Picture                                                                             | Suggested quantity | Discription                                                             |
| 25T0940B                      |    | 1                  | ASTM thermometer similar to 47C                                         |
| 00T0239                       |    | 1                  | Thermometer holder                                                      |
| 24T0049                       |    | 1                  | Blue tubing 4 x 2.5 mm (2 m standard included. To connect TMV and TVS). |
| 08T0001                       |   | 2                  | Silicon oil 200-10 mm <sup>2</sup> /s 20 ltrs transparent (20..150°C)   |
| Viscosity reference standards |  | -                  | Please see our "Viscosity accessories" specification sheet.             |



D2171

### Set-up for Viscosity of Bitumen by Vacuum Capillary Viscometer

Vacuum viscometers and holders

| Cannon Manning Vacuum Viscometers (CMVV) |                                                                                   |                |                               |
|------------------------------------------|-----------------------------------------------------------------------------------|----------------|-------------------------------|
| Part number                              | Picture                                                                           | Size           | Range                         |
| 25T1045                                  |  | Size number 4  | Range from 0.0036 - 0.08 Pa·s |
| 25T1046                                  |                                                                                   | Size number 5  | Range from 0.012 - 0.24 Pa·s  |
| 25T1047                                  |                                                                                   | Size number 6  | Range from 0.036 - 0.8 Pa·s   |
| 25T1048                                  |                                                                                   | Size number 7  | Range from 0.12 - 2.4 Pa·s    |
| 25T1049                                  |                                                                                   | Size number 8  | Range from 0.36 - 8 Pa·s      |
| 25T1050                                  |                                                                                   | Size number 9  | Range from 1.2 - 24 Pa·s      |
| 25T1051                                  |                                                                                   | Size number 10 | Range from 3.6 - 80 Pa·s      |
| 25T1052                                  |                                                                                   | Size number 11 | Range from 12 - 240 Pa·s      |
| 25T1053                                  |                                                                                   | Size number 12 | Range from 36 - 800 Pa·s      |
| 25T1054                                  |                                                                                   | Size number 13 | Range from 120 - 2400 Pa·s    |
| 25T1055                                  |                                                                                   | Size number 14 | Range from 360 - 8000 Pa·s    |

| Asphalt Institute Vacuum Viscometers (AIVV) |                                                                                    |                  |                               |
|---------------------------------------------|------------------------------------------------------------------------------------|------------------|-------------------------------|
| Part number                                 | Picture                                                                            | Size             | Range                         |
| 25T3001                                     |  | Size number 25   | Range from 4.2 - 80 Pa·s      |
| 25T3002                                     |                                                                                    | Size number 50   | Range from 18 - 320 Pa·s      |
| 25T3003                                     |                                                                                    | Size number 100  | Range from 60 - 1280 Pa·s     |
| 25T3004                                     |                                                                                    | Size number 200  | Range from 240 - 5200 Pa·s    |
| 25T3005                                     |                                                                                    | Size number 400R | Range from 960 - 140000 Pa·s  |
| 25T3006                                     |                                                                                    | Size number 800R | Range from 3800 - 580000 Pa·s |

| Modified Koppers Vacuum Viscometers (MKVV) |                                                                                     |                 |                             |
|--------------------------------------------|-------------------------------------------------------------------------------------|-----------------|-----------------------------|
| Part number                                | Picture                                                                             | Size            | Range                       |
| 25T3010                                    |  | Size number 25  | Range from 4.2 - 80 Pa·s    |
| 25T3011                                    |                                                                                     | Size number 50  | Range from 18 - 320 Pa·s    |
| 25T3012                                    |                                                                                     | Size number 100 | Range from 60 - 1280 Pa·s   |
| 25T3013                                    |                                                                                     | Size number 200 | Range from 240 - 5200 Pa·s  |
| 25T3014                                    |                                                                                     | Size number 400 | Range from 960 - 20000 Pa·s |

| Viscometer holders conform ASTM D2171 |                                                                                     |                                                                                                                                      |
|---------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| Part number                           | Picture                                                                             | Discription                                                                                                                          |
| 10T6052                               |  | Viscometer holder "CMVV/AIVV"<br>Holder is adjustable in length as the nominal length of the viscometer can be between 23 and 26 cm. |
| 10T6053                               |  | Viscometer holder "MKVV"                                                                                                             |