

Standards and Assessment Guide

Mechanical Engineering CAD

Introduction

Welcome to the Standards and Assessment Guide (SAG), a comprehensive resource designed to support excellence in assessment practices for all skills competitions hosted at the WorldSkills Competition. A key component of the SAG is the commitment to continuous improvement through ongoing review, ensuring that these guides consistently reflect the latest industry innovations and high standards of assessment in an open and transparent manner.

Purpose

The primary purpose of this guide is to provide a structured framework for the consistent and fair assessment of each skill competition. It aims to ensure that all assessments are conducted with a high degree of accuracy, reliability, validity, and reflect global industry standards. By adhering to these guidelines, assessors can maintain the integrity of the competition and uphold the high standards associated with WorldSkills.

Note: this guide is not a replacement for the Marking Scheme and should only be used as a reference when required during the assessment process. Competitors are not allowed to have a copy of this SAG in the workshop in either digital or paper form.

Scope

This document covers general assessment practices applicable to a diverse range of industry sectors including:

- Manufacturing and Engineering Technology
- Information and Communication Technology
- Construction and Building Technology
- Transportation and Logistics
- Social and Personal Services
- Creative Arts and Fashion

Each skill competition has its unique requirements and benchmarks, which are detailed within sections of this guide. The consistency of assessment across each skill is the overarching principle, ensuring a unified approach to evaluating Competitor performance to the highest standards.

Key Components

The guide is structured into several key components, each addressing critical aspects of the assessment process:

Assessment Principles and Objectives

- Emphasis on fairness, transparency, and objectivity in assessments.
- Alignment with global industry standards and best practices.

Assessment Methods and Tools

- Description of various assessment methods in Measurement and Judgement.
- Guidance on the application of appropriate assessment tools and equipment (if applicable).

Criteria and Benchmarks

- Examples of assessment criteria and aspects for each skill, outlining the expected competencies and performance standards.
- Benchmarks for different levels of proficiency i.e. Judgement award range 0, 1, 2, 3 or Yes/No criteria alongside clear measurable descriptors.

Expert assessment requirements

- Completion of the Access Programme.
- Approved Curriculum Vitae (CV).
- Reaching **100%** Expert preparedness.
- Full participation of online and in-person Mandatory Assessment Training (MAT).
- Completion of practical assessment testing at the Competition.

Quality Assurance and Improvement

- Monitoring and evaluation: Ensuring assessments are carried out correctly and produce reliable results.
- Continuous improvement: Using feedback from Experts and Skill Competition Managers to enhance future assessments.
- Periodic review: Regularly updating processes to reflect current industry and WorldSkills standards.

Implementation

For effective implementation, this guide should be used for guidance purposes only and in parallel with the Technical Description for each skill. Experts are encouraged to familiarize themselves thoroughly with both the general guidelines and the particular requirements of their respective skill areas. Collaborative efforts between the Skill Management Team, Experts, and Competitors are vital for achieving the ultimate goal of global skills development.

Conclusion

The Standards and Assessment Guide embodies the commitment of the WorldSkills movement to nurturing talent and promoting the highest standards of vocational education and training worldwide. By providing clear and comprehensive guidance, we aim to empower Experts to conduct marking and assessment practices that are not only rigorous and equitable but also inspiring and transformative for all participants.

Thank you for your dedication to upholding these standards and contributing to the success of the WorldSkills Competition. Together, we can continue to champion skills excellence and celebrate the achievements of talented individuals from around the globe.

Skill 05 – Mechanical Engineering CAD

Measurement

Measurement is used to assess accuracy, precision, and other performance that can be measured objectively. It is used where ambiguity must be avoided.

The total marks allocated to measurement marking may vary from competition to competition depending on the Test Project.

Aspect	WSOS section as per TD	Descriptor
All	All	Has something been done? Is it there? Does it work? Yes = full mark No = no mark
All	All	It can ask how closely performance matches the requirement. This uses a scale, so that Perfect match = full mark Divergence = smaller or fewer mark(s) or fewer marks on a descending scale.
All	All	Must follow the ISO standards, last version – exact match

Judgement

Judgement is used to assess the quality of performance about which there may be small differences of view when applying the external benchmarks.

The Resources column in the table below may include all kinds/formats of resources such as: a link to a YouTube video, a website link, an illustration, a photo, a reference to a book, and so on. It needs to be as detailed as possible to show the differentiation between 0, 1, 2, 3.

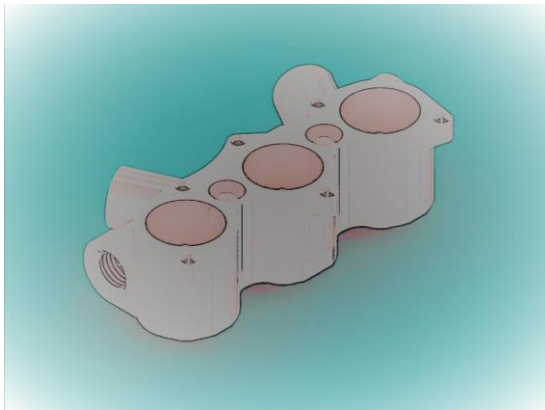
Generic rules:

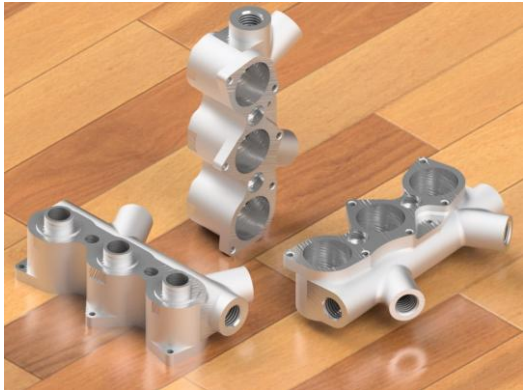
The assessment group comprises three Experts plus one Expert who acts as the supervisor. The supervising Expert will replace an Expert in the marking group to prevent compatriot marking.

The difference of the three Experts' scores may not exceed 1. If this is the situation the Experts must re-score until there is a maximum difference of 1. As long as the three Experts judge within 1, the result can be entered into the CIS.

The total marks allocated to judgement marking may vary from competition to competition depending on the Test Project.

Aspect – Rendered images

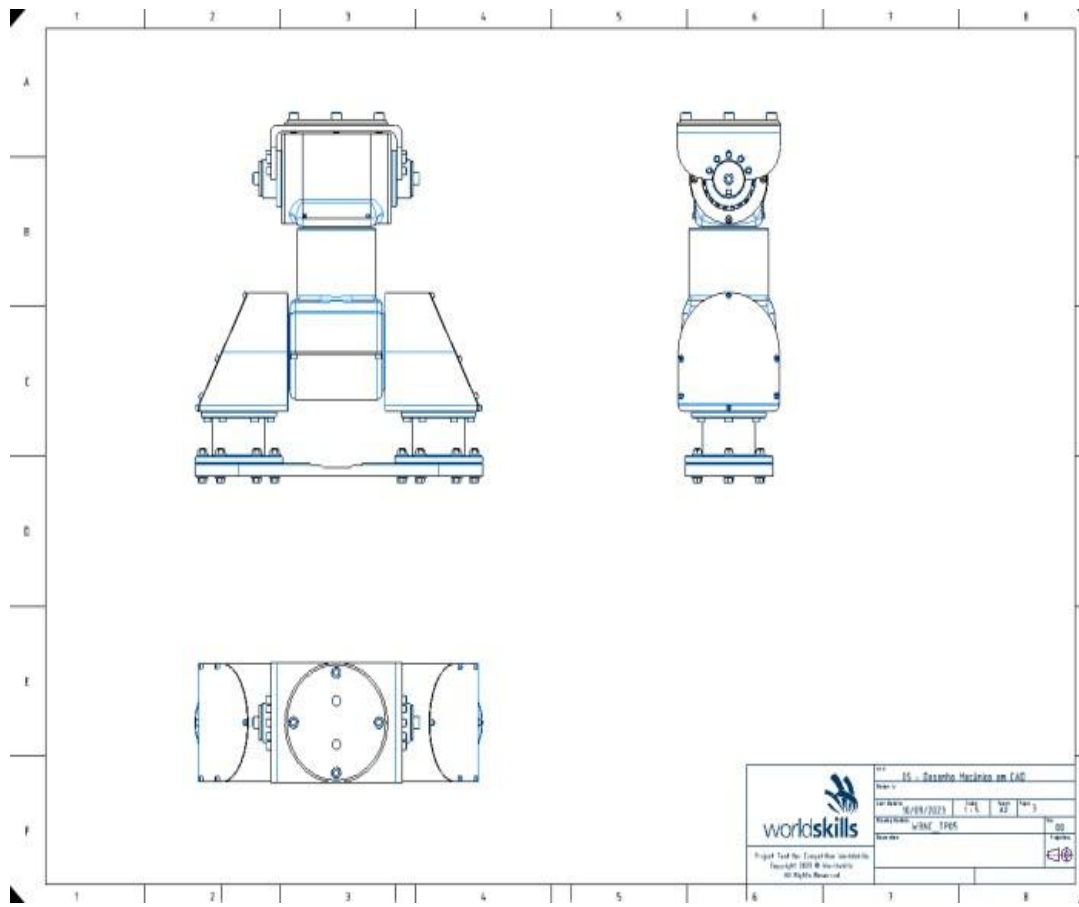
WSOS section as per TD	Score	Descriptor	Resource
04	0	The rendering is either too dark or too clear, compromising visibility. No rendering is present, or it is severely flawed, making it impossible to assess the design effectively. Essential features are missing or incorrectly represented.	
	1	The rendering is basic but clear, showing all essential features of the design. The image is sufficient to evaluate the design, but lacks advanced rendering techniques like shadows, textures, or reflections. The rendering demonstrates a fundamental understanding of CAD tools.	

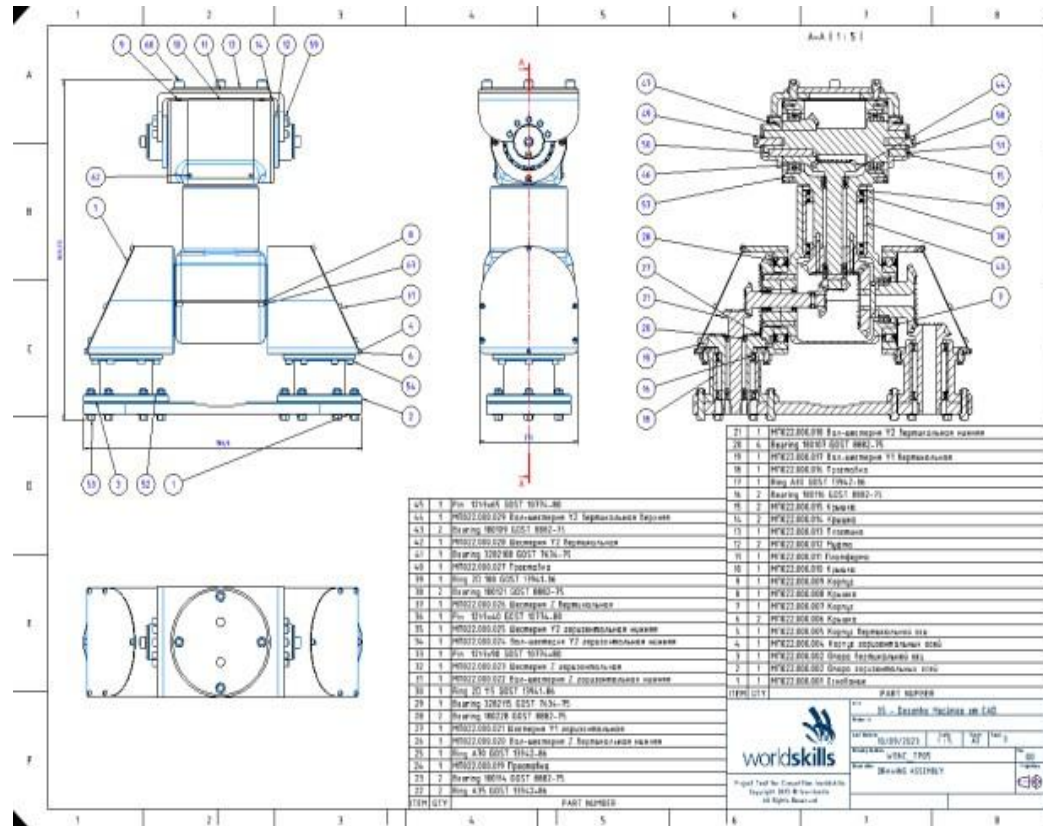
WSOS section as per TD	Score	Descriptor	Resource
	2	The rendering exceeds basic requirements by incorporating additional elements like background, reflections, materials, and positioning. These enhancements contribute to a more realistic and detailed representation of the design, demonstrating an advanced use of CAD software features.	
	3	The rendering is exceptionally realistic and detailed, showcasing a superior use of CAD software capabilities. Advanced techniques such as dynamic lighting, detailed textures, accurate reflections, and precise positioning are employed to create a highly realistic and visually compelling representation of the design.	

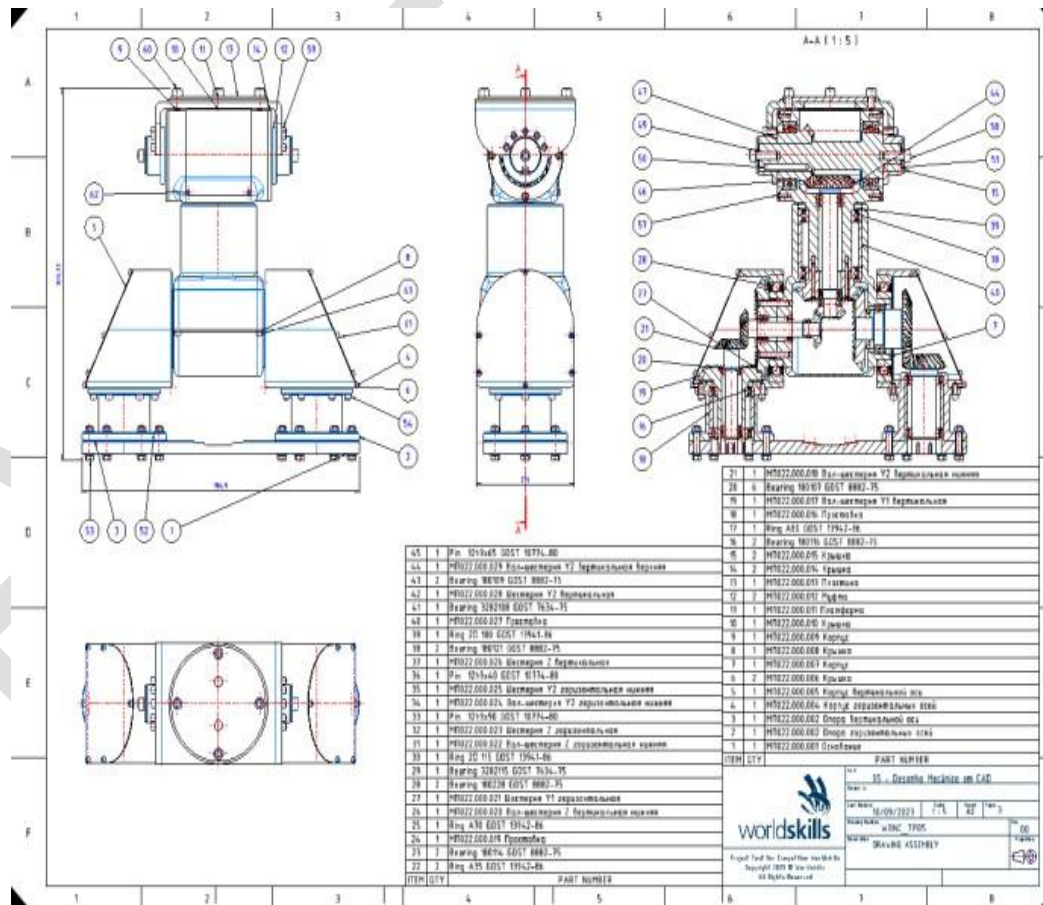
Aspect – Videos

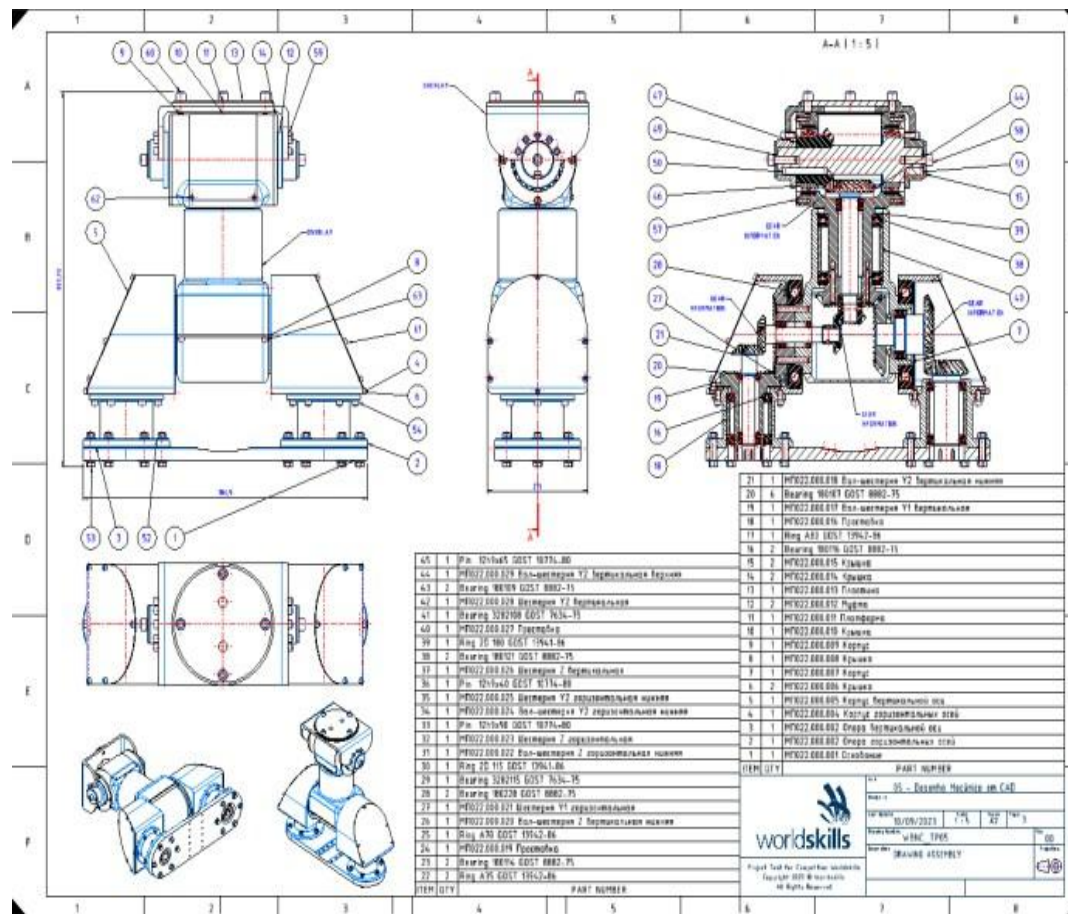
WSOS section as per TD	Score	Descriptor
Judgement	0	The video is either too dark or too clear, compromising visibility. No video is present, or it is severely flawed, making it impossible to assess the design effectively. Essential features are missing or incorrectly represented.
	1	The video is basic but clear, showing all essential features of the design. The video is sufficient to evaluate the design, but lacks advanced rendering techniques like shadows, textures, or reflections. The rendering demonstrates a fundamental understanding of CAD tools.
	2	The video exceeds basic requirements by incorporating additional elements like background, reflections, materials, and positioning. These enhancements contribute to a more realistic and detailed representation of the design, demonstrating an advanced use of CAD software features.
	3	The video is exceptionally realistic and detailed, showcasing a superior use of CAD software capabilities. Advanced techniques such as dynamic lighting, detailed textures, accurate reflections, and precise positioning are employed to create a highly realistic and visually compelling representation of the design.

Aspect – Assembly Drawing

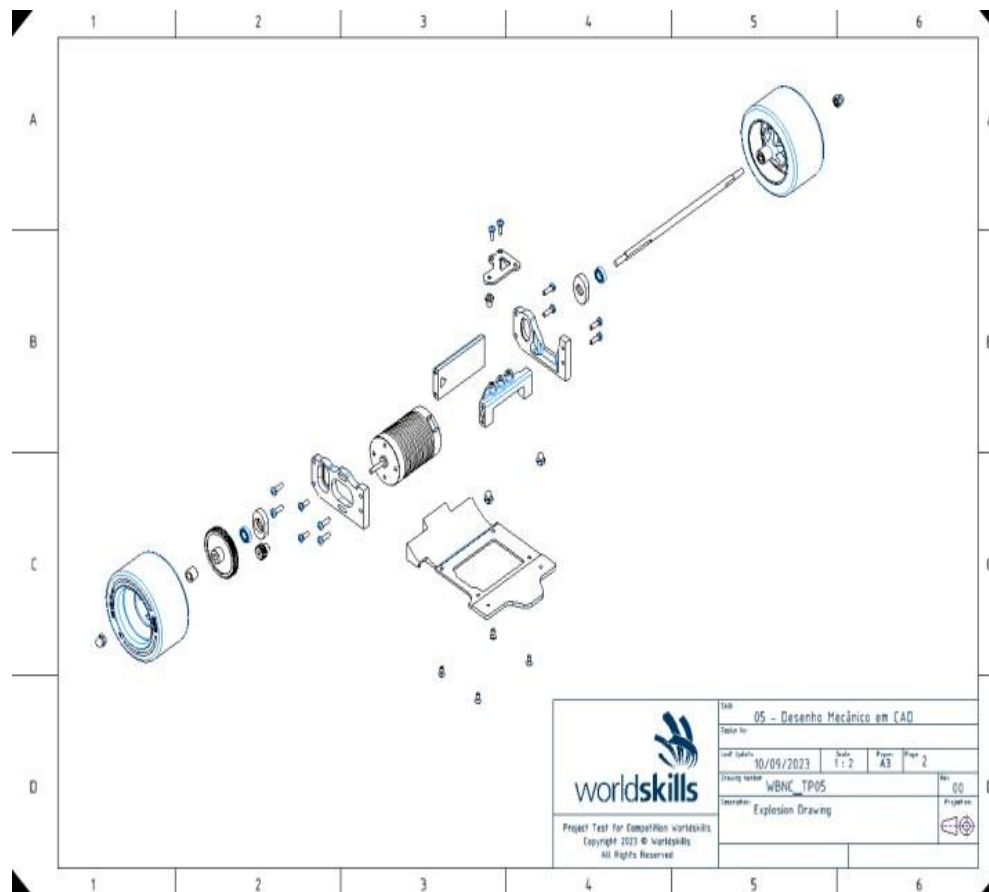
WSOS section as per TD	Score	Descriptor	Resource
06	0	The drawing does not present enough information, no dimensions, no section views to demonstrate the internal components. Lack of component identification and parts list.	

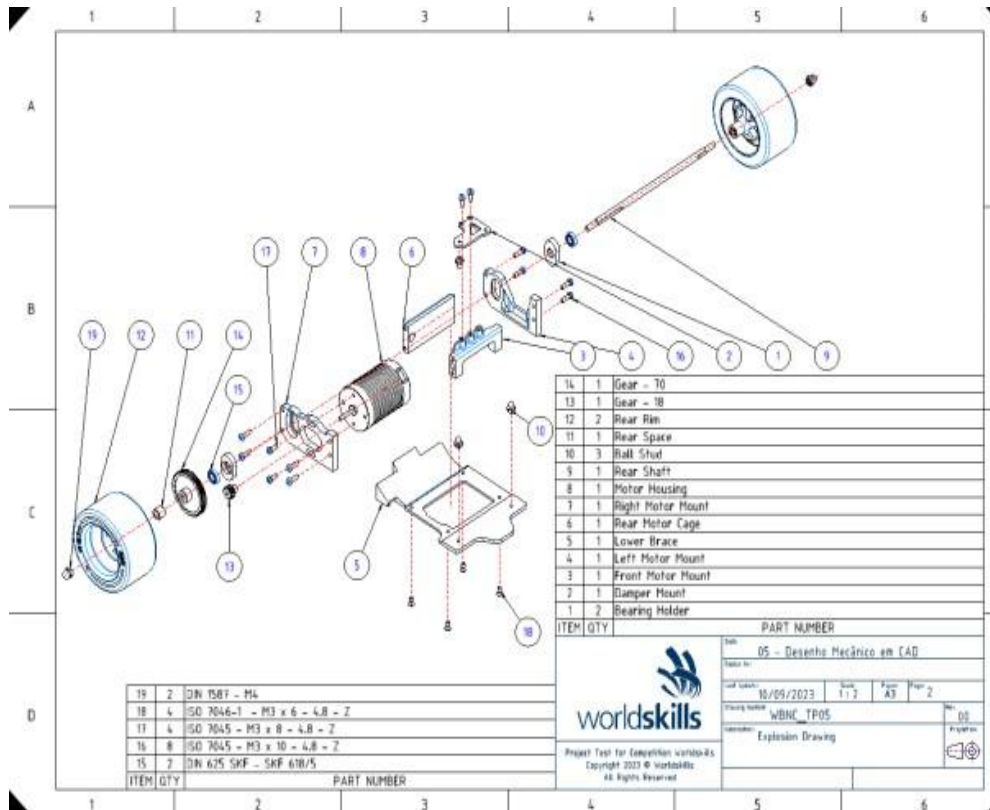
WSOS section as per TD	Score	Descriptor	Resource
	1	The drawing shows the internal parts with sections, identified components, parts list, title block completed. Balloons are organized with correct identification.	

WSOS section as per TD	Score	Descriptor	Resource
	2	The drawing shows the internal parts with sections, identified components, parts list, title block completed. Balloons are organized with correct identification, centrelines applied according to standard, removal of hatching from standardized elements and axes, application of overlay if necessary.	 The technical drawing illustrates a mechanical assembly in cross-section. It includes two main views: a front view (A-A) and a side view (B-B). The drawing is annotated with numerous balloons (numbered 1 through 45) identifying individual components. A detailed parts list is provided at the bottom right, listing items such as bearings, shafts, and gears with their respective specifications and quantities. The title block at the bottom right contains the drawing title 'Деталь: Вал', the drawing number '1', and the date '10/09/2021'. The drawing is signed by 'А.А. А.А.' and includes a scale of 1:1.

WSOS section as per TD	Score	Descriptor	Resource																																																																																																																																																																
	3	The drawing meets all the previous requirements and shows more details and information about the set. Notes for additional information to facilitate understanding.	 The drawing is a technical illustration of a mechanical assembly, specifically a pump or motor. It features several views: a front view (top left), a side view (top middle), a cross-section view (top right), and two detail views (bottom left and bottom middle). The drawing is annotated with numerous numbered callouts (1-31) pointing to various components. A title block is located in the bottom right corner, containing the part name 'PUMP', drawing number '1', and a list of parts and materials. <table><tr><th>ITEM</th><th>QTY</th><th>PART NUMBER</th><th>NAME</th><th>UNIT</th></tr><tr><td>1</td><td>1</td><td>1P0022.000.001</td><td>Корпус насоса</td><td>шт</td></tr><tr><td>2</td><td>1</td><td>1P0022.000.002</td><td>Вал насоса</td><td>шт</td></tr><tr><td>3</td><td>1</td><td>1P0022.000.003</td><td>Шкив насоса</td><td>шт</td></tr><tr><td>4</td><td>1</td><td>1P0022.000.004</td><td>Ролик насоса</td><td>шт</td></tr><tr><td>5</td><td>1</td><td>1P0022.000.005</td><td>Ролик насоса</td><td>шт</td></tr><tr><td>6</td><td>1</td><td>1P0022.000.006</td><td>Ролик насоса</td><td>шт</td></tr><tr><td>7</td><td>1</td><td>1P0022.000.007</td><td>Ролик насоса</td><td>шт</td></tr><tr><td>8</td><td>1</td><td>1P0022.000.008</td><td>Ролик насоса</td><td>шт</td></tr><tr><td>9</td><td>1</td><td>1P0022.000.009</td><td>Ролик насоса</td><td>шт</td></tr><tr><td>10</td><td>1</td><td>1P0022.000.010</td><td>Ролик насоса</td><td>шт</td></tr><tr><td>11</td><td>1</td><td>1P0022.000.011</td><td>Ролик насоса</td><td>шт</td></tr><tr><td>12</td><td>1</td><td>1P0022.000.012</td><td>Ролик насоса</td><td>шт</td></tr><tr><td>13</td><td>1</td><td>1P0022.000.013</td><td>Ролик насоса</td><td>шт</td></tr><tr><td>14</td><td>1</td><td>1P0022.000.014</td><td>Ролик насоса</td><td>шт</td></tr><tr><td>15</td><td>1</td><td>1P0022.000.015</td><td>Ролик насоса</td><td>шт</td></tr><tr><td>16</td><td>1</td><td>1P0022.000.016</td><td>Ролик насоса</td><td>шт</td></tr><tr><td>17</td><td>1</td><td>1P0022.000.017</td><td>Ролик насоса</td><td>шт</td></tr><tr><td>18</td><td>1</td><td>1P0022.000.018</td><td>Ролик насоса</td><td>шт</td></tr><tr><td>19</td><td>1</td><td>1P0022.000.019</td><td>Ролик насоса</td><td>шт</td></tr><tr><td>20</td><td>1</td><td>1P0022.000.020</td><td>Ролик насоса</td><td>шт</td></tr><tr><td>21</td><td>1</td><td>1P0022.000.021</td><td>Ролик насоса</td><td>шт</td></tr><tr><td>22</td><td>1</td><td>1P0022.000.022</td><td>Ролик насоса</td><td>шт</td></tr><tr><td>23</td><td>1</td><td>1P0022.000.023</td><td>Ролик насоса</td><td>шт</td></tr><tr><td>24</td><td>1</td><td>1P0022.000.024</td><td>Ролик насоса</td><td>шт</td></tr><tr><td>25</td><td>1</td><td>1P0022.000.025</td><td>Ролик насоса</td><td>шт</td></tr><tr><td>26</td><td>1</td><td>1P0022.000.026</td><td>Ролик насоса</td><td>шт</td></tr><tr><td>27</td><td>1</td><td>1P0022.000.027</td><td>Ролик насоса</td><td>шт</td></tr><tr><td>28</td><td>1</td><td>1P0022.000.028</td><td>Ролик насоса</td><td>шт</td></tr><tr><td>29</td><td>1</td><td>1P0022.000.029</td><td>Ролик насоса</td><td>шт</td></tr><tr><td>30</td><td>1</td><td>1P0022.000.030</td><td>Ролик насоса</td><td>шт</td></tr><tr><td>31</td><td>1</td><td>1P0022.000.031</td><td>Ролик насоса</td><td>шт</td></tr></table>	ITEM	QTY	PART NUMBER	NAME	UNIT	1	1	1P0022.000.001	Корпус насоса	шт	2	1	1P0022.000.002	Вал насоса	шт	3	1	1P0022.000.003	Шкив насоса	шт	4	1	1P0022.000.004	Ролик насоса	шт	5	1	1P0022.000.005	Ролик насоса	шт	6	1	1P0022.000.006	Ролик насоса	шт	7	1	1P0022.000.007	Ролик насоса	шт	8	1	1P0022.000.008	Ролик насоса	шт	9	1	1P0022.000.009	Ролик насоса	шт	10	1	1P0022.000.010	Ролик насоса	шт	11	1	1P0022.000.011	Ролик насоса	шт	12	1	1P0022.000.012	Ролик насоса	шт	13	1	1P0022.000.013	Ролик насоса	шт	14	1	1P0022.000.014	Ролик насоса	шт	15	1	1P0022.000.015	Ролик насоса	шт	16	1	1P0022.000.016	Ролик насоса	шт	17	1	1P0022.000.017	Ролик насоса	шт	18	1	1P0022.000.018	Ролик насоса	шт	19	1	1P0022.000.019	Ролик насоса	шт	20	1	1P0022.000.020	Ролик насоса	шт	21	1	1P0022.000.021	Ролик насоса	шт	22	1	1P0022.000.022	Ролик насоса	шт	23	1	1P0022.000.023	Ролик насоса	шт	24	1	1P0022.000.024	Ролик насоса	шт	25	1	1P0022.000.025	Ролик насоса	шт	26	1	1P0022.000.026	Ролик насоса	шт	27	1	1P0022.000.027	Ролик насоса	шт	28	1	1P0022.000.028	Ролик насоса	шт	29	1	1P0022.000.029	Ролик насоса	шт	30	1	1P0022.000.030	Ролик насоса	шт	31	1	1P0022.000.031	Ролик насоса	шт
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Aspect – Explosion Drawing

WSOS section as per TD	Score	Descriptor	Resource																												
Judgement	0	The drawing has no path lines, components not identified, and no parts list.	 The explosion drawing shows a mechanical assembly with various components including a motor, gears, and structural frames. The drawing is presented on a grid with columns numbered 1 to 6 and rows lettered A to D. A table in the bottom right corner provides details about the drawing. <table border="1"> <tr> <td colspan="4">Task: 05 - Desenho Mecânico em CAD</td> </tr> <tr> <td>Task No:</td> <td colspan="3"></td> </tr> <tr> <td>Issue:</td> <td>10/09/2023</td> <td>Scale:</td> <td>A3</td> </tr> <tr> <td>Drawing Name:</td> <td>WBNC_TP05</td> <td>Page:</td> <td>2</td> </tr> <tr> <td>Version:</td> <td>00</td> <td>Revision:</td> <td></td> </tr> <tr> <td colspan="2">Project Test for Competition WorldSkills</td> <td colspan="2">Explosion Drawing</td> </tr> <tr> <td colspan="2">Copyright 2023 © WorldSkills</td> <td colspan="2">All Rights Reserved</td> </tr> </table>	Task: 05 - Desenho Mecânico em CAD				Task No:				Issue:	10/09/2023	Scale:	A3	Drawing Name:	WBNC_TP05	Page:	2	Version:	00	Revision:		Project Test for Competition WorldSkills		Explosion Drawing		Copyright 2023 © WorldSkills		All Rights Reserved	
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Project Test for Competition WorldSkills		Explosion Drawing																													
Copyright 2023 © WorldSkills		All Rights Reserved																													

WSOS section as per TD	Score	Descriptor	Resource
	1	The drawing presents assembly path lines, component identification and a complete parts list.	

WSOS
section as
per TD

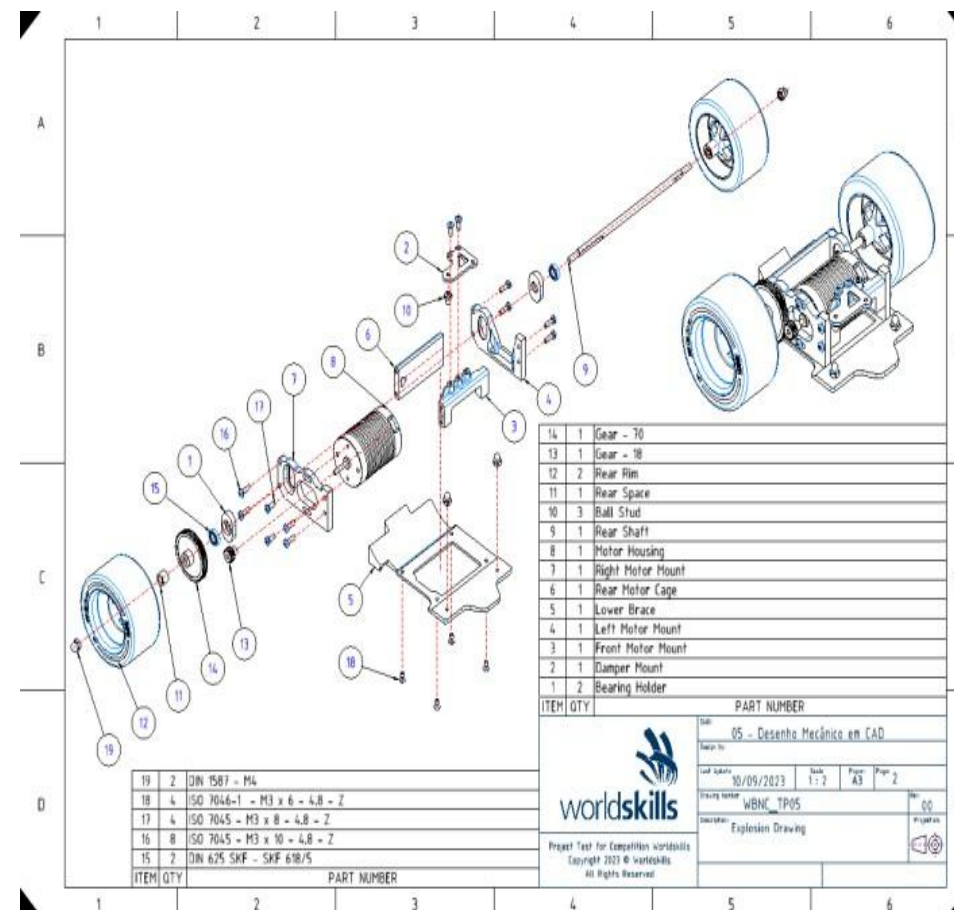
Score

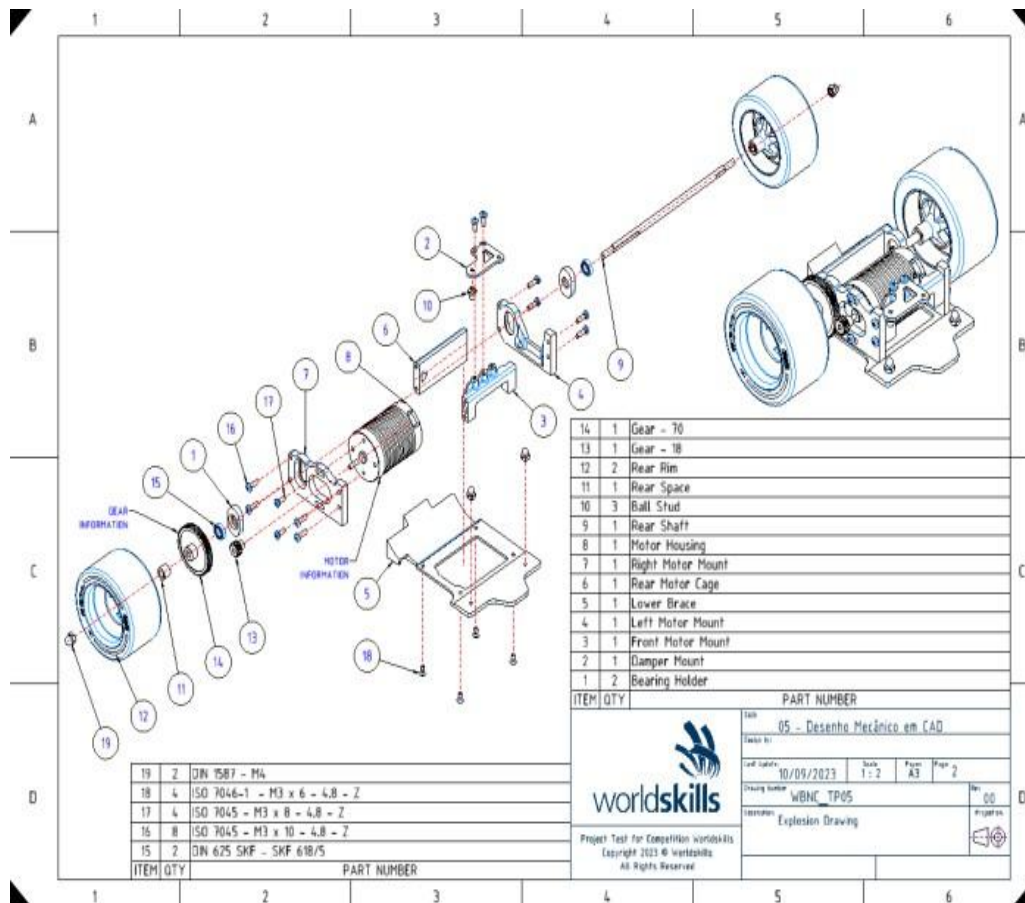
Descriptor

Resource

2

The drawing presents assembly path lines, component identification and a complete parts list. Identification balloons lined up. Isometric view according to task orientation.



WSOS section as per TD	Score	Descriptor	Resource																																																																																							
	3	The drawing presents assembly path lines, component identification and a complete parts list. Identification balloons lined up. Isometric view according to task orientation. Notes with information about the set for understanding, disassembling the set in a logical way.	 The drawing is an exploded view of a mechanical assembly, likely a small motor or pump. It shows various components like gears, shafts, bearings, and housing parts, each identified by a numbered callout. The assembly is shown in a disassembled state to illustrate the relationship between parts. Below the drawing is a detailed parts list table. <table><tr><th>ITEM</th><th>QTY</th><th>PART NUMBER</th></tr><tr><td>19</td><td>2</td><td>DN 1587 - M4</td></tr><tr><td>18</td><td>4</td><td>ISO 7046-1 - M3 x 6 - 4.8 - Z</td></tr><tr><td>17</td><td>4</td><td>ISO 7045 - M3 x 8 - 4.8 - Z</td></tr><tr><td>16</td><td>8</td><td>ISO 7045 - M3 x 10 - 4.8 - Z</td></tr><tr><td>15</td><td>2</td><td>DN 625 SKF - SKF 618/5</td></tr></table> <table><tr><th>ITEM</th><th>QTY</th><th>PART NUMBER</th></tr><tr><td>14</td><td>1</td><td>Gear - 70</td></tr><tr><td>13</td><td>1</td><td>Gear - 18</td></tr><tr><td>12</td><td>2</td><td>Rear Rim</td></tr><tr><td>11</td><td>1</td><td>Rear Space</td></tr><tr><td>10</td><td>3</td><td>Ball Stud</td></tr><tr><td>9</td><td>1</td><td>Rear Shaft</td></tr><tr><td>8</td><td>1</td><td>Motor Housing</td></tr><tr><td>7</td><td>1</td><td>Right Motor Mount</td></tr><tr><td>6</td><td>1</td><td>Rear Motor Cage</td></tr><tr><td>5</td><td>1</td><td>Lower Brace</td></tr><tr><td>4</td><td>1</td><td>Left Motor Mount</td></tr><tr><td>3</td><td>1</td><td>Front Motor Mount</td></tr><tr><td>2</td><td>1</td><td>Damper Mount</td></tr><tr><td>1</td><td>2</td><td>Bearing Holder</td></tr></table> <table><tr><th colspan="2">PART NUMBER</th></tr><tr><td>Task</td><td>05 - Desenho Mecânico em CAD</td></tr><tr><td>Task by</td><td></td></tr><tr><td>Valid until</td><td>10/09/2023</td></tr><tr><td>Scale</td><td>1:2</td></tr><tr><td>Page</td><td>A3</td></tr><tr><td>Page</td><td>2</td></tr><tr><td>Drawing Number</td><td>WBNC_TP05</td></tr><tr><td>Version</td><td>Explosion Drawing</td></tr><tr><td>Project Test for Competition WorldSkills</td><td></td></tr><tr><td>Copyright 2023 © WorldSkills</td><td></td></tr><tr><td>All Rights Reserved</td><td></td></tr></table>	ITEM	QTY	PART NUMBER	19	2	DN 1587 - M4	18	4	ISO 7046-1 - M3 x 6 - 4.8 - Z	17	4	ISO 7045 - M3 x 8 - 4.8 - Z	16	8	ISO 7045 - M3 x 10 - 4.8 - Z	15	2	DN 625 SKF - SKF 618/5	ITEM	QTY	PART NUMBER	14	1	Gear - 70	13	1	Gear - 18	12	2	Rear Rim	11	1	Rear Space	10	3	Ball Stud	9	1	Rear Shaft	8	1	Motor Housing	7	1	Right Motor Mount	6	1	Rear Motor Cage	5	1	Lower Brace	4	1	Left Motor Mount	3	1	Front Motor Mount	2	1	Damper Mount	1	2	Bearing Holder	PART NUMBER		Task	05 - Desenho Mecânico em CAD	Task by		Valid until	10/09/2023	Scale	1:2	Page	A3	Page	2	Drawing Number	WBNC_TP05	Version	Explosion Drawing	Project Test for Competition WorldSkills		Copyright 2023 © WorldSkills		All Rights Reserved	
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