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Zagreb Stock Exchange

Emergency Playbook

Incident Management Guide

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1 List of Abbreviations

The following table lists the abbreviations used in this document:

ADH	Alliance Data Highway
ASP	Application Service Provider
DBAG	Deutsche Börse AG
DR	Disaster Recovery
CARNET	Croatian Academic and Research Network
CET	Central European Time
CCP	Central Counterparty
CSD	Central Securities Depository
CSIRT	Computer Security Incident Response Team
GUI	Graphical User Interface
HANFA	Croatian Financial Services Supervisory Agency
ISV	Independent Software Vendor
LAN	Local Area Network
MFA	Master Framework Agreement between WBAG and ZSE
MiFID II	Markets in Financial Instruments Directive (2014/65/EU)
NCA	National Competent Authority
PEX	WBAG's Partner Exchanges: Budapest, Ljubljana, Prague and Zagreb Stock Exchange
VLAN	Virtual Local Area Network
WBAG	Wiener Börse AG - Vienna Stock Exchange
ZSE	Zagreb Stock Exchange



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2 Introduction

This document provides trading participants with a summary of Zagreb Stock Exchange (ZSE) emergency procedures in the event of a technical incident on the trading system that requires a Market Halt. It describes how ZSE will communicate in such cases to its customers (trading members, ASPs, ISVs), the NCA, the CSD, the CCP and the public.

The trading system of ZSE is provided by Wiener Börse AG (WBAG) on the Xetra® T7 trading platform operated by Deutsche Börse AG (DBAG), who rely on stable and resilient systems and aim to minimize disruptions and uncertainties.

MiFID II defines the requirements for trading venues to ensure the resilience of systems and orderly trading. ZSE complies with these requirements through the service levels contractually agreed with WBAG and thus ensures a high availability of the trading system.

In the event of a technical incident, ZSE has implemented processes and communication guidelines with all parties involved to minimize the impact of an incident and to resolve the problem quickly. Transparent and timely communication towards the trading participants is a key point in this process.



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3 Incident Prevention

The Xetra® T7 system is based on the state-of-the-art technology and a robust and resilient architecture that is continuously improved. It is a main goal for a provider to avoid any system issues and to ensure the highest possible system availability.

3.1 System Provider

The Xetra® T7 trading system of ZSE is provided by WBAG on the T7® trading platform operated by DBAG – the same platform used for the Frankfurt Stock Exchange, Eurex, Vienna Stock Exchange and other WBAG’s Partner Exchanges (PEX) in Budapest, Ljubljana and Prague.

WBAG provides for ZSE the connectivity services to the Xetra® T7 trading system, index calculation services and ADH Market Data Distribution to Data Vendors.

The core features of the trading system resilience were designed to ensure data integrity as well as maximum availability and to reduce the likelihood of technical incidents considerably by:

- redundancy of core elements,
- physical separation in two separated data centre rooms,
- separate Disaster Recovery system.

3.2 System Architecture

ZSE operates its markets on the Xetra® T7 trading system, accessed by the supplementary services provided through WBAG’s infrastructure.

The central Xetra® T7 systems are operated by DBAG in Frankfurt. DBAG also operates a “Disaster Recovery Data Centre,, which serves on the one hand as an access point to the Xetra® T7 system and on the other hand as a Disaster Recovery data centre for the Xetra® T7 system.

The central Xetra® T7 production system architecture consists of so-called “partitions” that are designed redundantly – in two physically separated rooms. ZSE’s trading system is operated on one partition. On this partition the central data processing components – the order books, matchers, market data and trade generation as well as distribution functions – are deployed. As an access point for trading members to the trading system, several gateway systems are operated in a location that is also designed redundantly in two physically separated rooms. The market data servers for Xetra® T7 – reference data as well as netted, unnetted and tick-by-tick market data – are also located in DBAG data centres. Among other things, they provide the market data for the index calculation, ADH Market Data Distribution to Data Vendors as well as for WBAG’s trading interfaces.

The second location – the Disaster Recovery Data Centre – is used for simulation operations and is available as a fallback option (*cold standby*) for production takeover if the first location fails completely.



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A detailed description of the Trading System Resilience of the Xetra® T7 System can be found in the [Emergency Playbook for Incident Handling DBAG](#) of DBAG.

The local Xetra® T7 networks at WBAG are provided on WBAG's own virtual LANs (VLANs). Separate hardware is used for production, simulation, and internal test operation. The hardware used is operated redundantly for all environments in two independent data centres (*primary* and *backup*).

3.3 Network Design

The network connections between ZSE's primary and secondary (DR) data centres and WBAG's data centres are provided by WBAG through two separate leased lines.

ZSE's trading members may choose to connect to the Xetra® T7 trading system indirectly through WBAG's trading interfaces (CEESEG FIX and CEE Trader) or DBAG's native interfaces directly via any Xetra® T7 access point.

Connectivity services provided by WBAG for ZSE are the subject of the MFA between WBAG and ZSE, and as such are completely under WBAG's responsibility as a service provider.

The physical network connection of WBAG to the Xetra® T7 trading system is provided via redundantly designed, dedicated network connections to the DBAG Access Point locations in Vienna. The network connections between the DBAG data centres in Frankfurt and the DBAG Access Point locations in Vienna are operated by DBAG. They are part of the DBAG network and in DBAG's responsibility.

4 Incident Handling

Bearing in mind that an incident which may occur on the core Xetra® T7 trading system involves all parties, starting with DBAG as a T7® trading platform operator, WBAG as a ZSE service provider and ZSE as a market operator, all participants in this chain are comprehensively prepared to deal with emergency situations.

The communication process with the service provider WBAG is carried out through various dedicated channels (emergency contacts, Service Desk, WBAG ticketing system, WBAG emergency channels via MS Teams or Zoom) depending on the severity of the situation. All critical information is communicated in real-time. To ensure the highest quality of service, communication protocols and channels are tested annually with the WBAG Service Desk.

Disaster recovery (DR) tests in the Xetra® T7 Production Environment are carried out at least once per year. Additionally, different incident test scenarios are regularly executed in the Xetra® T7 Simulation Environment. The Simulation Environment is available continuously and allows ZSE and its trading members to test the system in normal and abnormal conditions.

4.1 Disaster Recovery Testing

ZSE takes part in the regular trading system DR tests organized by WBAG. Testing is conducted using the native DBAG's Xetra® T7 GUIs. At the same time, connections and services of WBAG as System Provider for PEX and WBAG as Authorized Service Provider for trading members are tested by WBAG.

WBAG also organizes separate DR tests for its trading interfaces (CEESEG FIX and CEE Trader) and PEX Interexchange Connectivity on a yearly basis.

4.2 Focus Days

During ongoing Xetra® T7 Simulation, several "Focus Days" (e.g., Market Data Failure, Processing Delays, Gateway and Matching Engine Failover, Market Halt) are offered to trading members. Within the scope of the *Focus Days*, ZSE and WBAG test the reaction of the trading system related downstream systems as well as behaviour of WBAG's FIX interface and trading GUIs.

Details about timing and actions during Focus Days are communicated to trading members, ISVs and technical connectivity customers via a [Focus Days on Simulation](#) document and via the [ZSE Simulation Calendar](#).



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5 Incident Management and Communication

Incidents which have as a direct consequence the suspension of trading (Market Halt) on markets operated by ZSE are internally categorized as high priority incidents. As soon as the problem has been identified, and resolved and the systems are available for trading again, all relevant parties are informed by ZSE.

5.1 Incident Detection

Immediately upon detection of issues on the trading system, the communication process with WBAG is started via the emergency phone lines and WBAG's ticketing system. Simultaneously, ZSE's Crisis Management Committee is notified about the ongoing incident.

In the shortest possible time, ZSE's Information Technology Department receives the preliminary information from WBAG on the affected parts of the trading system.

Immediately upon notification, ZSE's Crisis Management Committee meets as soon as possible to review the consequences of the incident on the Stock Exchange's operations and determine the course of further action. All strategic decisions are made by the ZSE's Management Board, on the recommendation of the Crisis Management Committee. All further internal communication in regard of the incident is conducted through the Crisis Management Committee.

5.2 Incident Communication

The communication channels with the following parties are immediately activated upon the confirmation of the incident:

- **trading system customers:** trading members, ASPs, ISVs, Data Vendors;
- **the NCA** – HANFA;
- **the CSD** – *CENTRAL DEPOSITORY & CLEARING COMPANY Inc.*;
- **the CCP** – *SKDD-CCP Smart Clear d.d.*;
- **the public.**

All parties shall receive regular updates to ensure full transparency of the status of an incident. Parties can expect an update at regular intervals after the initial emergency message and until final resolution of the issue. Updates are provided as soon as they are provided by the service providers.

Trading system customers are required to provide up-to-date contact details to ensure a complete list of persons to be contacted when incidents occur.



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5.2.1 Communication Media

ZSE informs all parties in Incident Communication via the following channels, as technically available:

- public zse.hr website, section *Trading* news;
- *News Board* on the trading system, available to trading members;
- **ZSE Xetra® T7 Customer Zone** website, available to trading system customers;
- trading system customer mailing lists,
- pre-defined emergency contacts, by e-mail or alternatively by phone.

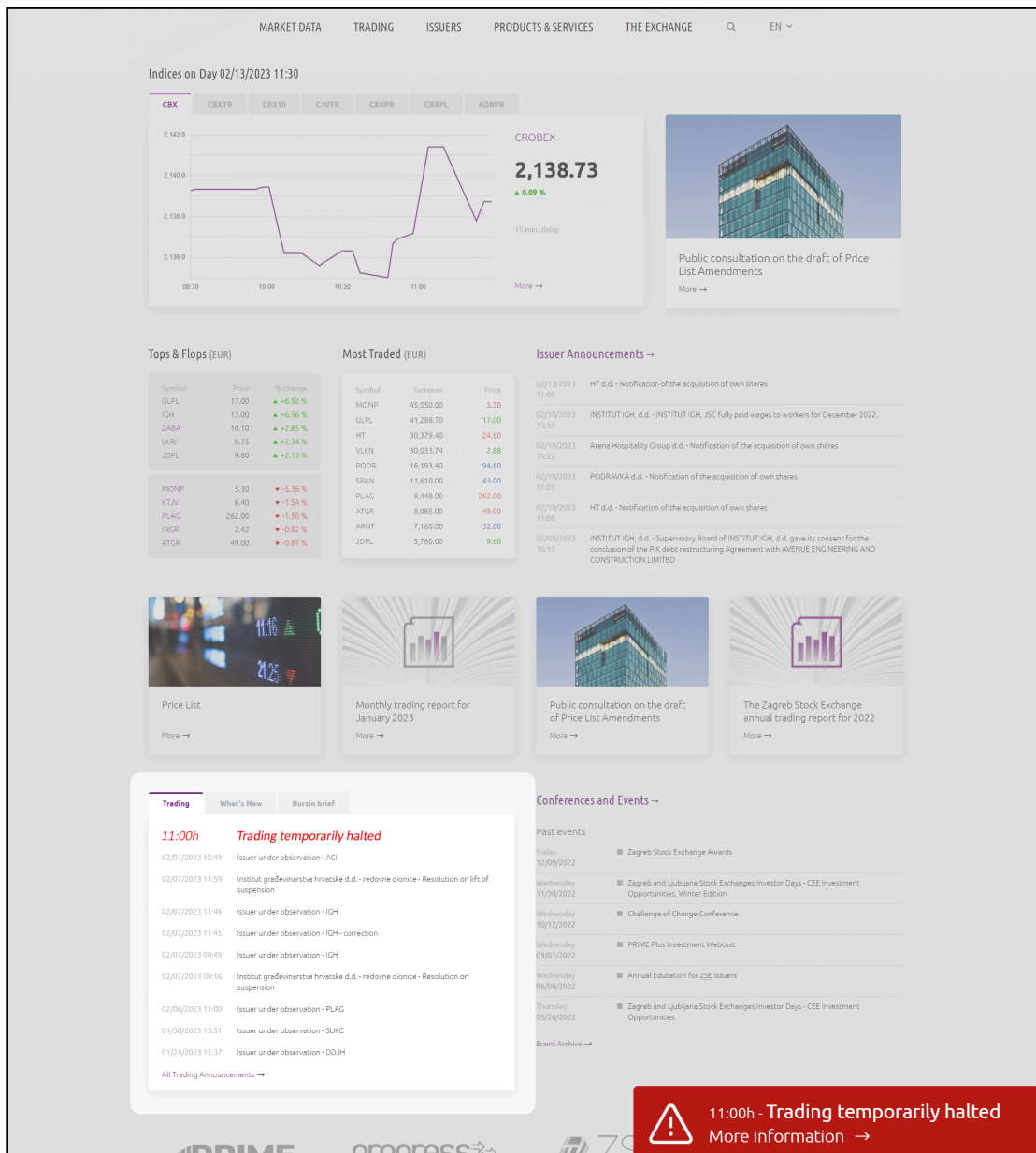


Figure 1 – notification on the incident on the public web site



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5.2.2 The National CSIRT

In accordance with the *Act on cybersecurity of operators of essential services and digital service* which entered into force on July 27, 2018, ZSE is recognized as the operator of the key service of the Financial Market Infrastructure / Trading Venue service.

ZSE will, without undue delay, inform the national CSIRT (Computer Security Incident Response Team) about incidents related to the suspension of trading (Market Halt) that last longer than 30 minutes.

Accordingly, the following notifications are submitted to the national CSIRT – CARNET:

- initial notification of an incident with a significant impact,
- interim incident report with significant impact,
- final report on an incident with a significant impact.

The competent CSIRT determines the forms with the consent of the competent sectoral body and issues guidelines which determine the procedure of delivery.

5.3 Incident Resolution

The Incident Resolution process ensures that after thorough assessment of the incident, careful measures are taken to re-establish orderly trading in the shortest of possible time considering incident severity. The following tasks are performed by WBAG:

- Identification, validation, and implementation of workarounds;
- Identification and implementation of technical recovery solutions;
- Identification of root cause and application of permanent fixes;
- Recommendation regarding alteration of the usual trading schedule including regular reassessment of the recommended schedule based on incident resolution progress;
- WBAG Internal declaration of Incident Resolution.

When the incident is resolved, ZSE receives the Incident Resolution Confirmation from WBAG about the possibility to restart trading procedures and its timing. Following the Confirmation, ZSE ensures that the entire trading process is functioning properly and securely, including the Xetra® T7 trading system, trading services provided by WBAG and ZSE's downstream systems.



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5.4 Market Re-opening Procedure

Once the incident was resolved, the timing for the reinstatement of trading operations is carefully deliberated and agreed with WBAG. ZSE's Crisis Management Committee ultimately decides when trading will resume and how it will be conducted.

ZSE will allow trading members at least a 15-minute Auction Call, prior to restoring the possibility of concluding trades.

ZSE will announce the resumption of trading to all parties via Communication Media, at least 30 minutes prior to restoring the possibility of concluding trades. The announcement will provide the information regarding the timing and sequence of trading phases during the reopening. If relevant, the announcement will include a status on orders entered before the Market Halt and a status of trades concluded before the Market Halt.

It is important to note that market maker quotes and any non-persistent orders are automatically removed during the Market Halt procedure.

5.4.1 Incidents Affecting the Closing Auction

In the occurrence of an incident affecting the closing auction, ZSE may postpone the start of the Closing Auction until 5:30 PM CET at the latest.

ZSE will make its best efforts to determine the official closing prices, considering the circumstances surrounding the incident and its resolution.

If, despite all efforts, ZSE is unable to establish a closing price via Closing Auction, the last traded price will be used as the official closing price.

5.5 Monitoring of Fair and Orderly Trading Conditions

ZSE is committed to ensuring fair and orderly trading conditions. To this end, ZSE carefully monitors the market status and activities, including the number of connected trading members and their respective market share, the type of connections of the trading members, and incoming calls from all trading participants (reporting of anomalies).

These factors are all considered when assessing the quality of the market and the appropriateness of trading conditions.

If ZSE identifies any adverse situation that could lead to unfair or non-orderly trading conditions, it will take action to halt trading (Market Halt) until the conditions have been restored. Trades are concluded when the legally binding trade confirmation has been sent by the Xetra® T7 system and is available there after the technical issues have been resolved and trading is resumed.



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In the event of extraordinary, emergency-related circumstances that lead to non-orderly trading conditions, ZSE will announce and execute the reversal of the resulting trades in accordance with the Exchange Rules. If ZSE becomes aware of such a scenario during a disruption, ZSE will strive to communicate the reversal of these trades before the market reopens.

5.6 Post Incident Analysis

After the incident is resolved, the root cause and the impact of the incident is analysed. The involved system suppliers are asked for statements with the results of their own incident analysis.

Incident reports provided by system suppliers contain, at minimum:

- the cause of the incident,
- corrective activities,
- possible improvement measures.

Moreover, the incident reports are subsequently the basis for:

- improvements in the affected systems,
- improvements in the system monitoring and,
- improvements of the incident handling process itself.



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6 Contacts

Business days from 08:30h to 17:00 CET:

ZSE Technical Support

E-mail: tech-support@zse.hr

Phone: +385 1 4686 837

WBAG Technical Support – for member connectivity

Email: it_helpdesk@wienerboerse.at

Phone: +43 1 53165 170

Market Operations

E-mail: trzista@zse.hr

Phone: +385 1 4686 831

Incident Management

E-mail: xetra-project@zse.hr

Phone: +385 1 4686 830

7 Related Documents

Public area:

- Exchange Rules
- Trading Manual
- Market model “Continuous Trading” and “Low Liquidity Trading”
- Market Model “Continuous Auction”
- Trading hours

Customer area:

- Simulation Focus Days
- ZSE Simulation Calendar