

# ADVANCED PEDESTRIAN LEGFORM IMPACTOR (aPLI)

233-5000-S18

The advanced Pedestrian Legform Impactor (aPLI) is the latest pedestrian crash testing tool representing a 50th percentile male leg which simulates the flexible nature of the human leg bones and is used for the assessment of knee, upper and lower leg injuries.

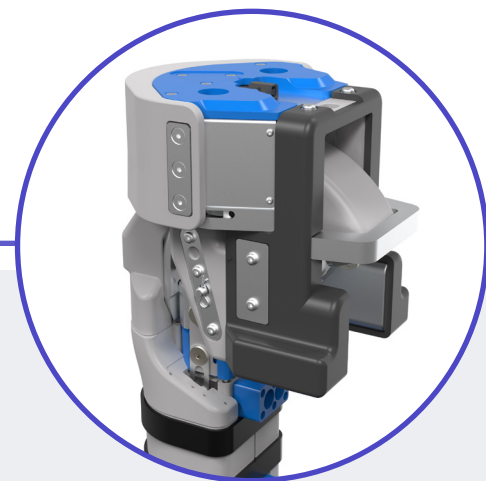
## Background

In response to increasing pedestrian and road vehicle collisions resulting in escalating injuries and fatalities, today's Global NCAP programs assess all new vehicles for pedestrian protection using an instrumented Flex PLI legform.

The aPLI improves on the Flex-PLI's groundbreaking technology by adding a Simplified Upper Body Part (SUBP) which adds ballast to the leg to simulate the human upper-body mass for enhanced kinematics. The SUBP also allows for femur injury to be assessed and provides for the placement of a Data Acquisition System (DAS). To make the aPLI's biofidelity and sensitivity more human-like, the leading experts in the field led by JSAE and the ISO/TC22/SC36/WG5&WG6 working group also redesigned the knee, rerouted ligament cables, and incorporated a polyurethane flesh to further help with mass distribution and biofidelic response.

A new aPLI Build Level was introduced in April of 2020 and adds a bumper to create initial negative femur bending. The aPLI's new simplified design features are paramount to enhance repeatability & durability and to establish the leg for oblique impacts against a wider test area.

The aPLI has a standard instrumentation count of 18 channels of strain, angular rate, displacement, and acceleration measurement capability with the potential to incorporate additional channels. Humanetics also offers a fully validated FE model conforming to the new build level.



## Application

Vehicular pedestrian lower leg and knee testing.

## Key Features

- Standard leg instrumentation has 18 channels with options for additional instrumentation
- Upper mass (SUBP) representing the torso to enhance kinematics and assess femur injury
- Significantly redesigned more humanlike knee and leg profile
- Applicability for oblique impacts against wider test area
- Improved bone/flesh mass distribution

## Consumer Rating Programs

aPLI protocol beginning dates.

- C-NCAP January of 2022
- Euro NCAP January 2023
- KNCAP January 2023
- JNCAP January 2024

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## Weight & Physical Specifications

SEGMENT WEIGHT	LOWER LIMIT(kg)	UPPER LIMIT(kg)
SUBP ASSEMBLY	11.5	12.1
FEMUR ASSEMBLY	4.1	4.5
KNEE ASSEMBLY	2.7	2.9
TIBIA ASSEMBLY	2.25	2.45
WEIGHTED FLESH	3.1	3.3
SKIN COVER	0.33	0.43
TOTAL WEIGHT	24.4	25.0
aPLI HEIGHT	LOWER LIMIT(mm)	UPPER LIMIT(mm)
COMPLETE LEG ASSY	1094	1112

## Certification Tests

NO.	SEGMENT	TEST
1	FEMUR GAGE ASSEMBLY	3 POINT BENDING
2	TIBIA GAGE ASSEMBLY	3 POINT BENDING
3	FEMUR ASSEMBLY	3 POINT BENDING
4	KNEE ASSEMBLY	3 POINT BENDING
5	TIBIA ASSEMBLY	3 POINT BENDING
6	SUBP BUMPER CERTIFICATION	MOMENT ANGLE, BUMPER COMPRESSION
7	LEG ASSEMBLY	INVERSE TEST TYPE 1 KNEE IMPACT
8	LEG ASSEMBLY	INVERSE TEST TYPE 2 - FEMUR IMPACT

## Standard Instrumentation (18 Channels)

LOCATION	INSTRUMENT	MEASUREMENT
SUBP	ACCELEROMETER	XYZ
	ANGULAR RATE SENSOR	XYZ
FEMUR	STRAIN FEMUR UPPER MOMENT	Y
	STRAIN FEMUR MIDDLE MOMENT	Y
	STRAIN FEMUR LOWER MOMENT	Y
KNEE	ACCELEROMETER	Y
	ANGULAR RATE SENSOR	ANGULAR VELOCITY
	STRING POTENTIOMETER	MCL, PCL, ACL ELOGATION
TIBIA	STRAIN TIBIA UPPER MOMENT	Y
	STRAIN TIBIA MIDDLE UPPER MOMENT	Y
	STRAIN TIBIA MIDDLE LOWER MOMENT	Y
	STRAIN TIBIA LOWER MOMENT	Y

