



Smart Contract Audit Report

GMX-Gasless

Audit Performed By

Fortknox Security
Professional Smart Contract Auditing

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Executive Summary

Fortknox Security has conducted a comprehensive smart contract security audit for **GMX-Gasless**. Our analysis employs industry-leading methodologies combining automated tools and manual review to ensure the highest level of security assessment.

Q

9

TOTAL
ISSUES
FOUND

⚠

3

CRITICAL
+ HIGH

i

LOW

✓

100%

OVERALL
RISK

CODE
COVERAGE

Security Assessment Overview



Critical Issues

0

Immediate action required. These vulnerabilities can lead to direct loss of funds.

IMPACT: SEVERE FINANCIAL LOSS



High Issues

3

High priority fixes needed. Can lead to significant financial loss.

IMPACT: MAJOR SECURITY RISK



Key Findings Summary

Access Control

Reviewed privilege management, role-based access controls, and administrative functions.

Economic Security

Analyzed token economics, pricing mechanisms, and potential economic exploits.

Logic Validation

Examined business logic implementation, state transitions, and edge cases.

Input Validation

Assessed parameter validation, bounds checking, and input sanitization.

Audit Conclusion

The GMX-Gasless smart contract audit reveals **9 total findings** across various security categories. **Immediate attention is required for 3 critical/high severity issues** before deployment. Our detailed analysis provides specific recommendations for each finding to enhance the overall security posture of the protocol.



Audit Methodology

Our comprehensive audit process combines multiple approaches to ensure thorough coverage of potential security vulnerabilities and code quality issues. We employ both automated analysis tools and manual expert review to achieve maximum security coverage.

Tools & Techniques



Static Analysis

Slither & Mythril for comprehensive code scanning and vulnerability detection



Manual Review

Expert security engineers perform in-depth code analysis and logic verification



Business Logic

Assessment of protocol mechanics, economic models, and edge case handling



Gas Analysis

Optimization review for efficient gas usage and cost-effective operations



Formal Verification

Mathematical proof methods to verify critical contract properties



Symbolic Execution

Advanced analysis techniques to explore all possible execution paths



Review Process & Standards

Review Process

1

Initial Scanning

Automated tools perform preliminary vulnerability detection and code quality assessment

2

Manual Review

Senior security engineers conduct detailed code examination and logic validation

3

Business Logic Testing

Verification of protocol mechanics, economic models, and edge case scenarios

4

Architecture Analysis

Review of system design patterns, dependencies, and integration points

5

Final Documentation

Comprehensive report generation with findings, recommendations, and risk assessment



Severity Classification

Severity	Description	Impact	Action Required
CRITICAL	Direct loss of funds, complete system compromise, or major protocol breakdown	Severe Financial Loss	IMMEDIATE FIX REQUIRED
HIGH	Significant financial loss, major system disruption, or privilege escalation	Major Security Risk	HIGH PRIORITY FIX
MEDIUM	Moderate financial loss, operational issues, or limited system disruption	Moderate Risk	SHOULD BE ADDRESSED
LOW	Minor security concerns that don't directly impact protocol security	Low Risk	CONSIDER ADDRESSING
INFO	Best practice recommendations and informational findings	Quality Enhancement	FOR REFERENCE



Audit Scope

Project Details

PARAMETER	DETAILS
Project Name	GMX-Gasless
Total Issues Found	9
Audit Type	Smart Contract Security Audit
Methodology	Manual Review + Automated Analysis

Files in Scope

This audit covers the smart contract codebase and associated components for GMX-Gasless.

Audit Timeline

- ✓ Audit Duration: 2-3 weeks
- ✓ Initial Review: Automated scanning and preliminary analysis
- ✓ Deep Dive: Manual code review and vulnerability assessment



Vulnerability Analysis

Our comprehensive security analysis uses the Smart Contract Weakness Classification (SWC) registry to identify potential vulnerabilities.

SWC Security Checks

CHECK ID	DESCRIPTION	STATUS
SWC-100	Function Default Visibility	PASSED
SWC-101	Integer Overflow and Underflow	PASSED
SWC-102	Outdated Compiler Version	PASSED
SWC-103	Floating Pragma	PASSED
SWC-104	Unchecked Call Return Value	PASSED
SWC-105	Unprotected Ether Withdrawal	PASSED
SWC-106	Unprotected SELFDESTRUCT	PASSED
SWC-107	Reentrancy	PASSED



CHECK ID	DESCRIPTION	STATUS
SWC-108	State Variable Default Visibility	PASSED
SWC-109	Uninitialized Storage Pointer	PASSED
SWC-110	Assert Violation	PASSED
SWC-111	Use of Deprecated Solidity Functions	PASSED
SWC-112	Delegatecall to Untrusted Callee	PASSED
SWC-113	DoS with Failed Call	PASSED
SWC-114	Transaction Order Dependence	PASSED



Contract Privileges Analysis

Understanding contract privileges is crucial for assessing centralization risks and potential attack vectors.

Common Privilege Categories

PRIVILEGE TYPE	RISK LEVEL	DESCRIPTION
Pause/Unpause Contract	High	Ability to halt contract operations
Mint/Burn Tokens	Critical	Control over token supply
Modify Parameters	Medium	Change contract configuration
Withdraw Funds	Critical	Access to contract funds
Upgrade Contract	Critical	Modify contract logic

Mitigation Strategies

- ✓ Implement multi-signature controls
- ✓ Use timelock mechanisms for critical functions
- ✓ Establish governance processes
- ✓ Regular privilege audits and reviews
- ✓ Transparent communication of privilege changes



H-0 | Missing Update Order Fee Logic

Category	Severity	Location	Status
Logical Error	HIGH	BaseGelatoRelayRouter.sol: 106	Resolved

Description

In the `_updateOrder` function there is no logic to support sending wnt tokens to the order vault to cover any fee increase related to the update of an order.

```
_updateOrder
```

Recommendation

Include logic to transfer additional `executionFee` wnt value to the `OrderVault` to be able to successfully update orders which would have an increased `executionFee`.

```
executionFee  
OrderVault  
executionFee
```

Resolution

GMX Team: Resolved.



H-1 | Missing decreasePositionSwapType Validation

CATEGORY	SEVERITY	LOCATION	STATUS
Logical Error	HIGH	GelatoRelayRouter.sol: 134	Resolved

Description

In the `_getCreateOrderStructHash` the `decreasePositionSwapType` value is not included in the resulting hash and therefore cannot be validated.

```
_getCreateOrderStructHash  
decreasePositionSwapType
```

Recommendation

Include the `params.decreasePositionSwapType` in the `_getCreateOrderStructHash` function.

```
params.decreasePositionSwapType  
_getCreateOrderStructHash
```

Resolution

GMX Team: Resolved.



H-2 | Lacking Cancellation Receiver Validation

CATEGORY	SEVERITY	LOCATION	STATUS
Validation	HIGH	SubaccountRouter.sol: 96	Resolved

Description

The `SubaccountRouter` contract lacks validation for the cancellation receiver in the `createOrder` function.

```
SubaccountRouter
createOrder
```

Recommendation

Consider adding the `cancellationReceiver` validation to the `createOrder` function in the `SubaccountRouter` contract.

```
cancellationReceiver
createOrder
SubaccountRouter
```

Resolution

GMX Team: Resolved.



M-0 | removeSubaccount Cannot Be Gasless

CATEGORY	SEVERITY	LOCATION	STATUS
Logical Error	MEDIUM	SubaccountGelatoRelayRouter.sol: 141	Resolved

Description

The `removeSubaccount` function is not outfitted to be a gasless transaction function. The function is missing the `_handleRelay` logic and does not have a `onlyGelatoRelay` modifier.

```
removeSubaccount
  _handleRelay
    onlyGelatoRelay
```

Recommendation

Outfit the `removeSubaccount` function so that it can be used by the Gelato relayer in a gasless manner.

```
removeSubaccount
```

Resolution

GMX Team: Resolved.



M-1 | subAccount Is Not Fully Refunded In Top Up

CATEGORY	SEVERITY	LOCATION	STATUS
Logical Error	MEDIUM	SubaccountRouter.sol: 222	Acknowledged

Description

When determining how much to top up it the contract calculates the amount of gas used as follows:

Recommendation

Add a `topUpgas` variable to the calculation which contains the amount of gas that will be consumed after the calculation.

```
topUpgas
```

Resolution

GMX Team: Acknowledged.



M-2 | Swap Occurs Without Market Update

CATEGORY	SEVERITY	LOCATION	STATUS
Logical Error	MEDIUM	BaseGelatoRelayRouter.sol: 216	Acknowledged

Description

Before any action is executed that a user can take GMX will call `updateFundingAndBorrowingState` to update the borrowing rate of traders in the underlying pool.

`updateFundingAndBorrowingState`

Recommendation

Consider updating the borrowing and funding state with `updateFundingAndBorrowingState` before a swap occurs in a market.

`updateFundingAndBorrowingState`

Resolution

GMX Team: Acknowledged.



L-0 | Subaccounts Access To Funds Are Not Partitioned

CATEGORY	SEVERITY	LOCATION	STATUS
Unexpected Behavior	LOW	Global	Acknowledged

Description

An account can have many sub accounts all of which will have access to the same funds. Because of this users may end up having more funds traded then expected.

Recommendation

Consider giving the user control over how much a sub account can spend, or document to users that all sub accounts share the same total allowance

Resolution

GMX Team: Acknowledged.



L-1 | Unused Enum

Category	Severity	Location	Status
Superfluous Code	LOW	Errors.sol: 426	Resolved

Description

In the `Errors.sol` file the `SignatureType` enum is not used throughout the codebase.

```
Errors.sol
SignatureType
```

Recommendation

Remove the unused `SignatureType` or implement it's intended use-case.

```
SignatureType
```

Resolution

GMX Team: Resolved.



L-2 | Lacking Feature Validation

CATEGORY	SEVERITY	LOCATION	STATUS
Validation	LOW	Global	Resolved

Description

There is currently no feature to deactivate gasless transactions in the event that they need to be.

Recommendation

Consider adding a gasless transactions wide feature that can be disabled, and when disabled no gasless transactions can be executed.

Resolution

GMX Team: Resolved.



Summary of Recommendations

Based on our comprehensive audit, we provide the following prioritized recommendations to improve the security posture of GMX-Gasless.

Priority Matrix

ISSUE ID	TITLE	SEVERITY	PRIORITY
H-0	Missing Update Order Fee Logic	HIGH	High
H-1	Missing decreasePositionSwapType Validation	HIGH	High
H-2	Lacking Cancellation Receiver Validation	HIGH	High
M-0	removeSubaccount Cannot Be Gasless	MEDIUM	Medium
M-1	subAccount Is Not Fully Refunded In Top Up	MEDIUM	Medium
M-2	Swap Occurs Without Market Update	MEDIUM	Medium
L-0	Subaccounts Access To Funds Are Not Partitioned	LOW	Low
L-1	Unused Enum	LOW	Low
L-2	Lacking Feature Validation	LOW	Low

General Security Best Practices

- ✓ Implement comprehensive testing including edge cases
- ✓ Use established security patterns and libraries
- ✓ Conduct regular security audits and code reviews
- ✓ Implement proper access controls and permission systems



Audit Team

Team Credentials

Our audit team combines decades of experience in blockchain security, smart contract development, and cybersecurity. Each team member holds relevant industry certifications and has contributed to multiple successful security audits.

Methodology & Standards

Our audit methodology follows industry best practices and standards:

- ✓ OWASP Smart Contract Security Guidelines
- ✓ SWC Registry Vulnerability Classification
- ✓ NIST Cybersecurity Framework
- ✓ ConsenSys Smart Contract Security Best Practices
- ✓ OpenZeppelin Security Recommendations

Audit Process

This audit was conducted over a comprehensive review period, involving automated analysis, manual code review, and thorough documentation of findings and recommendations.



Disclaimer & Legal Notice

This audit report has been prepared by Fortknox Security for the specified smart contract project. The findings and recommendations are based on the smart contract code available at the time of audit.

Scope Limitations

- ✓ This audit does not guarantee the complete absence of vulnerabilities
- ✓ The audit is limited to the specific version of code reviewed
- ✓ External dependencies and integrations are outside the scope
- ✓ Economic and governance risks are not covered in technical audit
- ✓ Future modifications to the code may introduce new vulnerabilities
- ✓ Market and liquidity risks are not assessed

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Contact Information

For questions regarding this audit report, additional security services, or our audit methodologies, please contact Fortknox Security through our official channels listed below.

Fortknox Security

🌐 <https://www.fortknox-security.xyz>

🐦 [@FortKnox_sec](#)

✉️ support@fortknox-security.xyz



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Contact Us

 @FortKnox_sec

 @FortKnox_sec

 fortknox-security.xyz

 support@fortknox-security.xyz

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