

# Application News

Autograph Series Universal Testing Machines

## Optical Extensometer Integration for static testing- X-Sight One

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### User Benefits

- ◆ Possibility of obtaining strain over big range
- ◆ Contactless Measurement
- ◆ Measurement of Strain Tensile, Compression and Bending tests

### Introduction

For many applications contactless extensometers have big advantages over standard contact extensometers. One of these advantages is already indicated by the name, as the extensometer doesn't get in contact with the sample and by this the sample isn't influenced by the extensometer in any case. For example, there are no sharp edges harming the specimen or additional weight hanging on the sample.

But not just the specimen is protected from influence of the extensometer, also the extensometer is protected from damages caused by specimen due to high breaking impact.

In addition to that the recording of the test provides further information on the specimens' behavior. Example given by linking the recorded video with the measurement data, you can observe accurately where the break is initiated.

### Benefits of X-Sight One

Besides the Shimadzu contactless Videoextensometer TRViewX, there are further optical extensometer that might be better for certain applications and therefore they can be adapted to Shimadzu systems as well.

One of these extensometers is the X-Sight One extensometer, which provides the following advantages:

- Measurement in tensile, compression and bending mode
- Compact Solution with integrated light
- Versatile software optimization possibilities for evaluation and calculations

Besides the advantages over the TRViewX, the extensometer has the disadvantage, that an additionally software is needed, as the interface can't be connected in the Trapezium software.

### System Set Up

The X-Sight One video extensometer can be used in standalone mode with the provided alpha software. For the usage with the Shimadzu AG-Series universal testing machines the measurement signal is forwarded to the UTM by using the digital input of the system. This provides a stable and accurate measurement.

The mechanical connection of the XSight can either be done by direct connection to the machine frame or with a tripod.

### Measurements

In this application the X-Sight One was used to conduct measurements on glass fiber reinforced plastic samples in accordance with ISO527. As this standard requires high accuracy measurement the capabilities of the X-Sight One can be shown

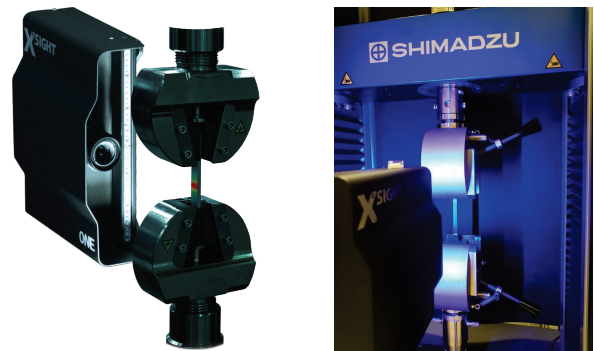
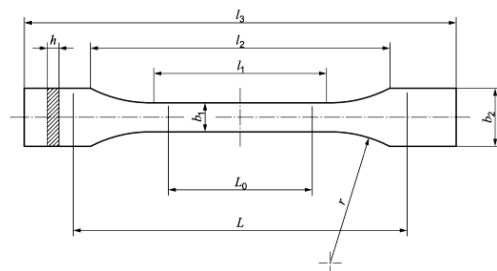


Figure 1 Xsight Video Extensometer

### Samples

Besides many different samples that were tested with the X-Sight One extensometer we used PA66 GFK50 in this application, as many optical extensometers tend to have problems with high rigid samples. The specimen size and shape was according to ISO527 Type 1A with a gauge length of 75 mm..

Figure 1 Sample geometry



$l_3$	Overall length	170
$l_1$	Length of narrow parallel-sided portion	$80 \pm 2$
$r$	Radius	$24 \pm 1$
$l_2$	Distance between broad parallel sided portions	$109.3 \pm 3.2$
$b_2$	Width at ends	$20 \pm 0.2$
$b_1$	Width at narrow portion	$10 \pm 0.2$
$h$	Preferred thickness	$4.0 \pm 0.2$
$L_0$	Gauge length (preferred)	$75.0 \pm 0.5$
$L$	Initial length	$115 \pm 1$

### ■ Measurement conditions

The samples were conditioned at 19 °C and 26% humidity. The tests were conducted under the same conditions.

Table 1 System Composition

Testing Machine	AGX-V 50kND
Load Cell	50 kN
Test Jig	50k N MWGs
Extensometer	X-Sight One

Table 2 Specimen Information

Dimensions	ISO 527 Type 1A 10x4 mm
Material	PA66 GF50

Table 3 Test Conditions

Test Speed	1 mm/min up to 0,3% Strain
	5 mm/min from 0,3% up to break
Test Environment	19 °C and 26% humidity

### ■ Results

Table 4 Results

Name	E-Modul [N/mm <sup>2</sup> ]	Max. Strain [%]	Break Strain [%]
PA6 50GF _ 1	13120.4	4.6	5.10
PA6 50GF _ 2	12627.3	3.62	3.62
PA6 50GF _ 5	12353.2	4.61	4.97
PA6 50GF _ 6	12547.0	4.4	4.60
PA6 50GF _ 7	12587.6	3.47	3.47
PA6 50GF _ 8	13527.6	4.34	4.48
Average	12793.9	4.17	4.37

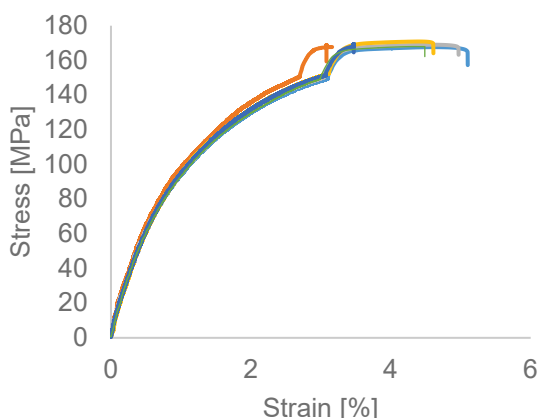


Figure 2 Stress Strain Diagram up to break

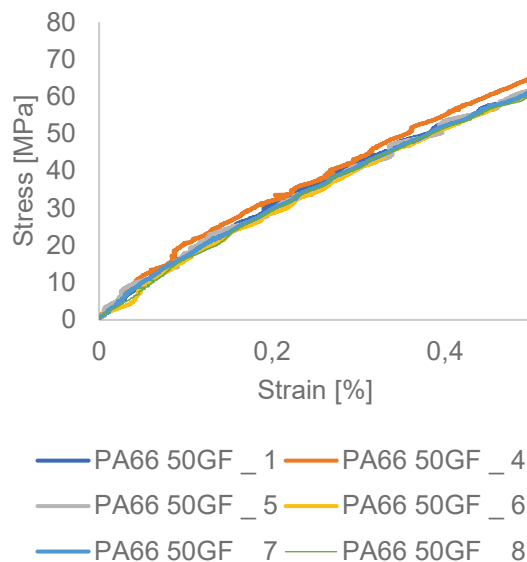


Figure 3 Detailed Stress Strain Diagram in the elastic region

### ■ Conclusion

The X-Sight One extensometer showed good and stable values for strain measurements. The results of the Elastic modules, the maximum strain and the break strain are in accordance with the literature values for this material and with the values captured with different extensometers.

### ■ The Package

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##### □ Main Unit

AG-Series (AGS-X AGX-V)

##### □ Accessory

- X-Sight ONE-M5
- X-Sight Software (Axial Trans)
- X-Sight Mounting Arm (Depending on Main Unit)
- Pulse-generator for AGS-X or AGX-V (depending on Main Unit)
- Grips in accordance with the sample e.g. Manual Wedge Type Grips

##### □ Software and Libraries

- X-Sight Software (Axial Trans)
- TrapeziumX-V or TrapeziumX (Depending on Main Unit)