



**SOLIDProof**  
*Bring trust into your projects*

**Blockchain Security | Smart Contract Audits | KYC**

MADE IN GERMANY

**MechaChain**

**Audit**

**Security Assessment**

**11. February, 2022**

**For**



**MECHACHAIN**

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| Version | Date              | Description  |
|---------|-------------------|--|
| 1.0     | 11. February 2022 | <ul style="list-style-type: none"><li>• Layout project</li><li>• Automated- /Manual-Security Testing</li><li>• Summary</li></ul> |

## **Network**

Binance Smart Chain (BEP20)

## **Website**

<https://mechachain.io/en/>

## **Telegram**

<https://t.me/mechachain>

## **Twitter**

<https://twitter.com/mechachain>

## **Discord**

<https://discord.gg/kMJCNaWaNz>



## Description

MechaChain is a 3D play-to-earn video game about robot combat and space conquest. Each robot, called “Mecha”, is a collection of NFT composed of robot parts, which can be purchased online with the game cryptocurrency called Mechanium, Ethereum, or by card. These parts once assembled give birth to a robot in a PvP fighting video game.

The player earns Mechanium by winning battles, and can trade and buy new parts to become the best MechaChain pilot.

## Project Engagement

During the 9th of February 2022, **MechaChain Team** engaged Solidproof.io to audit smart contracts that they created. The engagement was technical in nature and focused on identifying security flaws in the design and implementation of the contracts. They provided Solidproof.io with access to their code repository and whitepaper.

## Logo



## Contract Link

### v1.0

- Github
  - <https://github.com/thibautvdu/MechaChain-Smart-Contracts/tree/develop/contracts>
  - Commit: 678acde6e82a5c049c8e0707cb8095cfa8c3218e

# Vulnerability & Risk Level

Risk represents the probability that a certain source-threat will exploit vulnerability, and the impact of that event on the organization or system. Risk Level is computed based on CVSS version 3.0.

| Level                | Value   | Vulnerability   | Risk (Required Action)  |
|----------------------|---------|---|---|
| <b>Critical</b>      | 9 - 10  | A vulnerability that can disrupt the contract functioning in a number of scenarios, or creates a risk that the contract may be broken.      | Immediate action to reduce risk level.                              |
| <b>High</b>          | 7 – 8.9 | A vulnerability that affects the desired outcome when using a contract, or provides the opportunity to use a contract in an unintended way. | Implementation of corrective actions as soon as possible.           |
| <b>Medium</b>        | 4 – 6.9 | A vulnerability that could affect the desired outcome of executing the contract in a specific scenario.                                     | Implementation of corrective actions in a certain period.           |
| <b>Low</b>           | 2 – 3.9 | A vulnerability that does not have a significant impact on possible scenarios for the use of the contract and is probably subjective.       | Implementation of certain corrective actions or accepting the risk. |
| <b>Informational</b> | 0 – 1.9 | A vulnerability that have informational character but is not effecting any of the code.   | An observation that does not determine a level of risk              |

# Auditing Strategy and Techniques Applied

Throughout the review process, care was taken to evaluate the repository for security-related issues, code quality, and adherence to specification and best practices. To do so, reviewed line-by-line by our team of expert pentesters and smart contract developers, documenting any issues as there were discovered.

## **Methodology**

The auditing process follows a routine series of steps:

1. Code review that includes the following:
  - i) Review of the specifications, sources, and instructions provided to SolidProof to make sure we understand the size, scope, and functionality of the smart contract.
  - ii) Manual review of code, which is the process of reading source code line-by-line in an attempt to identify potential vulnerabilities.
  - iii) Comparison to specification, which is the process of checking whether the code does what the specifications, sources, and instructions provided to SolidProof describe.
2. Testing and automated analysis that includes the following:
  - i) Test coverage analysis, which is the process of determining whether the test cases are actually covering the code and how much code is exercised when we run those test cases.
  - ii) Symbolic execution, which is analysing a program to determine what inputs causes each part of a program to execute.
3. Best practices review, which is a review of the smart contracts to improve efficiency, effectiveness, clarify, maintainability, security, and control based on the established industry and academic practices, recommendations, and research.
4. Specific, itemized, actionable recommendations to help you take steps to secure your smart contracts.

## Used Code from other Frameworks/Smart Contracts (direct imports)

Imported packages:

| Dependency / Import Path                                | Count |
|---|-------|
| @openzeppelin/contracts/access/AccessControl.sol        | 1     |
| @openzeppelin/contracts/token/ERC20/utils/SafeERC20.sol | 1     |
| @openzeppelin/contracts/utils/math/SafeMath.sol         | 1     |





## Tested Contract Files

This audit covered the following files listed below with a SHA-1 Hash.

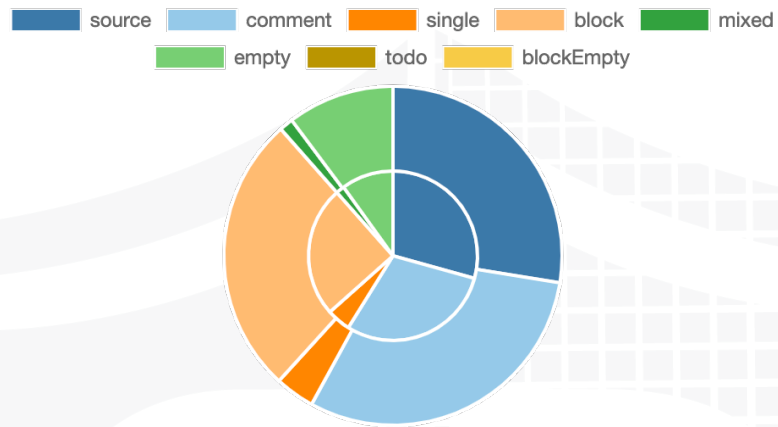
*A file with a different Hash has been modified, intentionally or otherwise, after the security review. A different Hash could be (but not necessarily) an indication of a changed condition or potential vulnerability that was not within the scope of this review.*

### v1.0

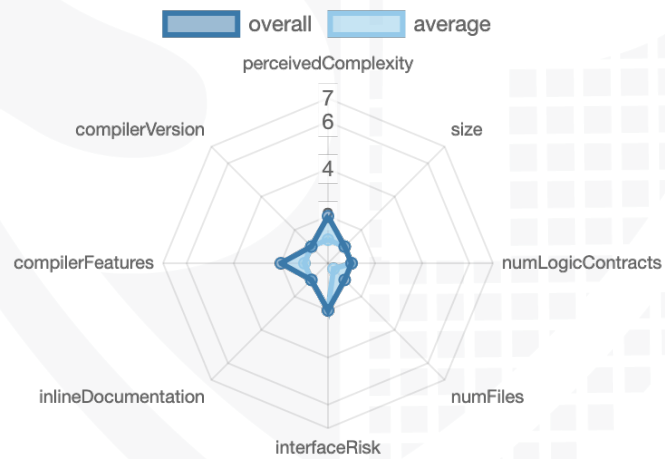
| File Name                                  | SHA-1 Hash                               |
|--|--|
| contracts/MechaniumVestingWallet.sol       | 007f9143ba862fdf36b492154d551760f29fc58b |
| contracts/IMechaniumVestingWallet.sol      | 44c81af9534c74f4d64ddf09fe768ee88e2782cf |
| contracts/MechaniumGrowthVestingWallet.sol | 5be660ffeccd17bf46e803b1fdac01311a3be6e  |

# Metrics

## Source Lines v1.0



## Risk Level v1.0



## Capabilities

### Components

| Version | Contracts | Libraries | Interfaces | Abstract |
|---------|-----------|-----------|------------|----------|
| 1.0     | 2         | 0         | 1          | 0        |

### Exposed Functions

*This section lists functions that are explicitly declared public or payable. Please note that getter methods for public stateVars are not included.*

| Version | Public | Payable |
|---------|--------|---------|
| 1.0     | 20     | 0       |

| Version | External | Internal | Private | Pure | View |
|---------|----------|----------|---------|------|------|
| 1.0     | 10       | 4        | 0       | 0    | 18   |

### State Variables

| Version | Total | Public |
|---------|-------|--------|
| 1.0     | 7     | 1      |

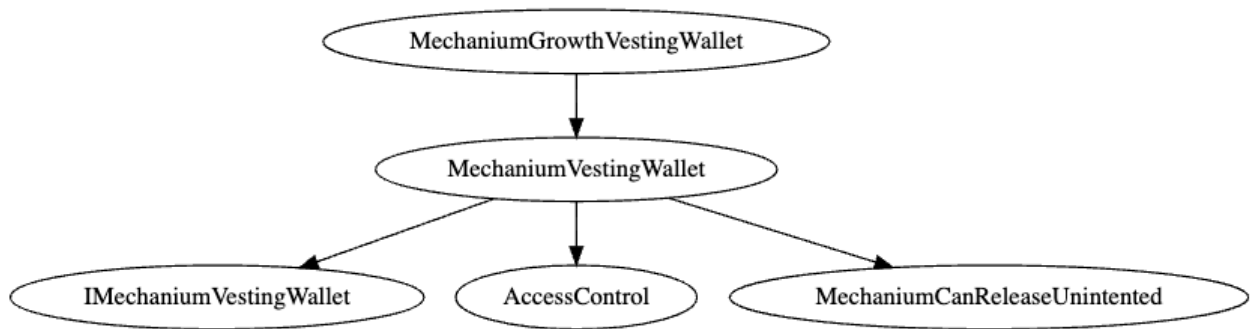
### Capabilities

| Version | Solidity Versions observed | Experimental Features | Can Receive Funds | Uses Assembly | Has Destroyable Contracts |
|---------|----------------------------|-----------------------|-------------------|---------------|---------------------------|
| 1.0     | ^0.8.2                     |                       |                   |               |                           |

| Version | Transfers ETH | Low-Level Calls | DelegateCall | Uses Hash Functions | EC Recover | New/Create/Create2 |
|---------|---------------|-----------------|--------------|---------------------|------------|--------------------|
| 1.0     |               |                 |              | yes                 |            |                    |

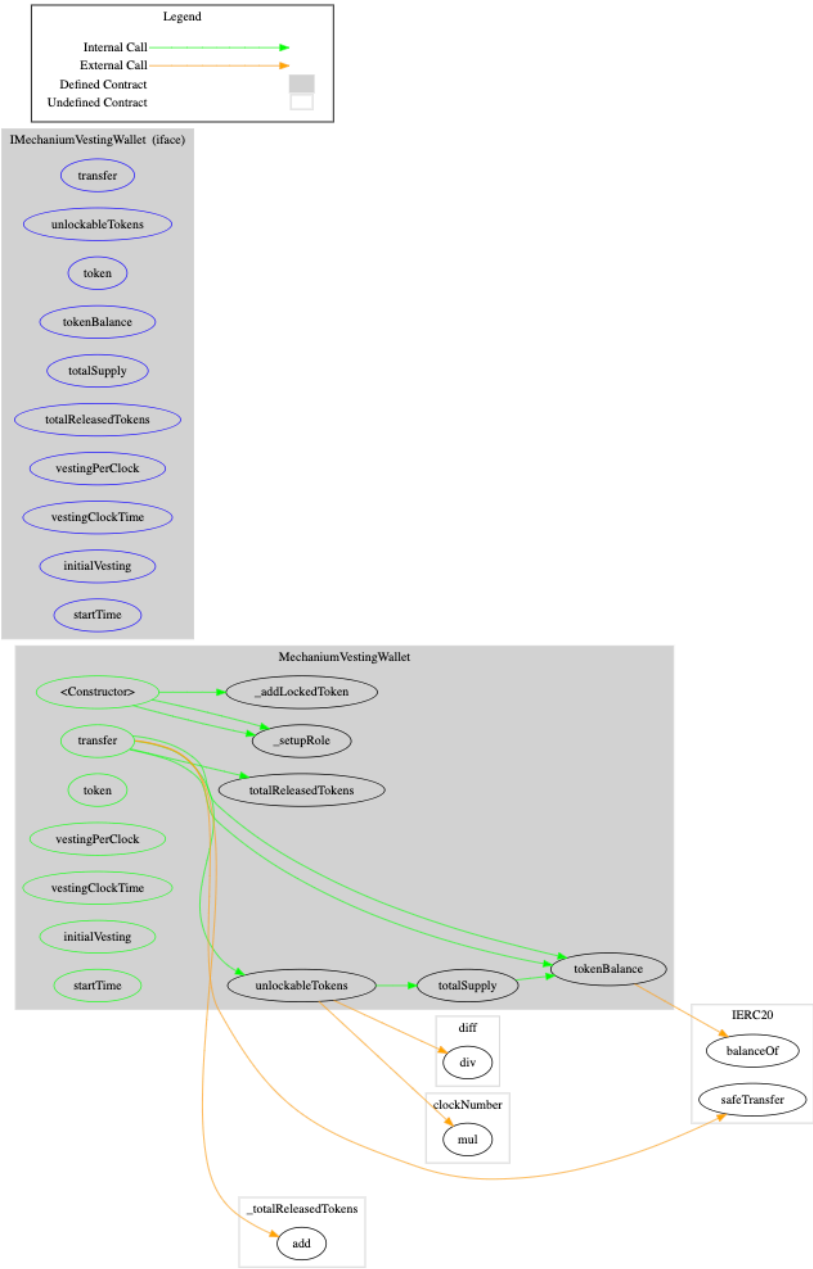
# Inheritance Graph

## v1.0



# CallGraph

v1.0



## Scope of Work/Verify Claims

The above token Team provided us with the files that needs to be tested (Github, Bscscan, Etherscan, files, etc.). The scope of the audit is the main contract (usual the same name as team appended with .sol).

We will verify the following claims:

1. Overall checkup (Smart Contract Security)



## Write functions of contract v1.0

grantRole

releaseUninte...

renounceRole

revokeRole

transfer

## Overall checkup (Smart Contract Security)

| Tested | Verified |
|--------|----------|
| ✓      | ✓        |


### Legend




| Attribute                | Symbol |
|--------------------------|--------|
| Verified / Checked       | ✓      |
| Partly Verified          | ⚠      |
| Unverified / Not checked | ✗      |
| Not available            | —      |




# Modifiers and public functions

v1.0

▼  transfer  
    Ⓜ onlyRole







▼  grantRole  
    Ⓜ onlyRole  
▼  revokeRole  
    Ⓜ onlyRole  
     renounceRole

▼  releaseUnintented  
    Ⓜ onlyRole

## Comments

- Only addresses with
  - TRANSFER\_ROLE
    - can use transfer function
  - DEFAULT\_ADMIN\_ROLE
    - Can use releaseUnintented function

## Source Units in Scope v1.0

| Type  | File                                       | Logic Contracts | Interfaces | Lines      | nLines     | nSLOC      | Comment Lines | Complex. Score | Capabilities  |
|---|--|-----------------|------------|------------|------------|------------|---------------|----------------|---|
|  | contracts/MechaniumVestingWallet.sol       | 1               | ————       | 214        | 209        | 94         | 86            | 67             |  |
|  | contracts/IMechaniumVestingWallet.sol      | ————            | 1          | 61         | 15         | 3          | 37            | 21             | ————  |
|  | contracts/MechaniumGrowthVestingWallet.sol | 1               | ————       | 26         | 26         | 12         | 14            | 4              | ————  |
|  | <b>Totals</b>                              | <b>2</b>        | <b>1</b>   | <b>301</b> | <b>250</b> | <b>109</b> | <b>137</b>    | <b>92</b>      |  |

### Legend

| Attribute        | Description   |
|------------------|---|
| Lines            | total lines of the source unit  |
| nLines           | normalized lines of the source unit (e.g. normalizes functions spanning multiple lines)   |
| nSLOC            | normalized source lines of code (only source-code lines; no comments, no blank lines)   |
| Comment Lines    | lines containing single or block comments   |
| Complexity Score | a custom complexity score derived from code statements that are known to introduce code complexity (branches, loops, calls, external interfaces, ...) |

# Audit Results

## AUDIT PASSED

### Critical issues

No critical issues

### High issues

No high issues

### Medium issues

No medium issues

### Low issues

| Issue | File                           | Type                     | Line | Description  |
|-------|--------------------------------|--------------------------|------|--|
| #1    | IMechaniumCanReleaseUnintended | A floating pragma is set | 2    | The current pragma Solidity directive is „^0.8.2“. |
| #2    | IMechaniumVestingWallet        | A floating pragma is set | 2    | The current pragma Solidity directive is „^0.8.2“. |
| #3    | MechaniumCanReleaseUnintended  | A floating pragma is set | 2    | The current pragma Solidity directive is „^0.8.2“. |
| #4    | MechaniumGrowthVestingWallet   | A floating pragma is set | 2    | The current pragma Solidity directive is „^0.8.2“. |

|    |                                    |                          |   |  |
|----|------------------------------------|--------------------------|---|--|
| #5 | Mechan<br>iumVest<br>ingWall<br>et | A floating pragma is set | 2 | The current pragma Solidity directive is „^0.8.2”. |
|----|------------------------------------|--------------------------|---|--|

## Informational issues

| Issue | File   | Type        | Line               | Description   |
|-------|--|-------------|--------------------|---|
| #1    | IMechan<br>iumVest<br>ingWall<br>et            | Misspelling | See<br>description | <p>Change following:</p> <ul style="list-style-type: none"> <li>- Mechanim to Mechanium L5</li> <li>- MechaniumCanReleaseUnintended to MechaniumCanReleaseUnintended L19, L8</li> <li>- transfered to transferred L74</li> </ul> <p>Change variables/functions/interfaces/imports etc. everywhere else</p>  |
| #2    | IMechan<br>iumCa<br>nReleas<br>eUninte<br>nted | Misspelling | See<br>description | <p>Change following:</p> <ul style="list-style-type: none"> <li>- Mechanim to Mechanium L5</li> <li>- IMechaniumCanReleaseUnintended to IMechaniumCanReleaseUnintended L10</li> <li>- unintended to unintended L12, L12, L13</li> <li>- releaseUnintended to releaseUnintended L18</li> </ul> <p>Change variables/functions/interfaces/imports etc. everywhere else</p> |

|    |                               |             |                 |   |
|----|-------------------------------|-------------|-----------------|---|
| #3 | MechaniumCanReleaseUnintented | Misspelling | See description | <p>Change following:</p> <ul style="list-style-type: none"> <li>- IMechaniumCanReleaseUnintented to IMechaniumCanReleaseUnintended L6, L14</li> <li>- ReleaseUnintentedTokens to ReleaseUnintendedTokens L23, L83</li> <li>- unintended to unintended L21, L47</li> <li>- releaseUnintented to releaseUnintended L52</li> </ul> <p>Change variables/functions/interfaces etc. everywhere else</p> |
| #4 | MechaniumVestingWallet        | Misspelling | See description | <p>Change following:</p> <ul style="list-style-type: none"> <li>- IMechaniumCanReleaseUnintented to IMechaniumCanReleaseUnintended L8, L19</li> <li>- transfered to transferred L74</li> </ul> <p>Change variables/functions/interfaces etc. everywhere else</p>  |

## Audit Comments

**11. February 2022:**

- [Read whole report for more information](#)

## SWC Attacks

| ID                        | Title   | Relationships  | Status |
|---------------------------|---|--|--------|
| <a href="#">SW C-1 36</a> | Unencrypted Private Data On-Chain                       | <a href="#">CWE-767: Access to Critical Private Variable via Public Method</a>         | PASSED |
| <a href="#">SW C-1 35</a> | Code With No Effects                                    | <a href="#">CWE-1164: Irrelevant Code</a>  | PASSED |
| <a href="#">SW C-1 34</a> | Message call with hardcoded gas amount                  | <a href="#">CWE-655: Improper Initialization</a>                                       | PASSED |
| <a href="#">SW C-1 33</a> | Hash Collisions With Multiple Variable Length Arguments | <a href="#">CWE-294: Authentication Bypass by Capture-replay</a>                       | PASSED |
| <a href="#">SW C-1 32</a> | Unexpected Ether balance                                | <a href="#">CWE-667: Improper Locking</a>  | PASSED |
| <a href="#">SW C-1 31</a> | Presence of unused variables                            | <a href="#">CWE-1164: Irrelevant Code</a>  | PASSED |
| <a href="#">SW C-1 30</a> | Right-To-Left-Override control character (U+202E)       | <a href="#">CWE-451: User Interface (UI) Misrepresentation of Critical Information</a> | PASSED |
| <a href="#">SW C-1 29</a> | Typographical Error                                     | <a href="#">CWE-480: Use of Incorrect Operator</a>                                     | PASSED |
| <a href="#">SW C-1 28</a> | DoS With Block Gas Limit                                | <a href="#">CWE-400: Uncontrolled Resource Consumption</a>                             | PASSED |

|                           |   |   |               |
|---------------------------|---|---|---------------|
| <a href="#">SW C-1 27</a> | Arbitrary Jump with Function Type Variable          | <a href="#">CWE-695: Use of Low-Level Functionality</a>                   | <b>PASSED</b> |
| <a href="#">SW C-1 25</a> | Incorrect Inheritance Order                         | <a href="#">CWE-696: Incorrect Behavior Order</a>                         | <b>PASSED</b> |
| <a href="#">SW C-1 24</a> | Write to Arbitrary Storage Location                 | <a href="#">CWE-123: Write-what-where Condition</a>                       | <b>PASSED</b> |
| <a href="#">SW C-1 23</a> | Requirement Violation                               | <a href="#">CWE-573: Improper Following of Specification by Caller</a>    | <b>PASSED</b> |
| <a href="#">SW C-1 22</a> | Lack of Proper Signature Verification               | <a href="#">CWE-345: Insufficient Verification of Data Authenticity</a>   | <b>PASSED</b> |
| <a href="#">SW C-1 21</a> | Missing Protection against Signature Replay Attacks | <a href="#">CWE-347: Improper Verification of Cryptographic Signature</a> | <b>PASSED</b> |
| <a href="#">SW C-1 20</a> | Weak Sources of Randomness from Chain Attributes    | <a href="#">CWE-330: Use of Insufficiently Random Values</a>              | <b>PASSED</b> |
| <a href="#">SW C-11 9</a> | Shadowing State Variables                           | <a href="#">CWE-710: Improper Adherence to Coding Standards</a>           | <b>PASSED</b> |
| <a href="#">SW C-11 8</a> | Incorrect Constructor Name                          | <a href="#">CWE-665: Improper Initialization</a>                          | <b>PASSED</b> |
| <a href="#">SW C-11 7</a> | Signature Malleability                              | <a href="#">CWE-347: Improper Verification of Cryptographic Signature</a> | <b>PASSED</b> |

|                           |                                      |  |               |
|---------------------------|--------------------------------------|--|---------------|
| <a href="#">SW C-11 6</a> | Timestamp Dependence                 | <a href="#">CWE-829: Inclusion of Functionality from Untrusted Control Sphere</a>                                    | <b>PASSED</b> |
| <a href="#">SW C-11 5</a> | Authorization through tx.origin      | <a href="#">CWE-477: Use of Obsolete Function</a>  | <b>PASSED</b> |
| <a href="#">SW C-11 4</a> | Transaction Order Dependence         | <a href="#">CWE-362: Concurrent Execution using Shared Resource with Improper Synchronization ('Race Condition')</a> | <b>PASSED</b> |
| <a href="#">SW C-11 3</a> | DoS with Failed Call                 | <a href="#">CWE-703: Improper Check or Handling of Exceptional Conditions</a>  | <b>PASSED</b> |
| <a href="#">SW C-11 2</a> | Delegatecall to Untrusted Callee     | <a href="#">CWE-829: Inclusion of Functionality from Untrusted Control Sphere</a>                                    | <b>PASSED</b> |
| <a href="#">SW C-11 1</a> | Use of Deprecated Solidity Functions | <a href="#">CWE-477: Use of Obsolete Function</a>  | <b>PASSED</b> |
| <a href="#">SW C-11 0</a> | Assert Violation                     | <a href="#">CWE-670: Always-Incorrect Control Flow Implementation</a>  | <b>PASSED</b> |
| <a href="#">SW C-1 09</a> | Uninitialized Storage Pointer        | <a href="#">CWE-824: Access of Uninitialized Pointer</a>   | <b>PASSED</b> |
| <a href="#">SW C-1 08</a> | State Variable Default Visibility    | <a href="#">CWE-710: Improper Adherence to Coding Standards</a>  | <b>PASSED</b> |
| <a href="#">SW C-1 07</a> | Reentrancy                           | <a href="#">CWE-841: Improper Enforcement of Behavioral Workflow</a>   | <b>PASSED</b> |
| <a href="#">SW C-1 06</a> | Unprotected SELFDESTRUCT Instruction | <a href="#">CWE-284: Improper Access Control</a>   | <b>PASSED</b> |



|   |                                      |  |                       |
|---|--------------------------------------|--|-----------------------|
| <a href="#">SW</a><br><a href="#">C-1</a><br><a href="#">05</a> | Unprotected<br>Ether<br>Withdrawal   | <a href="#">CWE-284: Improper Access<br/>Control</a>                                 | <b>PASSED</b>         |
| <a href="#">SW</a><br><a href="#">C-1</a><br><a href="#">04</a> | Unchecked<br>Call Return<br>Value    | <a href="#">CWE-252: Unchecked Return<br/>Value</a>                                  | <b>PASSED</b>         |
| <a href="#">SW</a><br><a href="#">C-1</a><br><a href="#">03</a> | Floating<br>Pragma                   | <a href="#">CWE-664: Improper Control of<br/>a Resource Through its<br/>Lifetime</a> | <b>NOT<br/>PASSED</b> |
| <a href="#">SW</a><br><a href="#">C-1</a><br><a href="#">02</a> | Outdated<br>Compiler<br>Version      | <a href="#">CWE-937: Using Components<br/>with Known Vulnerabilities</a>             | <b>PASSED</b>         |
| <a href="#">SW</a><br><a href="#">C-1</a><br><a href="#">01</a> | Integer<br>Overflow and<br>Underflow | <a href="#">CWE-682: Incorrect<br/>Calculation</a>                                   | <b>PASSED</b>         |
| <a href="#">SW</a><br><a href="#">C-1</a><br><a href="#">00</a> | Function<br>Default<br>Visibility    | <a href="#">CWE-710: Improper Adherence<br/>to Coding Standards</a>                  | <b>PASSED</b>         |

The logo features the words "SolidProof" in a white, handwritten-style script. The "P" is large and stylized, with a long horizontal stroke that extends to the left. The background is a solid blue color with a faint, large, semi-transparent shield emblem. The shield has a grid-like pattern on its right side and a solid blue area on its left side.

SolidProof

**Blockchain Security | Smart Contract Audits | KYC**

A small horizontal bar representing the German flag, with black, red, and gold stripes.

MADE IN GERMANY