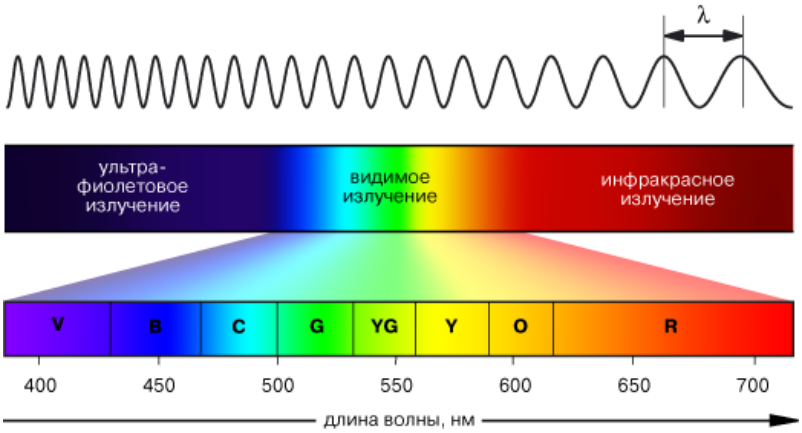
Visual Testing (VT)

Visual testing method (VT) refers to an optical type of non-destructive testing (NDT). It is based on the **use of the optical region of the electromagnetic spectrum** (wavelength ranges from 0.38 ... 0.76 μm to 4000 ... 8000 angstroms (A)) **in order to assess the technical condition of testable objects by means of visual observation or optical devices with up to 20 times magnifying capacity**. The visual method is extensively used for testing products in all the industries.



A visual-optical method is a method of non-destructive testing based on obtaining raw information about an object by means of visual observation or optical devices.

A visual measuring method is visual testing carried out using measuring instruments. It is used to verify compliance of the dimensions of parts or its defects with the requirements of regulatory documentation.

When performing visual testing, the main material, welded joints, claddings, etc. are assessed, the shape and dimensions of semi-finished products, parts, assembly units, the size of surface defects, structural elements of welds assembled and dimensions of the welds are measured both in preoperational phase and in technical diagnostics of products in use according to the requirements of the drawings and technical standards.

The main advantages of the visual method are:
- ease of testing, availability, simple-to-use equipment;
- 100% testing of questionable areas;
- independence of physical properties of a material;
- effective testing in hard-to-reach areas and on internal surfaces;
- high performance, relatively low labor intensity;
- low cost when detecting surface defects.

The disadvantages are the following:
- subjectivity (low reliability), dependence on visual acuity, fatigue, an NDT inspector's experience and control conditions (illumination, optical contrast, etc.);
- low sensitivity, which depends on the person's vision (with visual acuity 1 - 0.1 mm);
- low probability of detecting minor defects.

Training on the visual testing method of non-destructive testing **is intended for** specialists of NTD and technical diagnostics labs, central factory labs and other divisions performing non-destructive testing, and **is aimed at** improving and deepening knowledge in physical fundamentals of VT (optical radiation, geometrical optics, eye optics and visual mechanism, defects of the eye optical system), material engineering (classification, properties and characteristics of metals and alloys), quality control of workpieces and welded joints and the causes of technological and operational defects, as well as obtaining practical skills in working with visual-optical devices and tools.

Pre-examination training is **aimed at further certification** of specialists in visual testing for various levels of competence, taking into account the requirements of STB ISO 9712-2016 – Non-Destructive Testing. Qualification and Certification of Personnel in Non-Destructive Testing and EN ISO 9712: 2012 – Non-Destructive Testing. Qualification and Certification of Personnel.

To successfully undergo certification, a specialist have to study the technology of visual testing, get to know the criteria for assessing quality of products and the requirements to documenting testing results in accordance with Belarusian and European standards.

Relation of the Visual Testing to other NDT Methods

Almost all NDT systems have a number of common characteristics:

- products to be tested by various methods, their defects and the reasons for their occurrence are often the same;

- information models of defects in many NDT methods are analyzed and interpreted visually.

Human vision is the basis of non-destructive testing; criteria for the visibility of defects are specified for a number of NDT methods. In this regard, **almost any NDT method can be considered visual at the stages of detection and interpretation**.

The visual testing method can exist as an independent way to assess the quality of products, as well as complementary to other methods.

As a rule, defects are detected and identified amid various interfering factors. The light levels, particle sizes of flaw detection materials, visual angles, and light sensitivity related to an NTD inspector's eyesight are to be monitored to ensure the reliability and accuracy of NDT methods. In addition, almost all automated NDT systems use optical elements that are closely related to the properties of the human vision.

Therefore, training of NTD inspectors can be completed only when reliability of the testing they perform becomes sufficiently high and stable.

Although specialists in other NDT methods are not required to be certified in VT at the same time (STB ISO 9712-2016), **in practice NDT inspectors and their employers try to obtain qualification and a certificate in VT additionally to other methods.**