



# Tension & Damping Measurement in cables

- Quick and accurate
- Applicable during construction or on structures in operation
- Required by national recommendations codes

## Goals

Tension and damping characteristics of cables are two important parameters of cable supported structures. This information should be known during construction and rehabilitation works of the structures but also during its lifetime in order to assure the correct functioning of the structure and its safety.

## Application field

- Parallel wire, parallel strands or locked coil stay cables
- Hanger cables of suspension bridges
- External post tensioning cables
- Any other type of cable that can vibrate freely

### • Accurate

The frequency measurement incertitude is extremely low (better than 0.5%), additional incertitude will slightly reduce this accuracy, depending on the good knowledge of the length, and weight of the cable.



## Technology benefits

### • Fastest way to measure the tension

The measurement protocol consists in fixing one or several accelerometers to the cable, and then to measure its natural vibration frequencies. The cable is excited either manually or with mechanical devices, but in most cases, this is done simply by a man in a light basket.

## Choose Advitam

### • Large experience

With more than 20 years of practice Advitam has now been involved in many types of cable configurations, our teams are reactive, and well trained to ensure our clients' satisfaction

### • Technical expertise

Our analysis process integrates :

- Catenary effect
- Stiff cables effect

We can also assess the vibrating length when it is known with insufficient accuracy

### • High performance equipment

Our equipment uses high resolution accelerometers and data acquisition units (up to 24 bits). We also propose mechanical vibrator when manual excitation is not foreseeable.

# UScan®

## Ultrasonic detection of broken wires in strands

- Unique NDT for wire breaks detection within the anchorages
- Easy to deploy
- High resolution

### Goals

UScan® provides the possibility to evaluate the existence of broken wires inside a tensioned cable anchorage, and therefore to anticipate the maintenance strategy of the structure.

Stay cables and pre-stressing cables are critical elements for the safety of the structures, and therefore well protected against corrosion. However in some circumstances, corrosion initiates itself into the cable anchorages, and the condition of the strands in these areas is then unknown. In most of the cases, the corrosion is detected when a hazard has occurred.



### Application field

- T15 strands
- Stay cables, pre-stressing cables, ground anchors,
- Accessible anchorages
- Other type of wire / anchorage are subject to feasibility study



### Technology benefits

- Knowledge of the anchorages condition

UScan® is the only technology providing detailed information of the anchorages condition. Other techniques (endoscopy, magnetic flux, resistivity, ...) are not applicable due to the inaccessibility of the area.

- High resolution

UScan® sends Ultrasonic guided waves, into each individual wire of a strand end and therefore provides a detailed instant picture of the anchorages condition.

- Simple to deploy

UScan® is composed of a set of light tools, designed for field operation, and allowing a quick deployment on site.

- Complementary to acoustic monitoring

When broken wires are detected by acoustic monitoring, UScan® allows to know the global condition of the anchorages and the extent of damages.

### Choose Advitam

- Large Experience

Since its development, more than 100 000 wires have been inspected on different types of structures.

- Technical expertise

Advitam has developed this equipment in conjunction with IFSTAR labs, and co-patented the technology. Our equipment is available in stock. Our qualified operators will ensure a professional application of the technology.





# SlotStress®

Stress measurement in concrete

- Strain relief measurements
- Easy to deploy / Quick measurement
- Accurate

## Goals

**SlotStress®** provides Engineers with the real residual stress condition of a structure, allowing therefore the setup of an optimized strategy for maintaining and reinforcing assets.

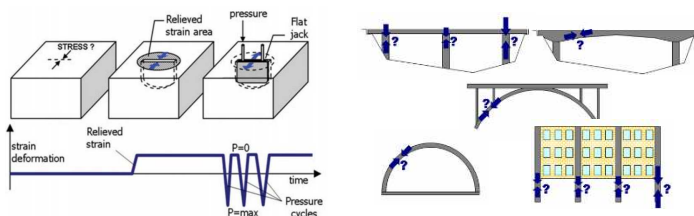
During its lifetime, the load distribution inside a structure can change due to external actions, or a slow deterioration of the structure. At some stage, the loads become incompatible with the safety of the structure and its users. **SlotStress®** allows an understanding of how the new loads are distributed into the structure, and which consequences they will have on the long term.



## Application field

Surface stress measurements in :

- Tunnels
- Bridges
- Buildings
- Car parks
- Pre-stressed beams



## Technology benefits

- Knowledge of the local stresses in concrete

**SlotStress®** is a strain relief technology compliant with ASTM D4729-087, allowing to know local stresses in structures by performing punctual drillings.

- **SlotStress®** provides measurements with an accuracy of  $\pm 0.5$  Mpa.
- **Stress profiles assessments**

When needed, a cartography of measurement will allow evaluating normal forces and bending moments effectively undergone by the structure.

- **Completes the acoustic Monitoring**

When pre-stressing losses are detected by Acoustic Monitoring, **SlotStress®** allows to evaluate the local losses of pre-stressing, and therefore establish a rehabilitation plan.

## Choose Advitam

- **Large Experience**

With more than 800 measurements performed during the last 15 years, we provide qualified teams which ensure a professional performance of the works.

- **Technical Expertise**

Advitam has developed a unique methodology based on an innovative shape of hole. This patented shape improves significantly the accuracy of the measurement.

- **Light and robust equipment**

The equipment has been designed to be user friendly easy to operate, even in compact or hard to access places. The system can be used either outdoor or in confined spaces.





# Upus®

## Force measurement in pre-stressing bars and bolts

- Non Destructive Ultrasonic Measurement
- Easy to deploy
- Accurate and repeatable

### Goals

Upus® provides the real stress condition of the pre-stressing bars integrated to a structure, allowing therefore the setup of an optimized strategy for maintaining and repairing the assets.

Pre-stressing by bars or rods is used intensively to assemble elements, and to provide structural resistance. The loosening or releasing of forces in these bars can initiate critical structural hazards, therefore it is necessary to verify periodically the acceptability of the forces applied.



### Technology benefits

- **Cost effective for periodic monitoring**

Upus® is a cost efficient alternative to periodic lift off jobs, typically performed using jacks and hydraulic pumps.

After having performed a first calibration using the lift-off technique, the technology allows inspecting the bars and rods as frequently as wished, simply by applying an ultrasonic sensor on the head of the bar.

- **Accuracy significantly improved**

During the initial calibration, Upus® allows increasing significantly the measurement accuracy. When typical lift-off technique ranges between 20 to 40% accuracy, the use of Upus® lowers it to 5%.



### Application field

- **Applicable to all load readable (ungrounded) bars**
  - Bars with diameter between 12 to 120 mm (\*)
  - Bars with lengths from 25 cm to 12 m (\*)
- **Long term periodic monitoring**
- **Quality control during construction works**
- **Typical applications :**
  - Anchorages,
  - Cable clamps,
  - Tie rods, etc...

### Choose Advitam

- **Large experience**
  - More than 10 000 bars controlled in the nuclear field
  - More than 1 500 bars controlled on suspension bridges
- **Technical expertise**

Upus® is a patented technology, initially developed for the nuclear field. It has been used for more than 15 years.

Our specialised teams have a strong experience, even in difficult environments, to ensure our clients a high level of service.

(\*) Measurement is possible subject to effective propagation of the ultrasonic wave