

TSRST-Multi

MULTI STATION THERMAL ASPHALT SYSTEM

Standards:

AASHTO TP10-1993 - Standard test method for Thermal Stress Restrained Specimen Tensile strength.

EN12697-46:2012 - Test methods for hot mix asphalt Part 46: Low temperature cracking and properties by uniaxial tension tests.

The Thermal Stress Restrained Specimen Test (TSRST) is used to determine the low temperature cracking susceptibility of asphalt concrete. In the early 1990s the TSRST was developed by OEM with Oregon State University (OSU) as part of the Strategic Highway Research Program. The test method became AASHTO TP10.

The TSRST test has also been included as one of the tests within EN 12697-46. The European Standard specifies uniaxial tension tests for characterising the resistance of an asphalt mixture against low temperature cracking. The results of the uniaxial tension tests can be used to evaluate the following:

- ▼ Tensile strength at a specified temperature, using the uniaxial tension stress test (UTST);
- ▼ Minimum temperature that the asphalt can resist before failure, using the thermal stress restrained specimen test (TSRST);
- ▼ Tensile strength reserve at a specified temperature (using a combination of TSRST and UTST);
- ▼ Relaxation time, using the relaxation test (RT);
- ▼ Creep curve to back calculate rheological parameters, using the tensile creep tests (TCT);
- ▼ Fatigue resistance at low temperatures due to the combination of cryogenic and mechanical loads, using the uniaxial cyclic tension stress tests (UCTST).



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MULTI STATION THERMAL ASPHALT SYSTEM

**MAIN FEATURES:**

- ▼ Up to three working stations (electromechanical and/or servo-hydraulic stations);
- ▼ Servo-hydraulic actuator: 30 kN static, 25 kN dynamic, double acting, fatigue rated and equal area type with long life Labyrinth bearings;
- ▼ Hydraulic Power Supply: Variable Frequency Drive (VFD) 2.2 kW pump motor; speed based on demand.
- ▼ Ability to clone, modify and/or generate user's own method file(s) to suit their specific requirements.
- ▼ Programmable test "Wizard" to guide the operator step by step based on a "recipe book" approach.

TO PERFORM:

- Uniaxial tension stress test (UTST)
- Thermal stress restrained specimen test (TSRST)
- Relaxation time, using the relaxation test (RT)
- Tensile creep tests (TCT)
- Uniaxial cyclic tension stress tests (UCTST)**

EXTERNAL DIMENSIONS:

MAIN UNIT (INCLUDING ENVIRONMENTAL CHAMBER):
1860(H) X 1020(D) X 1260(W) MM

HYDRAULIC POWER SUPPLY (FOR SERVO-HYDRAULIC STATION(S)): 700(H) X 550(D) X 570(W) MM

WEIGHT: 600 KG APPROX.

ELECTRICAL REQUIREMENT:

SERVO-HYDRAULIC STATION (EACH): 230 V 50-60 HZ 1 PH 2.5 KW

ELECTRO-MECHANICAL STATION (EACH): 100-240 V 50-60 HZ 0.5 KW

REFIGERATION UNIT: 230 V 50 HZ 1 PH 1.5 KW

TECHNICAL SPECIFICATIONS:

- ▼ Loading Frame(s)
 - Rigid two column frame.
 - Width of work space: 240 mm.
 - Height of work space (between the two platens): 285 mm.
- ▼ Electro-mechanical actuator(s)
 - 25kN static.
 - +/- 50 mm stroke (100 mm).
 - Internal displacement transducer.
- ▼ Servo-hydraulic actuator
 - 30kN static, 25kN dynamic, double acting, fatigue rated, servo hydraulic actuator, equal area type with long life Labyrinth bearings.
 - +/- 50 mm stroke (100 mm).
 - Internal displacement transducer.
 - Close coupling of servo valve to actuator for best servo performance.
 - 10 µm pressure line filter at actuator for ultimate contamination control.
 - 0.5 lt hydraulic accumulator with 40 Bar pre-charge for best pressure line regulation at servo-valve.
 - High response, VCD direct drive, servo-valve: -3 db @ 350 Hz, +/- 5% amplitude (performance curves available on request).
- ▼ Load Cell(s)
 - Low profile Precision Transducers load cell, +/-30kN, 0.1%. Normalized output with in-line signal conditioning.
 - Hydraulic Power Supply
 - Working pressure of up to 160 Bar.
 - High/Low pressure selectable from control pendant.
 - Low pressure adjustable from 10 to 160 Bar.
 - Variable flow rate up to 7.5 liter/min.
 - Variable Frequency Drive (VFD) 2.2 kW pump motor; speed based on demand.
 - 3 µm return line filtration.
 - Low oil, over temperature and dirty filter indication.
 - Remote starting.
 - Pressure gauge.
 - Air cooling (Electric fan).
 - Oil pressure and temperature displayed on virtual pendant.

** Only applicable to servo-hydraulic work station(s)

CONTROL AND DATA ACQUISITION SYSTEM (CDAS)

CONTROL:

- High speed, (18 bit) digital servo-control, 4/6 axis.
- Digital closed loop update sampling rate of 2.5 kHz.
- Computer programmable, Proportional, Integral and Derivative (PID) control algorithm.
- Adaptive Level Control (ALC) algorithm for best dynamic peak accuracy.
- 3 feedback control modes. E.g. force, position and on-specimen strain.
- “Bumpless transfer” between control modes.

ACQUISITION:

- Analog inputs are automatically calibrated on power up.
- Simultaneous sampling of all channels.
- 16/24 Analog (± 10 Volt) input channels.
- Up to 64 times over sampling (set to 8 by default).
- 20 bit digital resolution (no auto ranging required).
- Sampling rate up to 192,000/sec.



COMMUNICATION:

- USB or Ethernet



ENVIRONMENTAL CHAMBER

REFRIGERATION RANGE: -40°C TO +40°C, CAPABLE OF COOLING AT A RATE OF 10°C PER HOUR.
LIQUID NITROGEN SYSTEM IS AVAILABLE UPON REQUEST TO REACH -50°C.



ORDERING INFORMATION:

The basic MULTI TSRST includes the main frame, the CDAS, the climatic chamber, the refrigeration unit and at least one between the electro-mechanical or servo-hydraulic station. All available configurations are summarized in the following table:

	ELECTROMECHANICAL STATION	SERVO-HYDRAULIC STATION
B282-10	1	-
B282-11	2	-
B282-12	3	-
B282-13	-	1
B282-14	1	1
B282-15	2	1