

Soete Laboratory has a dedicated self-designed test-rig for fatigue tests in three- or four-point bending of beams and girders (typical example: rails for tracks or train applications, leaf springs, ...) with a typical width up to 150 mm. The outer supports can be positioned at distances between 950 and 1500 mm, while the inner supports are typically at a distance of 200 mm. On the middle supports a varying load up to 300 kN per support (600 kN total) can be applied with a hydraulic cylinder.

The hydraulic pressure to drive the cylinder is provided by a modernized Amsler pulsator (type PA131). In the pulsator, a mechanism which allows to mechanically vary the stroke, drives a hydraulic piston. By varying the displacement of the pulsator, the amplitude of the load generated by the test-rig can be varied. This mechanism however is not self-priming. A small hydraulic pump is used to fill the system with oil and provides the required minimum pressure (typical $R=0.1$). The test sample is typically equipped with a strain gauge in order to measure the strain and thus stresses in the region between two middle supports.

This pulsator system is very energy efficient, as the energy contained in the loaded specimen and frame is returned to the piston of the pulsator and from there to a flywheel connected to the driveshaft of the pulsator. So a 5.5 kW motor is sufficient to drive the system as it only has to compensate for the losses in the system. The pulsator has been equipped with new controls and an inverter drive. Frequency of the motor can be set between 25 and 100 Hz (2-8Hz load frequency). During operation a number of detectors are used to guard against malfunction (minimum pressure, maximum pressure and failure detection of the specimen). The test is executed fully continuously and 2 000 000 cycles per week are as such easily attainable to allow for a fast response time.

Smaller or larger capacities (range between 20kN up to 1850kN total load) are available by means of the use of our multipurpose test rigs. Here, a programmable servo-hydraulic controller allows for a displacement-controlled or load-controlled test execution.



TEST RIG CHARACTERISTICS

Property	MTS 50	ESH 100	ESH 150	Pulsator	MTS 1000	MTS 2500
Dynamic capacity	+/- 20 kN	+/- 75 kN	+/- 110 kN	+ 600 kN	+/- 750 kN	+/- 1850 kN
Max. dynamic loading rate	100 mm/s	50 mm/s	25 mm/s	50 mm/s	20 mm/s	4 mm/s
Max. stroke	250 mm	100 mm	100 mm	4 mm	150 mm	150 mm
Min. test frequency	0.01 Hz	0.01 Hz	0.01 Hz	2 Hz	0.01 Hz	0.01 Hz
Typical test frequency	12 Hz	8 Hz	4 Hz	6 Hz	3 Hz	0.5 Hz
Max. test frequency	15 Hz	10 Hz	5 Hz	8 Hz	5 Hz	1 Hz
Stress ratio	-1 up to +1			+0.1 up to +1	-1 up to +1	
Typical middle support distance	0 mm			200 mm	200 mm	
Typical outer support distance	500 mm			1000 mm	1000 mm	

Test rig is designed in such a way that it can be customized upon request