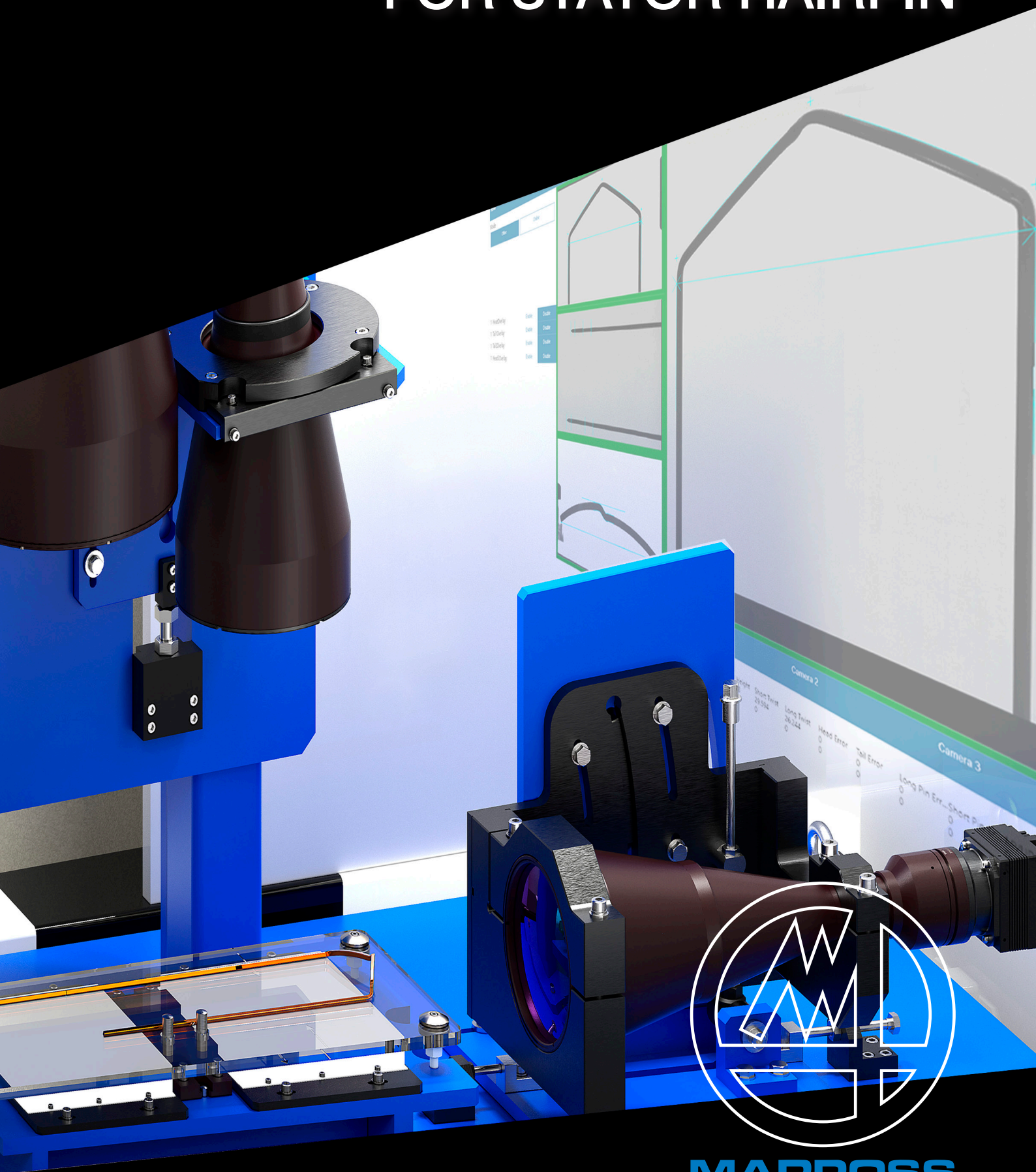




# HAIRPINFLASH

## OPTICAL GAUGE FOR STATOR HAIRPIN



**MARPOSS**

# TECHNICAL SPECIFICATION

## Introduction

The increasing demand for compact and high-performance electric motors in the automotive industry creates the requirement of motors having both high specific energy and small overall dimensions. This problem has been solved by several car manufacturers, using stators incorporating hairpin windings.

One of the greatest manufacturing challenges is to produce single hairpins so that they can best fit the stator grooves. A major production problem is that the hairpin is inherently weak, being constructed from a thin copper bar, and is therefore easily deformed when measured with contact systems or using reference profile masks. The need to be able to measure the true shape of hairpins without distortion led to the development of a measuring system based on vision techniques.

## Description

The proposed solution is a non-contact measurement system, capable of performing dimensional verification of the main geometric characteristics of the hairpin, using three proprietary high-resolution cameras equipped with telecentric optics to eliminate image distortion.

The most important sections of the component (head, tail and roof) are measured with the aim of controlling lengths, widths and twists in order to avoid problems during the assembly of the stator, for example avoiding damage to the insulation paper inside the stator slots.

After positioning the hairpin on the tempered glass reference plane and referring the part against the transparent pins, it is possible to launch the measurement cycle which consists of acquiring three images in sequence, one for each camera. The processing software will identify the pivotal points of the part allowing the reconstruction of the required dimensions.

## Benefits

- Non-contact measuring technology
- Fast – measuring time about 5 seconds
- Flexible for different part types
- Designed for workshop/laboratory environment
- High sensitivity and accuracy
- Optional statistic elaboration and data transfer with Marposs Quick-SPC software available
- Optional station to gage stripped area

## Versions

- Manual loaded testing bench
- Possibility to integrate the control into an automated production line, for 100% product inspection

## List of measures

L1-6	length of hairpin legs and stripped sections
W1-n	width of the hairpin on different sections along part length
$\alpha 1 - \alpha 2 - \alpha 3$	bend angles
D1T – D2T – HT	roof dimensions (top view)
H1S	roof dimensions (side view)
$\tau 1 - \tau 2$	twist angle (side view)
Additional measurements available upon request	

