Test Project

Reverse Engineering

Effective Date:

_____ Full Name, WSR Expert

Test Project for module 1

Non-contact 3D digitization of parts (3 parts of different complexity from 3 different materials)

The following is given to participants: three parts, optical 3D scanner, necessary consumables.

Task:

1. Prepare the necessary parts for digitization.

- wipe off, degrease if necessary,

- apply the flaw detection spray.

2. Perform scanner calibration and 3D scanning of:

- plastic housing of the part (1),

- spiral gear (2),

- worm (3).

3. Return parts and equipment to their former condition.
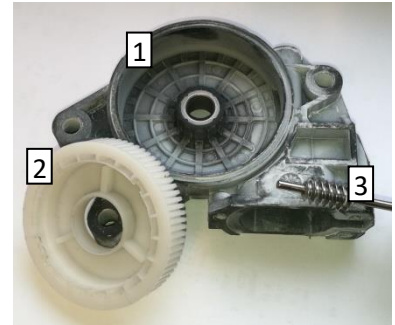
The Competitor shall:

1. prepare parts for scanning so that the flaw-detective spray is applied as smooth and thinner as possible, avoiding drips, sags and significant thickness difference of the spray coating;

 2 digitize the necessary parts and receive cross-linked point clouds for them without irreplaceable data gaps and other artifacts containing the required information about the items.

3. received point clouds shall be converted into polygonal models (stl format) and aligned to enable subsequent reverse engineering. The received point cloud shall be suitable for a modelling quality check.

4. remove spray from the parts, pack the equipment.

The total time for the performance of the entire Test Project is 3 hours.

The competitor's work results shall be saved on the desktop:

C:\Users\USER NAME\Desktop\Participant No.(PARTICIPANT NUMBER) \Day 1\Module 1.

Test Project for module 2

Non-contact planar digitization and reverse engineering of the part based on the results of digitization and manual measurements of mating parts and photography of the required part

The following is given to participants: 4 mechanism parts (1,2, 3 and 5), as well as photographies and apparatus of projection digitization.

Task:

1. Prepare the necessary parts for digitization.

2. Calibrate the apparatus of projection digitization and digitize the provided parts.

3. According to available data, make computer
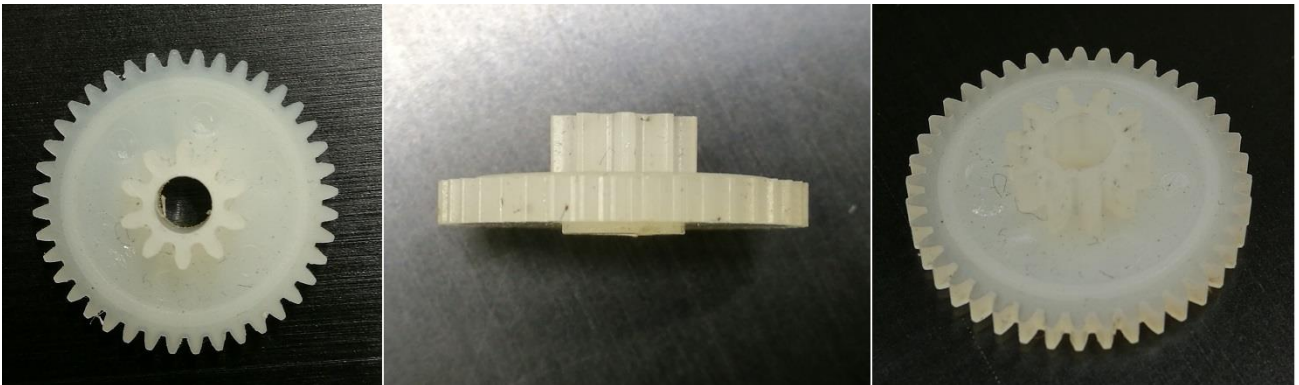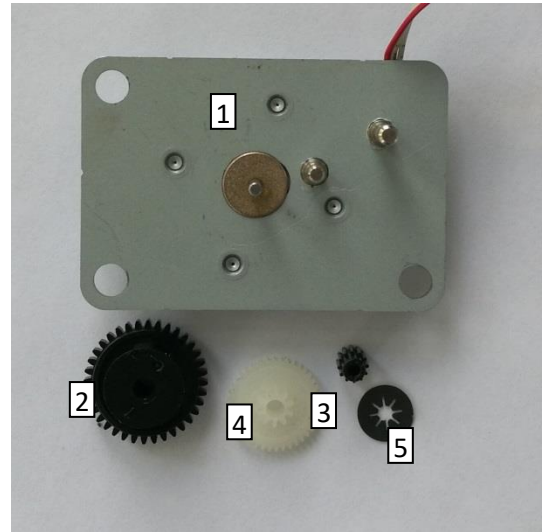
models of parts:

- (1) – a plate with holes and axes;

- (2) a simplified gear (only wheel and wheel hub with

an opening);

- (3) a pinion;

(4) a cluster gear (recover the lost one);

- (5) a lock.

4. Return parts and equipment to their initial condition.

The Competitor shall:

1.   prepare the parts for digitization so that the digitized object form are clear for transmission;

2. digitize the necessary parts and get their possible full vector paths.

3. based on the obtained vector paths (and, if necessary, the manual measurements), make parametric models of mechanism parts and assemble them.

4. Carefully collect the parts, pack the equipment.

The total time for the performance of the entire Test Project is 3 hours.

The competitor's work results shall be saved on the desktop:

C:\Users\USER NAME\Desktop\Participant No.(PARTICIPANT NUMBER) \Day 1\Module 2.

Defining the geometry of mounting seat and their mutual bracing on the large unit with the use of photogrammetric system of non-contact digitization
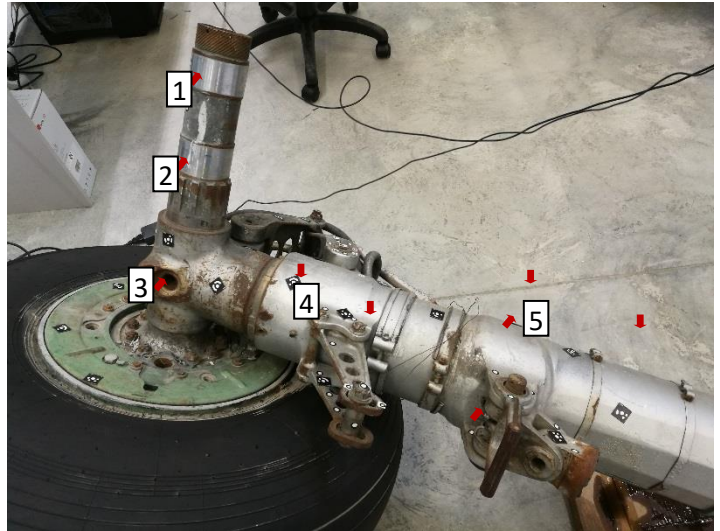
The following is given to participants: large unit, photogrammetric non-contact digitization, consumables

Task:

1. Prepare the part for digitization:

- wipe off, degrease if necessary,

- apply temporary and permanent optical marks.

2. Scan 3D-objects of the required parts providing their relative position in space.

3. On the basis of the obtained data, determine:

- diameters of bearing journals 1 and 2, their axes and check the alignment of these axes;

- hole diameter 3

- the distance between the common axis of the bearing journals 1 and 2 and the axis of the rack 4

- the angle between the common axis of the journals 1 and 2 and the axis of the rack 4

- distance between the mounting axis of the bracket 4 and the mounting axis of the bracket 5
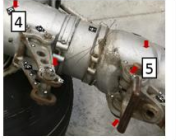
4. Return the unit and equipment to the former condition (remove marks).

The Competitor shall:

1. prepare the part for scanning so that the optical marks are applied in sufficient quantity for digitization;

2 digitize the necessary components and receive cross-linked point clouds for them without irreplaceable data gaps and other artifacts containing the required information.

3. received point clouds shall be converted into polygonal models (stl format) and aligned to enable subsequent reverse engineering.

4. return the unit and equipment to the former condition (remove marks), pack the equipment.

5. On the basis of the obtained data, determine the necessary linear and angular dimensions. Make a report in the ExCel table (according to the provided template) with screenshots

№	мм/гр	Скриншот
1	10	
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The total time for the performance of the entire Test Project is 2 hours. To return the unit to their initial condition is not more than an hour.

The competitor's work results shall be saved on the desktop:

C:\Users\USER NAME\Desktop\Participant No.(PARTICIPANT NUMBER) \Day 1\Module 3.

Test Project for module 4

Reverse engineering of a part according to the polygonal model of the item obtained with the help of milled treatment

The following is given to participants: polygonal models of parts, physical samples (the parts of the oil unit), manual measuring tool.

Task: make editable 3D models of all the parts.

The participant needs to align the original polygon model for further reverse engineering. Save (export in .stl). On the basis of the polygonal model, make a parametric editable computer model suitable for subsequent manufacturing.

The permissible tolerance of the model should not exceed + - 0.15 mm. The computer models made by the Competitor shall exclude defects of the original parts acquired during production, operation, breakdowns and repairs (nicks, beads, burrs, welding, soldering, chips, etc.), recovering its original geometry.

Computer models made by the participant must be three-dimensional, fully linked and editable, that is, all elements must be interfaced, models cannot have open edges, models must allow the possibility of further work to determine their parameters and make changes.

The participant shall use the following units of measurement of the computer model: millimeters (mm) - for linear dimensions and degrees (°) - for angular dimensions.

The total time for the performance of the entire Test Project is 2 hours.

The competitor's work results shall be saved on the desktop:

C:\Users\USER NAME\Desktop\Participant No.(PARTICIPANT NUMBER)\Day 2\Module 4.

Test Project for module 5

Reverse engineering

of parts on the polygonal model of the shaped objects received by molding or casting

The following are given to participants: three polygonal models of shaped items (1, 2 and 3).

Task:

Making editable 3D models of the parts.

The participant needs to align the original polygon model for further reverse engineering. Save (export in .stl). On the basis of the polygonal model, make parametric editable computer models suitable for subsequent manufacturing.
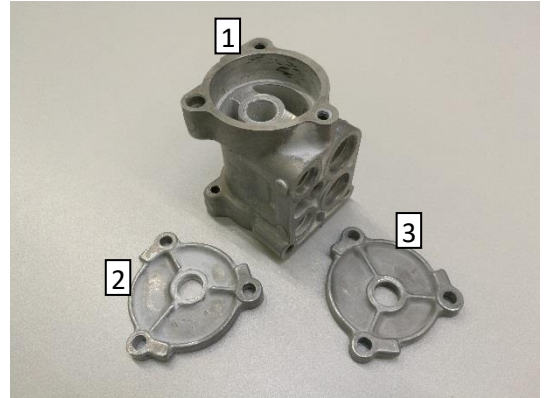
The permissible tolerance of the model should not exceed + - 0.15 mm.

The computer model made by the Competitor shall exclude defects of the original object acquired during production, operation, breakdowns and repairs (nicks, beads, burrs, welding, soldering, chips, etc.), recovering its original geometry.

Computer model made by the participant must be three-dimensional, fully linked and editable, that is, all elements must be interfaced, models cannot have open edges, models must allow the possibility of further work to determine their parameters and make changes.

The Competitor shall use the following units of measurement of the computer model: millimeters (mm) - for linear dimensions and degrees (°) - for angular dimensions.

To evaluate the work on module 5, the participant must submit parametric part models and aligned polygon models in the file .stl.

The total time for the performance of the entire Test Project is 4 hours.

The competitor's work results shall be saved in STEP format on the desktop:

C:\Users\USER NAME\Desktop\Participant No.(PARTICIPANT NUMBER)\Day 2\Module 5. The name of each file should be "part 1", "part 2", etc.

Test Project for module 6

Reverse engineering and restoring by polygonal models

and preparation production drawings

The following are given to participants: polygonal model of a mounting bracket of the struts of the aircraft, resulting from the digitization of parts that have been damaged and, in many ways, have lost their original geometry.

Task:

Make an editable 3D models of all 6 brackets, restore their original geometry, create production drawings of the parts.

The Competitor needs to align the polygon model for further reverse engineering. On the basis of polygonal models, it is necessary to make an editable parametric computer model, suitable for the subsequent manufacturing and create production drawings of the parts.

The permissible tolerance of the model should not exceed + - 0.15 mm.

The computer models made by the Competitor shall exclude defects of the original objects acquired during production, operation, breakdowns and repairs (nicks, beads, burrs, welding, soldering, chips, etc.), recovering its original geometry.

Computer models made by the Competitor must be three-dimensional, fully linked and editable, that is, all elements of the models must be interfaced, models cannot have open edges, models must allow the possibility of further work to determine their parameters and make changes.

The Competitor shall use the following units of measurement of the computer model: millimeters

(mm) - for linear dimensions and degrees (°) - for angular dimensions.

To evaluate the work on module 6, the participant must submit parametric models of all 6 parts and production drawings of the parts.

The total time for the performance of the entire Test Project is 2 hours.

The competitor's work results shall be saved on the desktop:

C:\Users\USER NAME\Desktop\Participant No.(PARTICIPANT NUMBER) \Day 3\Module 6.