GPW WATS 1.01 Trading System

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CONTENTS

1. DISCLAIMER

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2. PREFACE

This document has been prepared by Warsaw Stock Exchange to help in the implementation process of GPW WATS trading platform.

2.1. TARGET AUDIENCE

This document has been prepared for development staff, Independent Software Vendors who produce software integrated with GPW WATS, analysts, market participants, and all clients who want to deepen their knowledge about GPW WATS.

2.2. DOCUMENT PURPOSE

The purpose of this document is to provide a full description of GPW WATS services.

2.3. ASSOCIATED DOCUMENTS

GPW WATS 1.01 Trading System is a part of GPW WATS documentation set.

Please check the following documents to learn about the construction of Trading System.

- GPW WATS 1.01 Trading System (this document).

Please check the documentation of the trading protocols supported by GPW WATS.

- GPW WATS 2.01 Native Order Gateway Specification,
- GPW WATS 2.02 FIX Order Gateway Specification.

Please check the description of the communication with Data Distribution Service.

- GPW WATS 3.01 Market Data Protocol.

Please check the additional documentation which explains other services provided within GPW WATS.

- GPW WATS 4.01 Drop Copy Gateway,
- GPW WATS 4.02 Post Trade Gateway,
- GPW WATS 5.01 Risk Management Gateway.

Please check the additional documentation describing the following:

- GPW WATS 2.03 Rejection Codes,
- GPW WATS 2.04 BenDec Message Definition Format,
- GPW WATS 6.01 Connectivity.

It is recommended that you read the GPW WATS 1.01 Trading System document first.

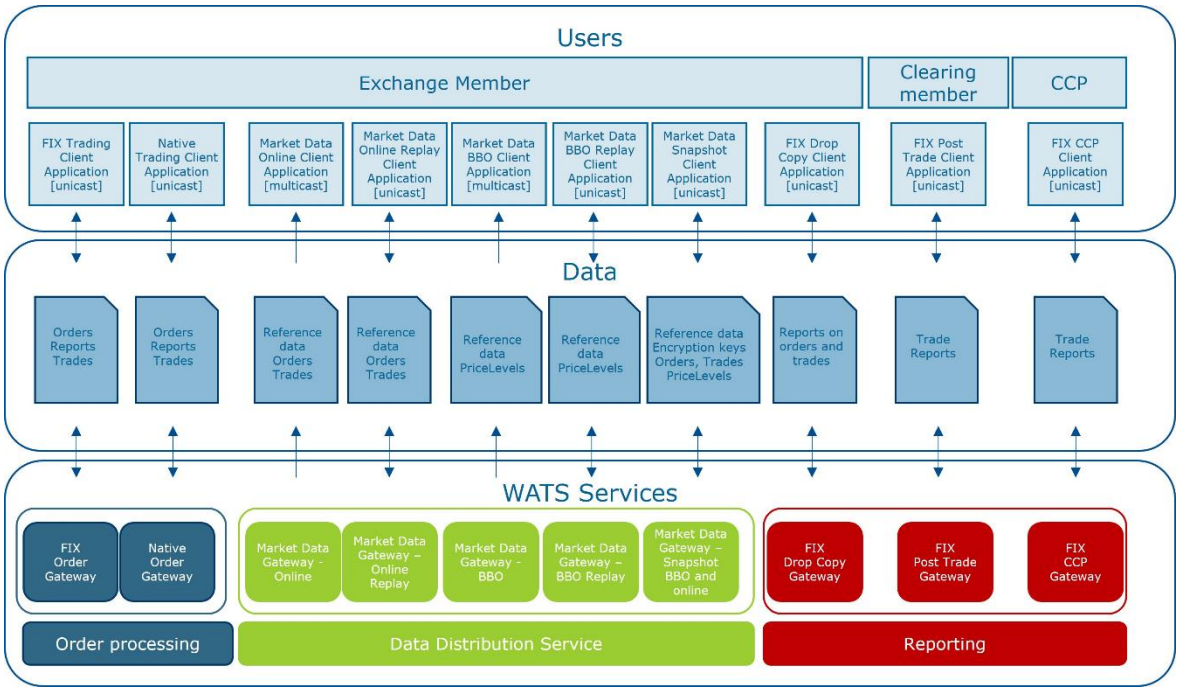
3. Document History

Version	Date	Description
0.51	29.06.2023	The initial publication of the documentation.
0.52	26.07.2023	Publication of v0.52.
0.53	16.08.2023	Publication of v0.53.
0.54	19.09.2023	Publication of v0.54.
0.55	11.10.2023	Validities for Tender Offer orders have been corrected accordingly to regulations from GTD and GTC to D and GTD.
0.56	08.11.2023	Publication of v0.56.
0.57	30.11.2023	The following sections have been updated comparing to the previous version: • 5.4.1 Instrument Code - clarification of the instrument code creation, • 6.2. Trading Schedule - minor adjustment of a description concerning number of unscheduled phases, • 8.1.1 Auction - minor amendments regarding the description of auction procedure, • 8.1.2 Continuous Trading - minor amendments regarding the description of Fixed Price Matching, • 8.1.5 Random Opening – updated by information about this functionality as optional one, • 9.4. Market Phases for block trades – information about the split of a market phase to cover the settlement process added. Expanding the settlement date from 2 to 30 for block trades, • 9.6.1 Block Trades - removal of VWAP as one of the reference price to be used for block trades.
0.58	15.12.2023	Publication of v0.58.
0.59	20.01.2024	Publication of v0.59.

4. GPW WATS SERVICES (INTERFACES)

GPW WATS provides the following groups of IT services:

- order processing via FIX and Native Order Gateways,
- market data distribution via Market Data services,
- reports on orders and transactions via Drop Copy, Post-Trade and CCP Gateways.



4.1. USERS

GPW WATS provides tailored services to users based on assigned roles, which determine their specific interactions with different services and products in Trading System.

4.1.1. EXCHANGE MEMBER

An exchange member is typically an entity whose business is directly related to trading financial instruments. An exchange member may subscribe to one or more markets through one or more connections.

4.1.1.1. Market Maker

A market maker is usually a financial institution, often an existing exchange member, who agrees to act as an intermediary between buyers and sellers. In an order driven market a market maker provides additional liquidity by submitting and maintaining bids and ask prices for particular securities. A market maker plays its role based on a separate direct agreement with the exchange that establishes the terms and conditions under which they operate. Usually such agreement defines the inventory of instruments to be maintained together with quoting requirements with regards to spread, order size or quoting timeframe.

Orders or quotes submitted by market makers are additionally flagged, in order to distinguish them from the remaining orders and facilitate validations as per market maker's agreement conditions.

There are two types of market makers:

- Exchange market maker – operating on an agreement with Market,
- Issuer market maker – acting on behalf of Instrument issuer based on a separate agreement. Despite signing an agreement between an issuer and market maker, Market has the right to examine the agreement, especially in the context of the minimum requirements related to market maker's quoting obligations.

4.1.1.2. Direct Electronic Access

Direct Electronic Access (DEA) is a functionality (service provided by the exchange member where an exchange member enables its clients to electronically transmit orders directly to Market. Orders are submitted to Trading System under the exchange member's trading code.

DEA is subdivided into:

- Direct Market Access (DMA), and
- Sponsored Access (SA).

In both cases the exchange member (DEA provider) is fully responsible for order flow submitted by its clients (DEA clients). DEA provider is obliged to carry out a due diligence on its DEA clients to ensure that they are familiar with Trading System and with the exchange rules.

DEA provider shall ensure that:

- Pre-trade check on order entry,
- Post-trade control,
- Surveillance system to detect market manipulation,
- Real-time monitoring of DEA client activity.

Direct Market Access

DMA functionality offers exchange members' clients direct access to Trading System by using the member's infrastructure. Orders submitted by the DMA client are subject to passing through the member's order management system where appropriate risk controls are performed.

Sponsored Access

Sponsored Access offers exchange members' clients direct access to Trading System without passing through the exchange member's infrastructure. Sponsoring firm is an exchange member that provides their clients (Sponsored Client) Sponsored Access. A Sponsoring Firm shall ensure that Sponsored Clients' order flow is subject to appropriate pre- and post-trade checks by using the exchange's Risk Management Gateway.

Only the Sponsoring Firm is entitled to set trading limits for their Sponsored Clients. Sponsoring Firm receives a Drop Copy for orders and trades of their Sponsored Clients.

4.1.2. CLEARING MEMBER

A Clearing Member is a financial institution or a firm that acts as intermediary between buyers and sellers to facilitate the settlement of transactions. A clearing member can be an active exchange member of Market.

A Clearing Member can subscribe to additional services e.g. Post Trade Gateway.

4.1.3. CLEARING AND SETTLEMENT INSTITUTION

A Clearing and Settlement Institution is a financial entity that facilitates the clearing and settlement of financial transactions between different parties. The primary function is to ensure that trades executed on financial markets are settled accurately, securely and in a timely manner.

A Clearing and Settlement Institution may subscribe to CCP Gateway.

4.1.4. DATA VENDOR

A Data Vendor collects, processes and disseminates data received from a variety of sources including exchanges. They provide data to customers who use them for various purposes, such as trading, research and analysis.

4.2. ORDER GATEWAYS

GPW WATS Order Gateways are customer-facing services. Through Order Gateways, firms connect to submit orders and receive order confirmation reports and trade information.

GPW WATS implements two Order Gateway interfaces: Native (also known as Binary) and FIX interface following the FIX 5.0 SP2 standard. Native Order Gateway is optimized for high-frequency trading, whereas FIX Order Gateway enables standardized connections.

Order Gateway service provides the following additional functionalities for each connection:

- Cancel on Disconnect (CoD) is a sub-service that automatically cancels orders from the order book in the event of loss of connection with Order Gateway.
- Risk management is a sub-service that allows clearing and exchange members to set limits on their order parameters such as quantity or value. As for sponsored access, a sponsoring firm may set risk management parameters for a sponsored client.

4.2.1. NATIVE ORDER GATEWAY

Native Order Gateway key business messages:

- OrderAdd - the message that allows an order to be submitted.
- OrderAddResponse - the response to an OrderAdd message. It contains the status of an order execution (e.g. Acknowledged, Rejected, Filled).
- OrderCancel - the message that cancels a submitted order.
- OrderCancelResponse - the response to an order cancellation request. It contains information about execution, in particular, whether cancellation was successful or not.

- OrderModify - the message that allows modifying a submitted order.
- OrderModifyResponse - the response message to OrderModify, notifies if an order modification was successful or not.
- Trade - the message that reports trades between counterparties (i.e. generated when two or more orders are matched).
- TradeCaptureReportSingle - the message that reports single-sided block trade.
- TradeCaptureReportDual - the message that reports dual-sided block trade and Cross Trade
- TradeCaptureReportResponse - the response message to TradeCaptureReportSingle or TradeCaptureReportDual messages. It contains the status of a trade report and a trade.

4.2.2. FIX ORDER GATEWAY

FIX Order Gateway key business messages:

- NewOrderSingle (D) - the message that allows an order to be submitted.
- ExecutionReport (8) - the confirmation receipt, which conveys information about the order status change and executed trades.
- OrderCancelRequest (F) - the message that cancels a submitted order.
- OrderCancelReplace (G) - the message that allows to modify a submitted order.
- OrderCancelReject (9) - the response to an OrderCancelRequest or an OrderCancelReplace. It contains information about execution, particularly whether cancellation was successful or not.
- TradeCaptureReport (AE) - the message that reports single-sided block trade
- TradeCaptureReport (AE) - the message that reports dual-sided block trade and Cross Trades
- TradeCaptureReportAck (AR) - the message that confirms receiving the TradeCaptureReport message. It contains the status of a trade report and a trade.
- MassQuote (i) – the message used by Liquidity Providers/Market Makers to submit many quotes in one message.
- MassQuoteAck (b) – the message that confirms receiving the MassQuote message with the appropriate statuses.

4.3. MARKET DATA GATEWAY

Market Data Gateway includes the following complimentary services: Online, Online Replay, BBO (Best Bid Offer), BBO Replay, Snapshot. Each of the services implements a proprietary binary protocol:

- Online Market Data Gateway delivers a real-time stream of market information to subscribers over a multicast connection. Market data includes reference data, orders and transactions details. Certain message fields can be encrypted (e.g. a price in an OrderAdd message). Access to the above fields is subject to authorization. Participants receive appropriate decryption keys (see Snapshot service) to access certain information. The session day begins with the distribution of Reference Data to market Participants. Subsequently, data regarding instruments statuses and trading phases, as well as ongoing orders and transactions.

- Online Replay service allows users to request information about messages that were lost due to possible gaps in multicast Online Market Data stream transmission.
- BBO provides a real-time stream of market information to subscribers over a multicast connection. The BBO data contains reference data and the best price levels for the buy and sell sides. Certain message fields can be encrypted (e.g. a price in the PriceLevelSnapshot message). Access to the fields is provided in the same manner as in the Online service. The session day starts with sending Reference Data to market participants. Subsequently, data regarding instruments statuses and trading phases, as well as best price levels are transmitted.
- BBO Replay service allows users to request information about messages that were lost due to possible gaps in multicast BBO Market Data stream transmission.
- Snapshot enables users to download the current status of an order book any time during the trading session. The important functionality of the service is the ability to download keys to decrypt market data. Each exchange member only receives the keys that allow them to access the permitted data. The Snapshot service is dedicated to both Online and BBO Market Data subscribers.

Market Data Gateway key business messages:

- OrderAdd - orders submitted in the System,
- OrderDelete - deleted orders,
- OrderModify - order modifications,
- OrderExecute - order execution information,
- Trade - trade full information message including MiFID 2 fields,
- PriceLevelSnapshot - BBO price levels and volumes.

Reference data messages - a set of messages which define markets and their products (e.g. Market Structure, Instrument) and other metadata necessary for trading.

4.4. FIX Drop Copy Gateway

Drop Copy service sends a copy of executions including details on orders and/or trades. It is used in order to facilitate real time trading activity monitoring.

4.5. FIX Post-Trade Gateway

The purpose of Post-Trade Gateway is to provide confirmation of transactions concluded by the exchange member. With the consent of exchange member, confirmation of transactions can be forwarded to their clearing members. FIX Post-Trading Gateway is based on the FIX 5.0 SP2 protocol. The transaction confirmation is sent as a TradeCaptureReport (AE) message.

4.6. FIX CCP Gateway

The purpose of the CCP Gateway is to report transactions concluded by the exchange member to CCP (Central Clearing Counterparty). FIX CCP Gateway is based on the FIX 5.0 SP2 protocol. Transaction report is sent as a TradeCaptureReport (AE) message.

4.7. Additional Functionalities

Additional functionalities provided by GPW WATS are briefly mentioned below and further described in a separate document GPW WATS Risk Management Gateway. To become further acquainted with risk management and self-trade prevention, please check the above-mentioned document.

4.7.1. RISK MANAGEMENT

Risk Management is a service which enables trading and clearing members to clear orders with the help of pre and post-trade risk controls.

The Risk Management service enables,

- Clearing members to define risk controls for orders submitted by exchange members,
- Exchange members to configure active filters to control own and their clients' order flow.

Risk Management implements pre and post trade limits.

Pre-trade limits prevent orders not meeting specific parameters from entering the order book. These parameters are:

- Order price collar - defines a price range for order prices,
- Maximum order quantity - prevents unusually large orders from entering the order book,
- Maximum order value - prevents orders with unusually high value from entering the order book.

Post trade controls manage a client's overall pattern of trading activity. When a participant exceeds a given post-trade involvement threshold, the risk management service can block further submission of orders.

Examples of post trade limits are:

- Total traded value – total value of buy and sell transactions executed during a session,
- Total open order value – total value of buy and sell orders awaiting execution,
- Total risk value - total traded value + total open orders value.

To further become acquainted with risk management functionality, please consult GPW WATS Risk Management Gateway.

4.7.2. SELF-TRADE PREVENTION

Self-Trade Prevention (STP) functionality enables exchange members to avoid unintentional internal order execution with their orders. The exchange member should provide the STP ID value at the order entry level to enable Trading System to activate the STP functionality. Both order gateways (FIX and BIN) contain the STP ID field. There is no need to set any additional configuration on Trading System level. The exchange does not provide or validate the STP ID, provided it is compliant with the field format. Allocation of the STP ID is at the sole discretion of the exchange member. Each exchange member can freely encode the value of STP ID, which meets their needs to protect a specific order against self-trade.

Main STP functionalities:

- STP only applies to orders executed in the Central Limit Order Book,
- STP is active in the Continuous at Variable Price and Continuous Trading at Last phase,

- STP is inactive in Auction phases (Scheduled Auctions, Volatility Auctions).

Currently only one STP logic is applied. Whenever an incoming order may potentially match with an order which rests in the order book sharing the same STP ID, a passive order is deleted in favor of aggressive order to prevent self-match trade.

The STP action is triggered only if:

- Both orders are submitted for the same financial instrument,
- Both orders are submitted by one participant,
- Both orders have the same STP ID,
- Both orders may potentially match against each other in whole or in part.

In the event of STP activation, the exchange member receives the relevant message which contains the reason for order cancellation.

4.8. CONNECTIVITY

4.8.1. CANCEL ON DISCONNECT

Cancel on Disconnect (CoD) is an optional functionality which prevents orders from remaining in the order book when there is a connection loss between Participant and System.

Cancel on Disconnect works on both FIX and Native Gateways. If there is more than one connection within a trading protocol, CoD may be enabled on both or the chosen Gateway.

The exchange is responsible for CoD configuration on behalf of the exchange member.

Whenever a connection loss is detected, the service cancels orders with the following TIF (time in force) conditions: Day, GTT, VFA and VFC. Orders with GTC and GTD validity conditions remain in the system.

If heartbeat messages are not sent, an additional grace period is granted before CoD activation.

Disconnection from the Gateway is understood as breaking the TCP/IP connection or lack of communication from the client, including the lack of Heartbeat messages.

4.8.2. THROTTLING

Message Throttling mechanism secures users from overloaded FIX and Native gateways by excessive incoming messages. Two separate rate limits are set to control the flow of messages. Once the first level is exceeded any new message is rejected and a reject message is sent as a response to any new incoming order. If during a given time, the second level is reached, the connection is closed down..

Logout and order cancel messages are not taken into the throttling rate calculation.

5. Market Structure

Market structure consists of layers that construct the final product such as Instrument.

Each level of market structure represents some dedicated parameterization details and carries specific trading rules or a given behavior. All components might be transferable across the structure and set on various market layers. A given parameter set on a specific market structure layer applies to all instruments which are part of this segment (exception: lower layers can be overwritten if a parameter is parameterized differently than the whole segment). The same rule applies to any other common definitions within a given structure.

5.1. Market

Market represents an entity with a legal status of an organized Regulatory or Multilateral Trading Facility market or any other exchange structure e.g. usually following the MIC code (ISO 1038 standard).

5.2. Market Segments

Market segment represents a multi-level market structure built to group instruments in terms of their trading rules or specific allocations (Market Model).

5.3. Product

Product represents a base structure for instrument creation. It carries the set of reference data common for instruments that belong to a given product (ISIN, FISN, CFI, number of instruments, nominal value, multiplier, or accrued interest). One Product can have more than one Instrument linked. Instruments associated with the same Product can be listed on more than one Market. Product is mainly used to facilitate instrument management by incorporating reference details on one level and passing them down to the instrument layer. Product is not a subject of trade execution or order submission. It carries some of the reference data common for associated instruments.

Numerous types of products can be traded, for example:

- Equity products (shares, including ordinary shares, allotment certificates, issue rights),
- Fixed Income (all type of bonds),
- Derivatives (including futures contracts and options),
- Structured products.

5.4. Instrument

Instrument represents a tradable entity i.e., instrument that can be bought and sold. Instruments of the same characteristics are grouped as a Market Segment. Every Instrument must be a part of a Market Segment.

5.4.1. INSTRUMENT CODE

Instrument Code Identifier represents a financial instrument that can be traded in GPW WATS Trading System. It is a naming convention that relates to an instrument type, Market and Market Model that allows to uniquely identify a particular entity.

Instrument Code is created based on the following components:

- **Product Code** - a code representing the name of the product to which the instrument applies. For stocks it is represented by the ticker of the instrument, for other types of instruments it is its name.
- **MIC** - Market Instrument Code (ISO 20022) to which the instrument belongs.
- **Market Model** - a definition that defines the trading rules. The list of available Market Model definitions is defined at the Market Structure (Market Segment) level.
- **Instrument Type** - the type of instrument assigned to a record.
- **Trading Currency** - the currency in which the instrument is listed.

The range of options below each of instrument code components, presented on the example below, is just for informational purposes and may not constitute the final list of options once Trading System goes live. The adequate parameterization document will be updated to reflect which of these will be used by a given Market.

Figure 1. Instrument Code

5.5. INSTRUMENT STATES

GPW WATS operates statuses that are related to events during a business day and the trading phase for all instruments traded in. Each change of the instrument status is populated to the Market Data via InstumentStatusChange. The instrument status informs if trading activities are possible in the current trading phase.

The following statuses exist within GPW WATS :

- Active,
- Inactive,
- Market operations suspension,
- Outside collars,
- Regulatory suspension,
- Technical halt.

Please bear in mind each financial instrument can be assigned to each status listed above, no matter what status it is at. No additional limitations exist.

5.5.1. ACTIVE

Trading is allowed. Orders placement and trades may take place as long as a trading phase' conditions allows for such activity.

5.5.2. INACTIVE

Trading is not allowed. Any operations aimed at order handling including order placement, modification or cancellation are not allowed.

5.5.3. REGULATORY SUSPENSION

A status is reserved for Financial Supervisory Authority decisions. Once FSA assesses that the instrument should be suspended, the exchange will set the status to regulatory suspension. The status can be adjusted during the whole trading day and for each market phase.

5.5.4. MARKET OPERATIONS SUSPENSION

A status can only be activated following the decision by the exchange. The exchange can decide to suspend an instrument when there is an extraordinary event which impacts on the rules of trading. The status can be released during the entire trading day.

5.5.5. OUTSIDE COLLARS

A status is activated automatically whenever an attempt is observed to conclude a trade outside the limitations imposed. Once a status is triggered, a Volatility Auction takes place which may result in setting up new limitation levels (trade collars) or without.

5.5.6. TECHNICAL HALT

The status technical halt is automatically assigned when there is a System failure or technical errors related to the instrument. While entering this status, the System simultaneously closes the order book, thus it is impossible to add, modify or cancel orders and conclude transactions.

6. Trading Parameters

6.1. Trading Calendar

A trading calendar consists of a list of trading and non-trading days. The main focus of a trading calendar is to provide information on non-trading days and provide alternative trading schedules. The calendar incorporates two pieces of information:

- a weekly plan with the following days of the week specifying whether trading is allowed on those days,
- the exceptions when trading is closed or falls into an alternative trading schedule.

In most cases, a trading calendar is specific to market, however it can also be assigned to a particular segment or Instrument.

6.2. Trading Schedule

Trading schedule defines the pre-determined timeframe or set of hours during which trading activities may be conducted. Trading schedule consists of individual market phases which define an exact time when a given phase is initiated. Some phases may be randomized in order to introduce a level of randomness or uncertainty regarding the exact opening or closing time.

Information about trading schedule becomes part of reference data for each Instrument in trading. The trading schedule consists of a list of individual market phases used to organize the trading day. Market phase determines the following trading characteristics:

- the type of trading phase (no trading phase is also possible),
- allowed order types,
- allowed order validity conditions,
- actors that can perform operations on orders (i.e. exchange members and/or Market Operations).

Market phases within a trading schedule are configured to begin at a particular time during the trading day. As for Auction Uncrossing, it is also possible to have random start times (as a result also the start time of the following market phase).

Most of the market phases are scheduled, thus they have a predefined start time (with randomization or not). There are also unscheduled market phases, which are automatically triggered when certain market conditions are met (e.g. attempt to trade outside dynamic or static trade price collar). These phases are Static Volatility Auction and Dynamic Volatility Auction correspondingly.

There is also one conditional market phase, Continuous Trading at Closing Price, which is only triggered if there were any trades executed during the preceding Closing Auction, otherwise, it is skipped and the following market phase begins.

There is no limitation regarding the maximum number of market phases or market phase transitions which constitute a trading schedule.

Various instruments can have different trading schedules assigned in Trading System, or even may use different trading schedules during particular trading days. For instance, one trading schedule can be

applied for the first trading day, while for the following days, another one is used. For some instruments (usually derivatives) an exceptional trading schedule can be set to handle the expiration process and run the calculation of final settlement prices. Various trading schedules can be assigned to different weekdays too.

When creating a new trading schedule, the allowed market phase transition rules must be followed:

From (rows) / To (columns)	Continuous at VP.	Continuous at FP.	Continuous at CP	Auction	Monitoring	Market Closed
Continuous Trading at Variable Price	yes	yes	no	yes	yes	yes
Continuous Trading at Fixed Price	No	yes	no	yes	yes	yes
Continuous Trading at Closing Price	no	yes	no	no	yes	yes
Auction	yes	yes	Yes*	yes	yes	yes
Monitoring	yes	yes	no	yes	yes	yes
Market Closed	yes	yes	no	yes	yes	no

* The transition to Continuous Trading at Closing Price is possible from Closing Auction only.

6.3. Price

Instruments may be quoted in currency or in percentage of a nominal value. Information about the manner in which they are traded depends on their characteristics.

6.4. Tick Size

Tick size is the smallest price movement allowed by the system. Any limit order must follow the definition of a tick size. In other cases, it will be rejected.

More than one tick size can be allocated to Instrument, Market Segment, or Market. Tick size is located in a tick table with consecutive limits (price levels) and corresponding quotation steps. The lower bounds of a tick table always correspond to a valid price.

A tick table always starts with 0, which can be set as the price limit. A tick table can support negative prices. However, currently only positive limit prices are allowed.

A tick size table can be assigned to any layer of market structure. On equity instruments, tick tables are typically allocated to individual instruments rather than any other layer of an existing market structure. For other types of instruments, the same tick table can be assigned for the upper market structure layers and serve all instruments of a given type.

Whenever order and trade price collars are defined, their limits must follow price levels and quotation steps which correspond to those being applied to an instrument.

6.5. Lot Size

Instrument lot size defines the number for one unit of quantity in order. Lot size is defined by the exchange for each instrument. Lot size is an integer number.

The order volume of a given lot size is calculated as:

Order Volume= Lot Size x Order Quantity

6.6. Trading Currency

Trading currency represents the currency a given instrument is traded at.

6.7. Corporate Actions

Corporate action refers to any significant event or decision taken by a company that may impact its existing shareholders. These actions include dividends, splits, re-splits, spin-offs, issue rights and any other events that affects company's structure, ownership or financial situation.

GPW WATS Trading System supports the following Corporate Events:

6.7.1. CORPORATE ACTION TYPE

- Dividend
- Bonus Issue
- Right Issues
- Split
- Reserve Split
- Spin-off.

6.7.2. ORDER PROCESSING DUE TO CORPORATE EVENT

If a corporate event is observed, all orders remaining in the order book are automatically deleted after the last trading day before a corporate event takes place. Orders which are deleted due to corporate event are flagged in order to indicate the reason for cancelation.

6.7.3. REFERENCE PRICE PROCESSING DUE TO CORPORATE EVENT

In order to minimize the effect of a corporate action, the exchange will amend the reference price in order to mitigate the risk of trading basing on outdated information. Whenever a reference price is updated due to corporate event, processing additional information is accompanied to inform recipients on the reasons for such amendment.

6.7.4. OTHER CHANGES DUE TO CORPORATE EVENT

A corporate event may also affect other values such as nominal (par-value), issue size or multiplier for derivatives. Referential data distributed by the exchange will reflect all these modifications to assure the accuracy of data before the start of trading on the next day after corporate event took place.

7. Settlement and Clearing Parameters

7.1. Settlement Calendar

Settlement calendar consists of a list of days that specify the settlement date for post-trade functionalities. The majority of settlement days fall on trading days. The main focus of a settlement calendar is to ensure the accuracy of the settlement process. Similarly, to a trading calendar, there are two sets of information that present a current picture of the settlement timing:

- a weekly plan,
- exceptions, when a settlement falls into an alternative settlement schedule.

Usually one settlement calendar applies to the whole market.

7.2. Settlement Cycle

The settlement cycle represents the time it takes from the day of executing a transaction to the date when transfer of securities bought or sold occurs. The settlement cycle may vary depending on the market, market model or instrument type. Usually, the settlement cycle follows T+2 standard where trade date is followed by two business days until the transaction is considered as settled, while for instruments representing derivatives T+0 may apply. For transactions done through Block Trade Facility, settlement process may be set from T+0 to T+2 as a maximum. In addition in order to secure an accurate settlement process, transactions concluded within T+0 timeframe are additionally checked against the maximum time when such trade may be executed.

7.3. Clearing Data

The exchange transmits all executed orders (transactions) to the clearing and settlement system. In order to properly allocate details of each transaction, exchange members may indicate on the order level a set of details including Account, Account Type and Clearing Firm.

8. Central Limit Order Book Model

Central Limit Order Book (CLOB) is an order-driven market model, where all trading interests (both orders and quotes) of buyers and sellers are matched against each other according to a predefined algorithm (usually price/time priority). Orders with better prices (i.e. higher for buy and lower for sell side) are ranked with higher priority for matching. Orders at the same price level are usually ranked according to their time priority (the oldest order has the highest priority). Other priorities are also possible (e.g. Time priority only for Continuous Trading at Fixed/Closing Price).

8.1. Market Phases

Market phases are the basic building blocks for trading schedules.

GPW WATS supports the following market phases:

- Auction, including scheduled Auctions (i.e. Opening, Intraday, Closing) and unscheduled Auctions (i.e. Auctions following Volatility Halt,),
- Continuous Trading (at Variable Price, at Fixed Price, at Closing Price),
- Monitoring (Early Monitoring, Late Monitoring),
- Market Closed.

8.1.1. AUCTION

The main goal of Auction is to concentrate liquidity at the specified point in time in order to get the best possible valuation of the financial instrument.

Auction is a market phase where all executable orders are matched at one fixed price (i.e. last Indicative Matching Price calculated at the end of the Auction phase).

During Auction the system calculates and provides continuous information about potential matching price and matched volume of orders, which would be executed at the time of calculation. This applies to the crossed order book only. For uncrossed order book, no matching price and volume is calculated, so only best bid and ask with cumulated quantities are provided instead.

The Auction phase can be ended with the order matching procedure (uncrossing) if market conditions enable it or can be ended without orders matching procedure depending on trading schedule or market model (e.g. IPO orders collection procedure).

There are 3 types of scheduled Auctions that can be distinguished in a trading schedule:

- Opening Auction (first Auction during the day),
- Intraday Auction(s) (all Auctions during the day between Opening and Closing Auction),
- Closing Auction (last Auction during the day).

In terms of matching, all three Auction types listed above behave the same way. The only difference is how orders with VFA/VFC validity are activated:

- orders with Valid For Auction (VFA) validity are activated by any type of Auction (Opening/Intraday/Closing),
- orders with Valid For Closing (VFC) validity are activated by the Closing Auction only.

Another difference is that in most cases the price resulting from the Closing Auction is taken as the official Closing Price for the instrument traded.

Apart from three scheduled Auction types mentioned above, there also exist unscheduled Auctions that are triggered:

- automatically, each time a trade price collar is breached (so called Volatility Auction),
- when an instrument is manually halted by Market Operations (e.g. due to regulatory reasons),
- when an instrument is automatically halted by Trading System (e.g. due to technical malfunction).

Auction procedure

During Auction phase orders are accumulated in the order book. Full order management is allowed (i.e. orders may be submitted, modified and canceled) but no matching occurs yet (even if the order book is crossed). Orders are executed at the end of the Auction phase.

As a rule, any unexecuted orders submitted in the previous market phases, are transferred to the Auction market phase and retain their time priority in the order book. All inactive orders with Valid For Auction validity are triggered as soon as Auction begins. These orders are inserted into the order book (note: Valid For Closing orders are triggered during Closing Auction only).

The following rules apply to orders entry during Auction:

- orders with IOC/FOK validity are not accepted,
- Limit Orders are accepted,
- Market Orders and Market To Limit orders are accepted with VFA/VFC validities only,
- Stop Limit, Stop Loss and Iceberg Orders are accepted with DAY, GTD, GTT, GTC validities only.

The Auction phase is ended at the time predefined in a trading schedule or after switching to the next phase (e.g. continuous trading) in case of unscheduled Auctions (with possible randomization range).

At the end of the Auction phase in the uncrossing procedure all eligible orders are allocated and matched at the same single Auction Price. Auction price and aggregated execution quantity are equal to the last Indicative Matching Price (IMP) and Indicative Matching Volume (IMV) calculated during the Auction phase.

As a result of uncrossing procedure all orders with the price strictly better than Auction Price (i.e. buy orders with the higher limit, sell orders with the lower limit) must be fully executed. Orders with the price equal to the Auction Price can be executed fully, partially or not executed at all. Orders not executed during Auction phase are carried over to the next market phase in the trading schedule, unless order validity stipulates otherwise (e.g. VFA/VFC orders get expired after Auction phase).

If at the end of the Auction phase order book is uncrossed (i.e. highest Bid<lowest Ask), IMP and IMV are not calculated and the Auction ends with no matching (no trades are generated).

Market Data publication

At the start of the Auction phase public order book is cleared by sending the Order Book Clear message.

During Auction phase, order-by-order/order-by-price view of the order book is not revealed to the general market via Market Data. Order book view is hidden.

In the case of crossed order book (i.e. Highest Bid >= Lowest Ask), Indicative Matching Price (IMP) and Indicative Matching Volume (IMV) are continuously calculated and published in Auction Update messages. IMP and IMV are re-calculated after each submission, modification and cancellation of an order. For crossed order book the Auction Update message specifies the following data:

- Indicative Matching Price (IMP),
- Indicative Matching Volume (IMV),
- Total Bid Quantity at IMP,
- Total Ask Quantity at IMP.

In case of uncrossed order book (i.e. highest Bid < lowest Ask), Best Bid and Best Ask along with aggregated quantities at these price levels are published in Auction Update messages. Auction Update message conveys the following values:

- Best Bid Price,
- Best Bid Quantity (aggregated),
- Best Ask Price,
- Best Ask Quantity (aggregated).

Once at the end of the Auction phase the uncrossing is completed, an Auction Summary message is published providing Auction Price and Auction Quantity (i.e. total quantity of orders executed during Auction). Trades generated during Auction are published via Market Data Trade Enriched messages as soon as the next market phase begins.

8.1.2. CONTINUOUS TRADING

During Continuous Trading, market phase orders are checked against potential execution immediately upon submission (except for Stop orders and orders with VFA/VFC validity condition). Matching orders take place on a continuous basis. Unexecuted or partially executed orders are added to the order book (if the validity condition allows) and ranked according to Price/Time priority (in Continuous Trading at Variable Price) or Time priority (in Continuous Trading at Fixed Price / at Closing Price).

There are 3 types of Continuous Trading:

- Continuous Trading at Variable Price,
- Continuous Trading at Fixed Price (when all consecutive executions are completed at the same Reference (fixed) price set by preceding Auction, or failing this, set by the Last Trade Price,
- Continuous Trading at Closing Price (when all consecutive executions are completed at the same fixed price, resulting from Closing Auction).

During Continuous Trading, limit orders are accepted with all validities. Market and market to limit orders are accepted with VFA, VFC, IOC, FOK validities only. Stop Limit, Stop Loss and Iceberg Orders are accepted with DAY, GTT, GTD, GTC validities only.

Market Data publication:

During Continuous Trading, order book is published via Market Data with order-by-order granularity. Each order submission, modification and cancellation is published on a real-time basis. Executed trades are revealed to Market Participants.

8.1.2.1. Variable Price Matching

During Continuous Trading at Variable Price execution, prices may vary from trade to trade. The execution price is determined by the limit of order(s) resting in the order book. A limit price of incoming aggressive order (i.e. an order hitting or lifting an opposite price level) does not affect the execution price. Incoming order may be executed in multiple trades at various price levels.

An incoming aggressive order is executed at the price(s) of limit orders awaiting execution on the opposing side of the order book. Passive orders (i.e. limit orders awaiting execution in the order book) are matched according to their Price/Time priority. Thus when there is an incoming buy order, sell orders with the lowest price limits are executed at first, increasing to higher limits, depending on incoming buy order quantity. When there is an incoming sell order, buy orders with the highest price limits are executed first, reducing to lower limits, depending on incoming sell order quantity. Orders resting at the same price level are executed according to their priority timestamps (i.e. orders that entered the order book earlier, are executed at first among orders with the same price limit).

Market Data publication:

During Continuous Trading at Variable Price, all orders in the order book are published via Market Data with their "real" prices (i.e. with the price limits that were specified by the exchange member in the order entry message). This also applies to any price modifications.

8.1.2.2. Fixed Price Matching

There are two sub-types of Continuous Trading that support Fixed Price Matching in Trading System:

- Continuous Trading at Ref Price equal to the Last Trade Price
- Continuous Trading at Closing Price.

During Continuous Trading at Reference Price/Closing Price the execution price is constant throughout the entire market phase. Limit prices of resting/incoming orders do not affect the execution price.

When there is Continuous Trading at Fixed Price, all orders (with prices better or equal to the reference price) are matched at the same reference price, irrespective of their actual price limits. The reference price may be established internally (e.g. the Last Traded Price from the preceding market phases) or injected from independent external sources. If Continuous Trading at Reference Price market phase is scheduled in a Trading Schedule, it is never skipped during the trading day.

Continuous Trading at Closing Price is a conditional market phase that only occurs after the Closing Auction, and only if there were any trades executed during Uncrossing. Otherwise, Continuous Trading at Closing Price is skipped and the scheduler triggers the following market phase. When there is Continuous Trading at Closing Price all orders (with prices better or equal to the reference price) are matched at the same Closing Auction price, irrespective of their actual price limits.

During Continuous Trading at Reference Price/Closing Price resting orders are executed according to their Time priority only (i.e. orders that entered the order book earlier are executed first, irrespective of their price

limits). Any incoming order is checked against potential execution upon entry. Unexecuted or partially executed orders are added to the order book.

Market Data publication:

During Continuous Trading at Reference Price/Closing Price orders in the order book are published via Market Data according to the following rules:

- orders with limits worse than the established reference price (i.e. buy orders with lower limits, sell orders with higher limits) are published with their "real" prices (i.e. with the price limits that were specified by the exchange member in the order entry message),
- orders with limits equal or better than the established reference price (i.e. buy orders with limits equal or higher, sell orders with limits equal or lower) are published with the limit equal to the reference price (i.e. their "real" limits are not visible in Market Data).

Order modifications that do not alter the price published in Market Data (for prices better than the Reference Price) are omitted in the MD feed (i.e. in such cases MD OrderModify messages are suppressed, as if the modification would not happen at all).

8.1.3. MONITORING

Monitoring market phase is designed for the Exchange to check market integrity before trading begins (Early Monitoring) or before closing System (Late Monitoring). During Monitoring phases, Trading System (including Order Gateways) is accessible to exchange members, but they cannot execute any operations on orders (i.e. order entry/modification/cancellation are not possible).

The exchange can cancel orders on behalf of exchange members during this market phase.

8.1.4. MARKET CLOSED

When market is closed no operations on orders are possible, neither by exchange members nor the Exchange, although some system components may still be available (e.g. Market Data Gateway).

8.1.5. RANDOM OPENING

Random Opening is a mechanism that adds a random time element to the Uncrossing procedure, introducing uncertainty to the exact time an instrument moves to the next market phase. The main goal of randomization is to avoid possible market manipulation caused by orders which influence Indicative Matching Price discovery process, especially close to the end of an Auction. A random element which is added to the Auction process may eliminate all such attempts by adding the risk that a given order may be included in the Auction Uncrossing.

Although start times of all market phases in a trading schedule are explicitly defined, it is possible to set up a Random Opening Period (in seconds) for each Auction which occurs in that trading schedule (including unscheduled Volatility Auction). This will result in an Auction Uncrossing being triggered in a random point during Random Opening Period. Depending on the Auction, the Random Opening Period can occur before or after the scheduled Uncrossing time. Immediately after Uncrossing, the following market phase scheduled in the trading schedule begins (disregarding its scheduled start time).

Please check out Example: Random Opening for details.

8.1.6. TRADING SCHEDULES

The following table provides an example of a trading schedule commonly used for equities trading:

Market Phase	Start Time	Scheduled	Random End	Conditional
Market Closed	00:00	yes		
Early Monitoring	07:45	yes		
Opening Auction	08:30	yes	yes	
Continuous Trading at Variable Price	09:00	yes		
Closing Auction	16:50	yes	yes	
Continuous Trading at Closing Price	17:00	yes		yes
Late Monitoring	17:05	yes		
Market Closed	17:30	yes		
Dynamic Volatility Auction	n/a		yes	yes

8.2. ORDERS

Market participants can choose between the following order types to buy or sell assets:

- Limit Order,
- Market Order (MO),
- Market to Limit (MTL),
- Stop Limit,
- Stop Loss,
- Iceberg (Hidden) Order.

Each order type can have one of the following validities assigned that define when and for how long an order remains in the order book:

- Day (DAY),
- Good Till Time (GTT),
- Good Till Date (GTD),
- Good Till Cancel(GTC),
- Immediate or Cancel (IOC),
- Fill or Kill (FOK),
- Valid for Auction (VFA),
- Valid for Closing (VFC).

For detailed information on order attributes, please refer to *GPW WATS02.01 Native Order Gateway Specification* and. *GPW WATS2.02 FIX Order Gateway Specification*.

8.2.1. ORDER TYPES

Order type defines the behavior of an order in the order book and the manner in which it is executed.

The following section describes order types available in GPW WATS Trading System.

8.2.1.1. Limit Order

Limit Order type allows one to buy or sell at a specified price. Limit Order execution happens at a price equal to or better than its limit price (at its limit or a lower price for a buy order and its limit or higher price

for a sell order). An unexecuted limit order is added to the order book unless other order attributes specify otherwise. An unexecuted limit order that enters the order book is prioritized according to the price/time priority. The limit price must be specified according to the tick size defined by the Market Operator for the Instrument in question. If not, an order is rejected.

8.2.1.2. Market Order (MO)

Market Order type allows one to buy or sell without a specified price.

During the Continuous Trading phase, Market Orders can be submitted with IOC, FOK, VFA, and VFC validity types. Market Order is executed with counterpart orders at the best opposing price levels (one or more). Market Order with IOC or FOK validity type must be executed immediately within trade price collars (TPC). If not, an unexecuted part is canceled by Trading System.

During the Auction phase, market orders can be submitted with VFA and VFC validity types. During Auction, market orders have higher priority than any limit order. Market Orders and Market To Limit Orders have the same price priority and are ranked according to their timestamps (time priority).

8.2.1.3. Market To Limit (MTL)

Market to Limit Order type allows one to buy or sell without a specified price.

During the Continuous Trading phase, Market To Limit Orders can be submitted with IOC, FOK, VFA, and VFC validity types. Market to Limit Order is executed with counterpart orders at the best opposing price level (i.e. only at the first price level). Market to Limit Order with IOC or FOK validity types must be executed immediately within trade price collars (TPC). If not, Trading System cancels an unexecuted part.

During the Auction phase, Market To Limit Orders can be submitted with VFA and VFC validity conditions. During Auction, Market To Limit orders have higher priority than any Limit Order. Market to Limit Orders and Market Orders have the same price priority and are ranked according to their timestamps (time priority).

8.2.1.4. Stop Limit

Stop Limit Order is an order to buy or sell, which is activated and inserted into the order book after reaching or exceeding a pre-defined price namely trigger price. Stop Limit remains inactive and is not displayed to the general market via Market Data until trigger price is reached. Once activated, Stop Limit is processed as a regular Limit Order and retains its original order type.

At the point of Stop Limit Order submission and modification, the following conditions must be met:

- for buy order: limit price > = trigger price > last traded price,
- for sell order: limit price < = trigger price < last traded price.

otherwise, the order is rejected.

Stop Limit orders can be submitted with the following validity conditions:

- Day (DAY),
- Good Till Time (GTT),
- Good Till Date (GTD),
- Good Till Cancel (GTC).

Selected validity applies to the inactive Stop Limit Order awaiting activation, as well as to the triggered order awaiting execution in the order book.

The Stop Limit Order trigger price may be modified by the exchange member as long as the order remains inactive.

8.2.1.5. Stop Loss

Stop Loss Order is an order to buy or sell without a specified limit price, which is activated and inserted into the order book after reaching or exceeding a pre-defined price called trigger price. Stop Loss remains inactive and is not displayed to the general market via Market Data until trigger price is reached. Once activated, Stop Loss is processed as a regular Market Order and retains its original order type.

When Stop Loss Order submission and modification occur the following conditions must be met:

- for buy order: trigger price > last traded price,
- for sell order: trigger price < last traded price.

otherwise the order is rejected.

Stop Loss Orders can be submitted with the following validity conditions:

- Day (DAY),
- Good Till Time (GTT),
- Good Till Date (GTD),
- Good Till Cancel (GTC).

Selected validity only applies to the inactive Stop Loss Order awaiting activation. Once activated, Stop Loss Order is processed as a Market Order with Immediate Or Cancel (IOC) validity condition, regardless of its original validity.

The Stop Loss Order trigger price may be modified by the exchange member as long as the order remains inactive.

8.2.1.6. Iceberg

Iceberg Order is a limit order, in which only a predefined part of the total order quantity is displayed on the market via Market Data. The remaining quantity remains hidden (not visible) from the market.

When submitting Iceberg Order, an exchange member must additionally specify the initial display quantity, which is lower than the total order quantity. Only the initial display quantity is visible to the market via Market Data in the order book.

The initial display quantity must be equal to or greater than the minimum display quantity parameter defined by Market Operator.

While submitting or modifying the total value (price x quantity) of an Iceberg Order, it must be equal to or greater than the minimum iceberg value parameter defined by the exchange (e.g. 10 000 EUR).

Refills

When Iceberg Order enters the order book, only the initial display quantity is revealed via Market Data. The initial display quantity may be randomized within a setup range if this feature is enabled by the exchange. Once the display quantity is filled, the next quantity is revealed (order refill) to the market with a new timestamp. At the same time, the hidden quantity is decreased proportionally. When the hidden quantity drops below the initial display quantity, the last refill will be equal to the remaining quantity.

Iceberg Order is refilled in the following cases:

- new iceberg order enters the order book,
- display quantity is filled,
- price is modified,
- initial displayed quantity is modified,
- multi-day iceberg order is restated to the order book on the following day,

Modifications

An exchange member is allowed to modify Iceberg Order's:

- total quantity,
- initial display quantity,
- price.

Modifications of the total quantity does not result in the refill of the display quantity.

When modifying the initial display quantity only (with other order attributes unchanged), the iceberg value is not validated against the minimum iceberg value set by the exchange.

When modifying the price of Iceberg Order during Continuous Trading at Reference (Fixed) Price or Continuous Trading at Closing Price phases, the orders keep their priority when the price is changed within the range of better or equal to Reference/Closing prices (for Buy orders higher and for Sell orders lower than Reference Price), otherwise the orders lose their execution priority.

Executions

An aggressive incoming Iceberg Order is executed in the same manner as a regular limit order (i.e. the system ignores the initial display quantity for matching purposes).

When Iceberg Orders are parked at the same price level (i.e. passive orders) and are hit or lifted by an incoming aggressive order, the display quantities are executed in their timestamp order and the rest of the incoming order is matched with the total hidden quantity of Iceberg Orders in their original timestamp order. Disclaimer: The quantity of an incoming aggressive order must be greater than the display quantity of all icebergs awaiting execution. In such cases, hidden quantities of parking Iceberg Orders are processed as regular limit orders awaiting execution at one price level.

Validity Conditions

Iceberg Orders can be submitted with the following validity conditions:

- Day (DAY),
- Good Till Time (GTT),
- Good Till Date (GTD),
- Good Till Cancel(GTC).

8.2.2. VALIDITY CONDITIONS

Order validity condition defines:

- when an order becomes activated (VFA, VFC),
- for how long an order remains in the order book (DAY, GTT, GTD, GTC),
- how the order is processed upon entry into the order book (IOC, FOK).

GPW WATS Trading System supports the following validity conditions:

8.2.2.1. Day (DAY)

Day order is valid for the current trading day only. Trading System expires Unexecuted Day orders at the end of the trading day during the post-session processing.

8.2.2.2. Good Till Time (GTT)

Good Till Time order is valid until the specified time of the current trading day. Then it expires in System.

Expire time for GTT orders may be specified with 1 second granularity when exchange member submits an order.

8.2.2.3. Good Till Date (GTD)

Good Till Date order is valid until the end of the specified day and it expires at the end of that date during the post-session processing.

The exchange defines the maximum GTD expiration delay that is allowed to be used when submitting an order. If exchange member requests an expiry date that exceeds set up delay, the order will be rejected. If the requested expiry date falls on a non-trading day, the order expires at the end of the previous trading day.

8.2.2.4. Good Till Cancel (GTC)

Good Till Cancel order is valid until it is fully executed or canceled by the submitter or Trading System.

Market Operator defines the maximum GTC expiry delay that is the maximum number of days that a GTC order is allowed to rest in the order book. After that period elapses, Trading System expires a GTC order during the post-session processing. If the calculated expiry date falls on a non-trading day, the order expires at the end of the previous trading day.

8.2.2.5. Immediate Or Cancel (IOC)

An order with Immediate Or Cancel validity condition must be executed immediately in full or at least partially upon entry into the order book. To be executed, IOC order must be matched with one or more opposing orders which have prices within trade price collars. The unexecuted part of IOC order is automatically canceled by Trading System.

IOC orders may only be submitted during the Continuous Trading market phases.

IOC validity condition cannot be used with Stop Limit, Stop Loss and Iceberg orders.

8.2.2.6. Fill Or Kill (FOK)

An order with Fill Or Kill validity condition must be fully executed immediately upon entry into the order book. To be executed, FOK order must be matched with one or more opposing orders which have prices within trade price collars. Unexecuted FOK order is automatically canceled by Trading System.

FOK orders may only be submitted during the Continuous Trading market phases.

FOK validity condition cannot be used with Stop Limit, Stop Loss and Iceberg orders.

8.2.2.7. Valid For Auction (VFA)

An order with Valid For Auction validity condition, submitted during Continuous Trading market phase, remains inactive and invisible to the general market via Market Data feed. It activates at the start of the next Auction market phase (whether scheduled or unscheduled, including instrument unhalt Auction). It is inserted into the order book when the Auction stage begins. If a VFA order is submitted during Auction period, it is activated immediately upon entry. Once activated, VFA order retains its original priority timestamp initially set by the exchange member.

Inactive VFA order remains valid until the end of the current trading day and it expires during post-session processing. Activated and unexecuted VFA order expires just after Auction (when the Uncrossing stage is complete and before the next trading phase begins).

8.2.2.8. Valid For Closing (VFC)

An order with Valid For Closing validity condition, submitted during Continuous Trading market phase, remains inactive and invisible to the general market via Market Data feed. It activates at the start of the Closing Auction market phase only. It is inserted into the order book when Auction stage begins. If a VFC order occurs during Closing Auction period, it activates immediately upon entry. Once activated, VFC order retains its original priority timestamp initially set by the exchange member.

Inactive VFC order remains valid until the end of the current trading day and it expires during the post-session processing. Activated and unexecuted VFC order expires just after the Closing Auction (when Uncrossing stage is over and before the next trading phase begins).

8.2.3. ORDER MODIFICATIONS

Exchange members are allowed to modify their orders during the following market phases:

- Continuous Trading at Variable Price,
- Continuous Trading at Fixed Price,
- Continuous Trading at Closing Price,
- Auction (Opening/Intraday/Closing).

Exchange members are allowed to modify the following order characteristics:

- Total quantity,
- Initial displayed quantity (in case of Iceberg Orders only),
- Price,
- Trigger price (in case of stop orders only).

Order type, validity and remaining order attributes cannot be modified during the order lifetime.

When decreasing an order total quantity, the new total quantity requested in modification must be strictly greater than the current cumulative executed quantity of the order.

8.2.3.1. Limit Order, Market Order, Market To Limit

Modification of Limit Order's price (both increase and decrease) may result in losing time-based priority in the order book depending on the current market phase:

- during Continuous Trading at Variable Price, Auction (Opening/Intraday/Closing) - modification of Price always results in losing priority (i.e. an order is assigned a new priority timestamp when it is modified),
- during Continuous Trading at Reference (Fixed) Price, Continuous Trading at Closing Price - the order loses its priority timestamp only if the modification results in amending the order price published in Market Data feed (where worse prices are not compressed to the reference price level during above mentioned market phases).

Increasing the order total quantity results in losing time-based priority in the order book (i.e. the order is assigned a new priority timestamp when it is modified).

Decreasing the order total quantity does not affect time-based priority of an order in the order book (i.e. an order retains its original priority timestamp and maintains its ranking in the order book).

8.2.3.2. Iceberg Order

Exchange member is allowed to modify Iceberg Order:

- Total quantity,
- Initial display quantity,
- Price.

Modifications of the initial display quantity and/or price results in refilling current display quantity. Each refill results in losing the Iceberg order's time-based priority. Each refill is immediately shown in the Market Data feed. Modification of the total quantity does not result in refilling the current display quantity and order retains its time-based priority.

Minimum Iceberg Value

Iceberg's unexecuted value (i.e. price x remaining quantity) upon submitting the order or any modification of price and/or total quantity must be equal or greater than the minimum iceberg value parameter defined by the Market Operator (e.g. 10 000 EUR).

When modifying only the initial display quantity (with other order characteristics remaining unchanged), Iceberg value is not re-checked against minimum iceberg value set by the Market Operator.

Price and Total Quantity

Modification of Iceberg Order price (both increase and decrease) may result in losing time-based priority in the order book depending on the current market phase:

- during Continuous Trading at Variable Price, Auction (Opening/Intraday/Closing) – modifying the price always results in losing priority (i.e. the order is assigned a new priority timestamp when it is modified),
- during Continuous Trading at Fixed Price, Continuous Trading at Closing Price - the order loses its priority timestamp only if the modification results in amending the order price published in Market Data feed (In which prices are compressed to the reference price level during the above-mentioned market phases).

Modifying Iceberg Order total quantity (both increase and decrease) does not affect time-based priority of an order in the order book (i.e. an order retains its original priority timestamp and maintains its ranking in the order book).

8.2.3.3. Stop Limit, Stop Loss

Any modification of price and/or total quantity, for inactive Stop Order, does not result in losing priority in the stop order book.

Modification of price and/or total quantity for an activated Stop Order follows priority loss rules described above for Limit and Market Orders.

Modifying trigger price is only allowed before Stop Order activation. It always results in losing priority in the stop order book.

8.2.4. COMPATIBILITY MATRIX

The tables below present the compatibility of specific validity conditions with various order types in each market phase.

8.2.4.1. Continuous Trading at Variable Price

	DAY	GTT	GTD	GTC	VFA	VFC	IOC	FOK
Limit Order	yes	yes	yes	yes	yes	yes	yes	yes
Market Order	no	no	no	no	yes	yes	yes	yes
Market To Limit	no	no	no	no	yes	yes	yes	yes
Stop Limit	yes	yes	yes	yes	no	no	no	no
Stop Loss	yes	yes	yes	yes	no	no	no	no
Iceberg Order	yes	yes	yes	yes	no	no	no	no

8.2.4.2. Continuous Trading at Fixed Price

	DAY	GTT	GTD	GTC	VFA	VFC	IOC	FOK
Limit Order	yes	yes	yes	yes	yes	yes	yes	yes
Market Order	no	no	no	no	yes	yes	yes	yes
Market To Limit	no	no	no	no	yes	yes	yes	yes
Stop Limit	yes	yes	yes	yes	no	no	no	no
Stop Loss	yes	yes	yes	yes	no	no	no	no
Iceberg Order	yes	yes	yes	yes	no	no	no	no

8.2.4.3. Continuous Trading at Closing Price

	DAY	GTT	GTD	GTC	VFA	VFC	IOC	FOK
Limit Order	yes	yes	yes	yes	yes	yes	yes	yes
Market Order	no	no	no	no	yes	yes	yes	yes
Market To Limit	no	no	no	no	yes	yes	yes	yes
Stop Limit	yes	yes	yes	yes	no	no	no	no
Stop Loss	yes	yes	yes	yes	no	no	no	no
Iceberg Order	yes	yes	yes	yes	no	no	no	no

8.2.4.4. Auction

	DAY	GTT	GTD	GTC	VFA	VFC	IOC	FOK
Limit Order	yes	yes	yes	yes	yes	yes	no	no
Market Order	no	no	no	no	yes	yes	no	no
Market To Limit	no	no	no	no	yes	yes	no	no
Stop Limit	yes	yes	yes	yes	no	no	no	no
Stop Loss	yes	yes	yes	yes	no	no	no	no
Iceberg Order	yes	yes	yes	yes	no	no	no	no

8.2.4.5. Monitoring

During Monitoring market phase, market participants cannot perform any operations on orders.

Only the exchange can cancel orders, if necessary.

8.2.4.6. Market Closed

When market is closed, order book is not accessible. No operations on orders are allowed.

The exchange cannot cancel orders.

8.3. Matching Algorithms

GPW WATS Trading System supports three types of trading phase matching algorithms:

- Variable Price matching (applied during Continuous Trading at Variable Price market phase),
- Fixed Price matching (applied during Continuous Trading at Fixed Price and Continuous Trading at Closing Price market phases),
- Auction matching (applied during Auction market phase).

8.3.1. AUCTION

During the Auction phase, System calculates and provides continuous information on potential matching prices and order volumes, which would be executed at the time of calculation. This applies to the crossed order book only. There is no matching price and volume for uncrossed order book, so only best bid and ask are provided instead.

Please check out Example: Auction for details.

8.3.1.1. Indicative Match Price (IMP)

The calculation of IMP and IMV is based on all active orders held in the order book.

The IMP/IMV calculation is based on four principles:

1. Maximum executable quantity - the IMP price maximizes the number of shares traded,
2. Minimum surplus - if more than one limit meets the maximum executable volume, then IMP minimizes the volume surplus between Buy and Sell orders at the IMP level,
3. If more than one price level meets the two first principles then the *market pressure* principle is applied:
    - if surplus exists on the buy side, only then is the highest price with the same surplus is the IMP price,
    - if surplus exists on the sell side, only then the lowest price with the same surplus is the IMP price.
4. If identical surplus is on both sides, then IMP price is the nearest or equal to the reference price:
    - if reference price is equal to or higher than the highest price limit with the same surplus on the buy side, the highest price is the IMP price,

- if reference price is equal to or lower than the lowest price limit with the same surplus on the sell side, the lowest price is the IMP price,
- if reference price is between the highest and lowest prices with the same surplus - the reference price is the IMP price.

Special cases:

- Only when unpriced orders are on both sides (market orders and/or market to limit orders), the IMP price is equal to the reference price,
- Only when unpriced orders are on one side without any orders on the opposite side, no IMP price is determined and unpriced orders expire due to VFA/VFC validity restrictions.

Stop Orders are not triggered during the Auction phase therefore they do not take part in the calculation of IMP and IMV values. Stop Orders triggered at the end of the Auction phase (after uncrossing) are added and processed at the beginning of the next trading phase.

The total volume of Iceberg Orders is included when calculating the IMP and IMV values.

Orders Matching

At the end of the Auction phase, all eligible orders are matched at the last calculated IMP price.

As a result of order matching (uncrossing) all orders with the price strictly better than indicative matching price (i.e. buy orders with the higher limit and sell orders with the lower limit) must be fully executed. Orders with the price equal to the indicative matching price can be executed fully, partially or not executed at all. Unexecuted orders are moved to the next market phase unless order validity indicate otherwise (e.g. VFA/VFC). Orders moved to next market phase preserve their original time priority.

8.3.2. UNCROSSING ALGORITHM

At the start of the uncrossing process, the system has the following data:

- Auction price equal to the last calculated indicative matching price at the end of Auction,
- Indicative matching volume.

Uncrossing process consists of three steps:

1. Selection of orders being matched,
2. Order quantity allocation,
3. Order matching (trades generation).

Selection of orders

- Based on IMP and IMV data a Buy auction list and a Sell auction list are created,
- Buy auction list includes all Buy orders with price limits higher than and equal to IMP,
- Sell auction list includes all Sell orders with price limits lower than and equal to IMP.

Order quantity allocation

- On the short side where total quantity is equal to the IMV, all orders are allocated for their entire quantity.
- On the long side where total quantity is higher than IMV thus some orders with prices strictly worse than the IMP (Auction price) are not executed and orders with the price equal to the IMP can be executed fully, partially or not executed at all. Orders are executed according to price/time priority rule.

  Please check out Example Uncrossing Algorithm: for details

8.3.3. CONTINUOUS TRADING

In Continuous Trading the incoming orders are matched and executed continuously.

GPW WATS Trading System supports two matching algorithms:

- Continuous Price and Time, in which orders are executed at different prices depending on the current order book situation,
- Continuous at Reference Price, in which orders are executed at a fixed price.

8.3.3.1. Price and Time Matching

Processing incoming orders

An incoming aggressive order is processed in three steps:

1. Selecting matching orders,
2. Allocating order quantity,
3. Matching orders (trade generation).

Selecting matching orders

Limit Orders

All orders with price limits greater than or equal to price limit of the incoming order are selected to the matching list. If the incoming order is a buy order the matching list includes sell orders with price limits equal to and lower than the buy order limit. If the incoming order is a sell order, then the matching list includes the buy orders with the price limit equal to or greater than the sell order limit.

Market Orders (MO)

Market Order as an unpriced order can be matched with any limit orders at different price levels. Selecting the orders depend only on the volume of the incoming market order. If the total volume of orders in the order book is higher than the volume of MO order then the MO order is fully executed.

Market To Limit orders (MTL)

Market to Limit Order as an unpriced order can be matched with the limit orders at the best price level. Selecting orders depend only on the volume of the incoming MTL order. If the total volume of orders in the order book at the best opposing price level is greater than the volume of MTL order then MTL order is fully executed.

Orders quantity allocation

Allocation of the passive orders must follow Price/Time priority principle.

Limit Orders

If the total volume of selected orders is lower than the volume of the incoming limit order then the incoming order is partially filled and the unexecuted part of the order is booked in the order book. Thus all selected orders are fully executed. If the total volume of selected orders is greater than the volume of the incoming order then the incoming order is executed in full. If so, not all selected orders are fully filled. Allocation of orders at the last limit touched by incoming order is processed according to the Time priority

Market Orders (MO)

If the total volume of selected orders is lower than the volume of the incoming market order with IOC validity, the incoming order is partially filled and the unexecuted part is canceled. If the total volume of selected orders is lower than the volume of the incoming market order with FOK validity, the incoming order is canceled according to processing a FOK order. If the total volume of selected orders is higher than volume of the incoming MO then incoming order is executed in full.

Market To Limit Orders (MTL)

MTL order is processed in the same manner as MO with the exception that the total volume of selected orders is calculated for the orders at the best opposing price limit.

Orders matching

Selected orders are matched and trades are generated. After matching, process order book is uncrossed.

Please check out Example: Price and Time Matching for details

8.3.3.2. Reference Price Matching

All orders are executed at the same reference price. During the trading day, when the Continuous at Reference Price phase follows the Auction phase then the Auction price is adopted as the reference price. Orders awaiting execution in the order book are matched according to the time priority only and price limits of such orders are disregarded. The orders with the price limits better than the reference price are displayed in the order book with the price limits suppressed to the reference price.

8.4. Pre-Trade Controls

To ensure market integrity and to prevent disorderly trading, regulated markets should have effective systems, procedures and arrangements to reject orders that exceed a pre-determined volume and price thresholds or are clearly erroneous. Markets should conduct the following pre-trade controls adapted for each financial instrument traded:

- price collars automatically block orders that do not meet preset parameters,
- maximum order value automatically prevents orders with uncommonly large order size from entering the order book,
- maximum order volume automatically prevents orders with an uncommonly large order.

Orders are validated upon order entry/modification, and are rejected if they do not meet the criteria set by the exchange. Pre-trade controls are performed during any market phase when order management is

allowed. Each incoming order or modification is subject to all three pre-trade checks in the following sequence:

- Order price collar,
- Maximum order value,
- Maximum order quantity.

If one parameter is exceeded then next pre-trade checks are not performed and the order is rejected with the appropriate reject reason.

Order price collar, maximum order value, maximum order quantity is provided in reference data.

8.4.1. ORDER PRICE COLLAR

Order price collar mechanism prevents orders from entering the order book whenever their limits exceed predefined limit thresholds (upper and lower limits). Orders which exceed thresholds are rejected with the appropriate reason for rejection. Upper and lower collar (for both bid and ask) are calculated in relation to reference price. Last auction price is used as a reference price for calculating static order price collar. Thus upper and lower collar are applied unchanged throughout the entire trading day, unless updated by any Auction. Order price collar can be expressed in percentage or absolute values and must comply with the respective tick size rules. Upper and lower collar can be calculated and set up symmetrically or asymmetrically against the reference price for both passive orders and aggressive orders separately. In addition, the order price collar can be defined independently for bid and ask orders.

The following order collar values can be setup:

- Lower ask - lower order limit for aggressive orders,
- Upper ask - upper order limit for passive orders,
- Lower bid - lower order limit for passive orders,
- Upper bid - upper order limit for aggressive orders.

Asymmetrical setup of order price collars enables Market Operator to define wider limits for passive orders (necessary for orders with long-term validity) and narrower limits for aggressive orders. This logic is shown in an example below:

- Lower ask: 10%,
- Upper ask: 30%,
- Lower bid: 30%,
- Upper bid: 10%.

Generally, static order price collars are wider than static trade price collars for the same financial instrument.

When the calculated order price collars do not meet tick size rules (e.g. the end result is at half tick) then calculated collars are calculated according to the following rules:

- Upper limits (upper ask and upper bid) are rounded down to the nearest tick size,
- Lower limits (lower ask and lower bid) are rounded up to the nearest tick size.

8.4.2. ORDER QUANTITY

Maximum order quantity pre-trade check prevents orders from entering the order book if the size exceeds a predefined quantity. Orders which exceed maximum order quantity, which is set up for instruments, are rejected with the appropriate reason for rejection.

8.4.3. ORDER VALUE

Maximum order value pre-trade check prevents orders and quotes from entering the order book whenever the value exceeds a predefined value of an order or quote. Orders exceeding maximum order value set up for instruments are rejected with the appropriate reason for rejection.

For the purpose of maximum order value check, incoming order value is calculated as follows:

Equities

- Limit order: total order quantity x lot size x order price,
- Market orders / market to limit: total order quantity x lot size x upper static order price collar.

Bonds

- Limit order: total order quantity x lot size x order price x nominal value,
- Market orders / market to limit: total order quantity x lot size x upper static order price collar x nominal value.

Futures

- Limit orders: total order quantity x lot size x order price x multiplier,
- Market orders / market to limit: total order quantity x lot size x upper static order price collar x multiplier.

Options

- Limit orders / market orders / market to limit: total order quantity x lot size x strike price x multiplier.

8.5. Circuit Breakers

Circuit Breakers is a mechanism that is applied during trading phases for the Central Limit Order Book (Continuous Phase with variable price and Auction Phases). It prevents large deviations in execution prices. Circuit Breakers mechanism checks if the potential trade price is within Trade Price Collar (price range within orders can be executed). If not, trading is interrupted by a Volatility Auction.

Trade Price Collars are calculated as the price deviates up and down the Reference Price. They are expressed in absolute or percentage values.

Static Trade Price Collar (Static TPC) is wider than Dynamic Trade Price Collar (Dynamic TPC). Static TPC has priority over Dynamic TPC. Thus if the potential trade price simultaneously goes beyond Static and Dynamic TPCs, then a Volatility Auction is triggered, but only for Static TPC.

8.5.1. CONFIGURATION PARAMETERS

8.5.1.1. Trade Price Collar Table

Trade Price Collar table defines the value of price deviation up and down the Reference Price. It can be expressed in absolute or percentage value.

8.5.1.2. Trade Price Collar Value

The value of Upper and Lower Trade Price Collars are calculated using the following formulas:

Collar Expression	Calculation method
absolute value	Upper TPC = Reference Price + absolute value Lower TPC = Reference Price - absolute value
percentage	Upper TPC = Reference Price x (1 + percentage deviation) Lower TPC = Reference Price x (1 - percentage deviation)

Trade Price Collar value is rounded to the nearest value within the tick size of the Instrument. The Upper TPC value is rounded down while the Lower TPC value is rounded up.

8.5.1.3. Collar Reference Price

Reference Price Sources

Adjusted Closing Price (ACP)

Type of Instrument	ACP method
Shares	ACP is the Closing Price that is adjusted by the value of corporate action. The calculation method depends on the type of corporate action. Adjusted Closing Price is rounded to the nearest value within the tick size of the Instrument. The Closing Price is the price of the last trade in a Central Limit Order Book session. If there is no trade in the session, the Closing Price is the Adjusted Closing Price from the last trading day.
Bonds	ACP = Closing Price.
Futures Contracts	for Index Futures and Currency Futures ACP = Daily Settlement Price* for Single Stock Futures ACP = Daily Settlement Price* adjusted by the value of corporate action. The calculation method depends on the type of corporate action. Adjusted Closing Price is rounded to the nearest value within the tick size of the Instrument. * Daily Settlement Price is set after each session, starting when the first transaction of a Futures Contract series was made, with the exception of the expiry date. The calculation method is specified in Standard Specification for a given futures contract class (available on the WSE website). Until the first transaction is concluded, ACP = Fair Value for a given futures contract series (Instrument).
Options Contracts	ACP = Fair Value for a given option contract series (Instrument).

8.5.1.4. Scheduled Auction Price

The scheduled auction price is a price determined in the following trading phases:

- Opening Auction
- Intraday Auction
- Closing Auction.

8.5.1.5. Last Traded Price

Last traded price (LTP) is the price of the last trade during the session considering the following rules:

If an incoming (aggressive) order is executed in more than one trade, then the price of the last one is set as an LTP. Thus LTP is not updated with the price of each trade resulting from the execution of an order, but only with the price of the last trade.

8.5.2. STATIC COLLAR REFERENCE PRICE

The rules for determining the Static Collar Reference Price are:

- at the start of a trading session, Static Collar Reference Price is the Adjusted Closing Price,
- new Static Collar Reference Price can be set as Scheduled Auction Price,
- when there is a Volatility Auction, resulting from a Static Trade Price Collar breach, a new Static Collar Reference Price can be set if Static Volatility Auction Price is:

    a) greater than the Upper Static TPC determined before the start of the Static Volatility Auction,

    or

    b) lower than the Lower Static TPC determined before the start of the Static Volatility Auction.

If the condition indicated in point a) is met then Static Collar Reference Price is determined by the equation:

Last Static Collar Reference Price + (Last Upper Static TPC - Last Static Collar Reference Price) x Reference Price Step

The result is rounded down to the nearest value within the tick size of the Instrument.

If the condition indicated in point b) is met then Static Collar Reference Price is determined by the equation:

Last Static Collar Reference Price - (Last Static Collar Reference Price - Last Lower Static TPC) x Reference Price Step.

The result is rounded up to the nearest value within the tick size of the Instrument.

8.5.3. DYNAMIC COLLAR REFERENCE PRICE

The rules for determining the Dynamic Collar Reference Price are:

- Adjusted Closing Price becomes Dynamic Collar Reference Price at the start of a trading session until the first transaction is concluded,
- after the first transaction is concluded, Last Traded Price becomes Dynamic Collar Reference Price.

8.5.4. CIRCUIT BREAKERS APPLICATION METHOD

During the continuous phase or auction phase, the system checks whether the potential trade price is within Static or Dynamic TPCs. If only one of the conditions is not fulfilled, trading is interrupted and Volatility Auction begins. A Volatility Auction is announced to market participants specifying breached

Static/Dynamic TPCs. Please note that Volatility Auction caused by a Static TPC breach has priority over Volatility Auction caused by a Dynamic TPC breach. Thus if the potential execution price is simultaneously beyond Static and Dynamic Collars then a Volatility Auction caused solely by Static Collar breach begins.

The following principles apply when an incoming order attempts to be traded beyond Dynamic or Static TPCs:

- an order may be partially executed within collars (if it matches the orders inside the collars),
- unexecuted part of the order that matches beyond collars is added to the order book,
- the Volatility Auction begins.

Please note that incoming FOK and IOC orders do not trigger Dynamic Collars. If FOK order which matches quantity include orders outside Dynamic Collars, then the FOK order is rejected. If IOC order which matches quantity include orders outside Dynamic Collars, then the IOC order is partially executed within Dynamic Collars, and the unexecuted part of the order is canceled.

8.5.5. VOLATILITY AUCTION PROCEDURE

The Volatility Auction procedure is identical both for Dynamic and Static Collars. The same principles as for Scheduled Auctions are applied, therefore:

- During the Volatility Auction, trades are not concluded,
- Order book is open,
- Indicative Matching Price (IMP) and Indicative Matching Volume (IMV) are calculated,
- The Volatility Auction ends after the predetermined duration elapses (including random end).

Volatility Auction Collars are calculated during the Volatility Auction:

For the Dynamic Volatility Auction, Volatility Auction Collars are calculated using Extension Ratio (collars are extended by multiplying by Extension Factor).

8.5.6. STRESSED MARKET CONDITION

GPW WATS detects situations resulting from the stressed market condition and triggers appropriate actions to inform the market. Stressed market conditions apply to ESMA liquid instruments only and affects those where market making scheme applies.

Stressed market condition is usually triggered if following a volatility auction an instrument moves to another phase and new reference price to determine the new price static collars levels have been set successfully. Additionally, the difference between new static collar reference price and previous static collar reference price is verified in order to define whether a change is significant enough to fall under stressed market requirement.

- If a stressed market condition is observed on an instrument that is also an underlying:

  stressed market conditions are automatically declared on stock futures contract (if they are recognized as ESMA liquid instruments).

- If for index futures contract on WIG20 or mWIG40 indices a new reference price to determine the new price static collars levels is set:

  stressed market conditions are automatically declared on all instruments of this contract series.

- If for index futures contract on WIG20 index a new reference price to determine the new price static collars levels is set triggering stressed market condition:

  stressed market condition is automatically declared on all index options on WIG20 index.

  Information about stressed market condition will be part of reference data message.

9. Off-Book Trading Models

9.1. Off-Book Trading

Off-book trading is a market model where pre-arranged trades are executed on the exchange. Off-book trades must comply with the exchange rules.

Trading System supports two types of off-book trades (market models) :

- Block trading model,
- Cross trading model.

9.2. Block Trading Model

Block trading is a market model in which trades are concluded bilaterally in the process of the negotiations between the counterparties (beneficiary clients). The beneficiary clients may belong to one exchange member or to different ones. The negotiations usually take place beyond Trading System infrastructure. Block trading is concluded when the respective trade entry is recorded in Trading System based on the Trade Capture Report message/messages submitted by exchange members.

Block Trade facility enables the exchange members to report pre-arranged large trades through the Market Operator Trading System.

The value of Block Trades must not be lower than the value e.g. Large In Scale value. The price of the Block Trade must be within thresholds set by the exchange. Price thresholds can be set on different levels depending on the session phase of the same instrument in the Central Limit Order Book. Only instruments traded in the Central Limit Order Book are subject to Block Trades.

Block Trade is reported to the exchange by entering "one-party" or "two-party" Trade Capture Report. In the "one-party for pass-through" Block Trade the beneficiary clients belong to different exchange members. The initiator who enters one-party Block Trade requires confirmation by the counterparty to achieve the Block Trade. In "two-party" Block Trade both beneficiary clients belong to the same exchange member. "Two-party" Block Trade is used to report internal trade where the trade can be concluded and reported between two clients of the exchange member (Order Capacity; Agency vs Agency) or between the firm and the client (order Capacity: Principal vs Agency).

Block Trade features:

- MiFID 2 tick size regime does not apply to Block Trades,
- Both parties to the Block Trade must be the exchange member,
- Block Trades are reported by using the Trade Capture Reports messages.
- Block Trades are not pre-transparent thus Trade Capture Reports are not disseminated in the market data stream,
- Block Trades are post-trade transparent thus confirmed and matched Block Trades are immediately disseminated in the market data stream,
- Block Trades do not update the Last Trade Price.
- Block Trades are not taken into account when calculating the opening price or the closing price.

9.3. Cross Trading Model

Cross trading is a separate market model in which trades are concluded bilaterally in the process of the private negotiations between the counterparties (beneficiary clients). The beneficiary clients must belong to one exchange member only.

An exchange member can:

- act on behalf of both the buyer and the seller,
- deal on their own account against their client.

Cross trading is concluded when the respective trade entry is recorded in Trading System based on the Trade Capture Report message submitted by exchange members.

The Cross Trades functionality enables exchange members to report pre-arranged trades through the Market Operator Trading System (defined as Off-book On-exchange trade).

Only financial instruments traded in the Central Limit Order Book (CLOB) are subject to Cross Trades.

Cross Trades are only available during Continuous Trading at Variable Price and during the Continuous Trading at Fixed Price phases in the CLOB for the same instrument.

The value of Cross Trades must be no lower than the minimum value established by the Market Operator. The price of the Cross Trades are within the current Best Bid and Best Offer price limits in the CLOB (boundary included). When there is absence of the Best Bid and/or Best Offer in the CLOB for that instrument the price of the Cross Trade shall be within pre-trade check price limits for order price collars.

Cross Trades are reported by the exchange member to the Market Operator by entering "two-party" Trade Capture Report where both beneficiary clients belong to the same exchange member. Cross Trade is used to report internal trade where the trade can be concluded and reported between two clients of the exchange member (Order Capacity; Agency vs Agency) or between the firm and the client (order Capacity: Principal vs Agency).

Cross Trade features:

- MiFID 2 tick size regime does not apply to Cross Trades.
- Cross Trades are reported by using the Trade Capture Report messages.
- Cross Trades are not pre-transparent thus Trade Capture Reports are not disseminated in the market data stream
- Cross Trades are post-trade transparent thus confirmed and matched Cross Trades are immediately disseminated in the market data stream
- Cross Trades do not update the Last Trade Price
- Cross Trades are not taken into account when calculating the closing price or the opening price.

9.4. Market Phases

Market Phases are based on a Trading Schedule.

Trading System supports the following Market Phase types:

- Continuous Trading,
- Monitoring,
- Market Closed.

9.4.1. CONTINUOUS TRADING

During Continuous Trading Market Phase:

- Trade capture reports can be submitted, canceled, accepted or declined by the exchange members,
- Trade capture reports must pass the pre-trade controls,
- Trade capture reports are processed by Trading System in real time,
- Trades are immediately published to the market via Market Data.

Depending on the settlement date the Continuous Trading Market Phase is divided into two sub-phases:

- first - from the start of the trading day up to X time - for trades with the settlement date T+0, T+1 and T+30,
- second - from X time up to the end of the trading day - for trades with the settlement date T+1 and T+30,

  where X is the deadline for forwarding matched trades to the settlement system for trades settled in T+0.

9.4.2. MONITORING

The Monitoring Market Phase is designed for the exchange to check market integrity before the daily start or closing of the system. During the Monitoring phase, Trading System (including Trading Gateway) is accessible to participants, but they cannot perform any operations on the trade capture reports. At the end of the day, the not-matched one-sided trade capture reports are notified to the submitters with the status "Expired".

9.4.3. MARKET CLOSED

When the market is closed no operations on the trade capture reports are possible, neither by Market Participants nor the exchange. Some system components may still be available (e.g. Market Data Gateway).

9.5. Trade Capture Reports

The Trade Capture Report (TCR) is a message that enables market participants (exchange members) to report off-book trades concluded in compliance with the exchange rules. Trade Capture Reports are conveyed through the trading ports (Order Entry Gateway). Trade Capture Reports are used to report:

- Block Trades,
- Cross Trades.

Trading System supports two types of Trade Capture Reports:

- Single-sided TCR - for Block Trades,
- Dual-sided TCR - for Block Trades and Cross Trades.

Trade Capture Report Data

The Trade Capture Reports include the following basic data:

- The executing firm (exchange member),
- The instrument identification,
- The Contra Firm (Counterparty to the trade),
- The quantity traded,
- The trade price,
- The side (buy or sell),
- The settlement date,
- The order capacity,
- The trade type (Block trade or Cross Trade).

Trade Capture Report Identifiers

Trade Report ID

The Trade Capture Report must include the Trade Capture Report Identifier named the Trade Report ID. The Trade Report ID is assigned by the submitter of the TCR message and is used as a pure message identifier. In the one-sided TCR the initiator and the counterparty assign the Trade Report ID independently of each other. The Trade Report ID must be unique across a trading day for each submitter separately. Trade Report ID is also assigned separately by the Market Operator in outbound messages when the TCR is issued as the notification to the counterparty and as a trade confirmation sent to parties to the trade. When there is TCR acknowledgment the Trade Report ID is not assigned by the Market Operator (is echoed back from the submitter's TCR).

Trade Report Reference ID

The Trade Report Reference ID is assigned by the submitter when the TCR refers to the previous message. This field is included in the TCR message in cases when e.g. the TCR is canceled by the submitter or the exchange sends the TCR as trade confirmation to the parties to trade.

9.5.1. DECLARATION STATUSES

The status of the Trade Capture Report (TCR) depends on the action taken by the initiator, the counterparty and Trading System. The following TCR statuses are supported:

- New - the TCR is newly generated. One-sided TCR (first leg) is waiting for approval by the counterparty to the trade. Dual-sided TCR does not require approval and if accepted by Trading System it means the trade done.
- Accepted - the TCR successfully passed the syntax validation and the pre-trade controls by Trading System (status Accepted in the TCR Acknowledgment). The status "accepted" is also included in the TCR submitted by the counterparty as a positive response to the first leg.
- Canceled - the TCR is canceled by the initiator. For one-sided TCR the initiator can cancel TCR before accepting the first leg by the counterparty.

- Rejected - the TCR failed the syntax validation and the pre-trade controls by Trading System (status Rejected in the TCR Acknowledgment)
- Decline - the TCR (the initiator's first leg) is declined by the counterparty
- Expired - the TCR expires after a pre-defined period of time or at the end of the trading day.
- Matched - the TCRs (both legs) are successfully matched which is considered as a reported trade.
- Unmatched - the matched TCRs with the status "canceled" are accepted by Trading System (Trade Canceled).

9.5.2. SINGLE SIDED

One-sided Trade Capture Report (TCR) is used to report Block Trade which are negotiated outside the Central Limit Order Book. Each exchange member must report its own Trade Capture Report (own leg to the trade).

One-sided Trade Capture Report management.

Trade Capture Report submission

When the TCR is submitted it must pass the validation process (syntax and pre-trade checks):

If the TCR fails the validation process, then the TCR Acknowledgment with the status "New"/"Rejected" is sent back to the submitter.

If the TCR passed the validation process successfully:

- The TCR acknowledgment with the status "New"/"Accepted" is sent back to the submitter,
- The TCR is notified to the counterparty with the status "New"/"Alleged",
- The counterparty accepts the initiator's TCR (first leg) by sending, as a response, its TCR with the status "Replace"/"Accept",
- The TCR with the status "Replace"/"Accept" must pass the validation process (syntax and pre-trade checks).

If the TCR issued by the counterparty passed the validation process successfully the TCR acknowledgment with the status "Accepted" is sent back to the counterparty and Trading System compares the matching criteria:

- The same instrument,
- The same trade quantity,
- The same trade price.
- The same settlement date,
- The same trade type (Block trade),
- the opposing executing firm and counterparty firm,
- Opposing sides (buy vs. sell).

If the matching criteria are fulfilled the trade is generated:

- The TCR with the status "Matched" is sent to the initiator as notification of the trade,
- The TCR with the status "Matched" is sent to the counterparty as notification of the trade.

If the matching criteria is not fulfilled then the counterparty TCR (second leg) is rejected.

TCR cancellation

The TCR can only be canceled by the initiator when its TCR is still waiting for matching. If the initiator attempts to cancel the matched TCR then the Trade Cancellation procedure is applied.

The initiator cancels the TCR (unmatched first leg) by sending the TCR with the status "Cancel":

- If the TCR does not pass the validation, Trading System sends the TCR acknowledgment with the status "Rejected",
- If the TCR passes the validation successfully, Trading System sends the TCR acknowledgment with the status "Accepted",
- If the TCR is accepted by Trading System, the counterparty is notified on TCR cancellation by the initiator.

TCR decline

In response to the notification on entering the TCR (first leg) by the initiator, the counterparty can decline accepting the TCR. The counterparty issues the TCR with the status "Replace"/"Decline" and submits it to Trading System.

If the TCR is valid:

- Trading System accepts the counterparty decline by sending the TCR acknowledgment back to the counterparty with status "Accepted",
- Trading System notifies the initiator on the counterparty's decline by sending the TCR with the status "Replace"/"Decline".

TCR expiration

When there is no response from the counterparty neither to accept nor to decline the initiator's TCR (first leg) then after specified period of time has elapsed (if applicable - parameter at Trading System level) or at the end of the current day the TCR expires one of the following messages will be sent to the counterparty:

- Trading sends the unsolicited TCR with the status "Expired" as notification to the initiator,
- Trading sends the unsolicited TCR with the status "Expired" as notification to the counterparty,
- After the TCR expiry time there is no facility for such TCR to be brought back to life.

Trade Cancellation

When the trade matches, both parties to the trade have the opportunity to cancel the trade. The trade can only be canceled on the current day.

Trade Cancellation is processed by using the similar TCR flow as for the submission of the new TCR thus the counterparty's agreement is required to cancel the trade successfully.

During the trade cancellation procedure, the submitted TCRs are referenced to:

- The Trade ID being canceled and
- The Trade Report Ref ID assigned by the parties to the trade.

When the TCR with the status "New"/"Trade Report Cancel" is submitted, it must pass the validation process.

If the TCR fails the validation process then the TCR Acknowledgment with the status "Trade Report Cancel"/"Rejected" is sent back to the submitter.

If the TCR passed the validation process successfully:

- The TCR acknowledgment with the status "Trade Report Cancel"/"Accepted" is sent back to the submitter,
- The TCR is notified to the counterparty with the status "New"/"Alleged Trade Report Cancel".

When the TCR with the cancel request is accepted by the counterparty:

- The counterparty as a response sends its TCR with the status "Replace"/"Accept", and "ExecType=H (Trade Cancel),

If the matching criteria and the value "TradeID" are compatible then:

- The TCR with the status "Replace"/"Trade Report Cancel" is sent to the submitter,
- The TCR with the status "Replace"/"Trade Report Cancel" is sent to the counterparty.

If the matching criteria is fulfilled the trade is generated:

- The TCR with the status "Matched" is sent to the initiator as notification of the trade,
- The TCR with the status "Matched" is sent to the counterparty as notification of the trade,
- The trade is canceled,
- The canceled trade cannot be restored.

When the TCR with the cancel request is declined by the counterparty:

- The counterparty as a response sends its TCR with the status "Replace"/"Decline", and "ExecType=H (Trade Cancel),
- Trading System notifies the submitter (initiator) of the trade cancel decline by the counterparty by sending the TCR with the status "Replace"/"Decline", and "ExecType=H (Trade Cancel),
- The trade is still valid.

9.5.3. DUAL SIDED

Dual-sided Trade Capture Report (TCR) is used to report Block Trade and Cross Trade which are negotiated outside the Central Limit Order Book. Both parties to the trade must belong to the same exchange member.

Dual-sided Trade Capture Report management.

Trade Capture Report submission

When the TCR is submitted, it must pass the validation process (syntax and pre-trade checks).

If the TCR fails the validation process then the TCR Acknowledgment with the status "New"/"Rejected" is sent back to the submitter.

If the TCR passed the validation process successfully:

- The TCR acknowledgment with the status "New"/"Accepted" is sent back to the submitter,
- The TCR with the status "Matched" is sent to the submitter as a trade confirmation,
- The trade is valid.

If the TCR failed the validation process:

- The TCR acknowledgment with the status "New"/"Rejected" is sent back to the submitter,
- The trade is invalid.

9.6. Pre-Trade Controls

The Off-book trades must comply with the exchange rules. The exchange can require the off-book trades to undergo pre-trade controls. The Pre-Trade Controls are defined on the instrument level. The trade capture report is rejected when it fails to pass the pre-trade control validation. The pre-trade controls for off-book trades cover:

- trade price,
- minimum and maximum trade value.

9.6.1. BLOCK TRADES

Trade Price Collars

The Block Trade price must be within the trade price collars set up for the Block trades. Trade price collars are calculated in relation to the Reference Price. The Reference Price is based on the trade prices for the instrument with the same ISIN code concluded in the Central Limit Order Book. Trading System supports the calculation of different Reference Prices depending on the trading phase in the CLOB for that instrument, e.g. Last Trade Price.

Minimum and maximum value

The trade value cannot be lower than the value defined by the exchange (e.g. the Large In Scale value calculated for that ISIN code on the European level).

The trade value cannot be higher than the maximum value set up on the exchange level.

9.6.2. CROSS TRADES

Trade Price Collars

The Trade Price Collars must be within the current spread (boundary included) for that instrument in the Central Limit Order Book. When the spread is missing, the Trade Price Collars must be within the Order Price Collars for that instrument applied in the Central Limit Order Book.

Minimum and maximum value

The trade value cannot be lower than the value defined by the exchange.

The trade value cannot be higher than the maximum value set up by the exchange.

10. Hybrid Model

Hybrid Market Model is a type of financial market that combines features of both exchange order driven market e.g., continuous matching with Price/Time execution priority and some functionalities typical for price driven market such as: facility to conclude trades only if there is a valid Market Maker quote in the order book. It is not necessary for the Market Maker to become part of each transaction as those may be executed between investors themselves, a Market Maker's presence is obligatory to allow doing so. Market Maker's quotes act as a threshold mechanism to manage volatility and restrict sudden price movement in the order book.

Although a separate market model documentation for Hybrid Market Model is to be released in the future, detailed below are some important facts regarding implementation scope.

10.1. Order Types

Order type defines the behavior of an order in the order book and the manner in which it is executed. The following section describes order types available in Hybrid Market Model

10.1.1. LIMIT ORDER

Limit Order type allows one to buy or sell at a specified price. Limit Order execution happens at a price equal to or better than its limit price (at its limit or a lower price for a buy order and its limit or higher price for a sell order). An unexecuted limit order that enters the order book is prioritized according to the price/time priority. The limit price must be specified according to the tick size definition. If not, an order is rejected.

10.1.2. STOP LIMIT (ON QUOTE)

Stop Limit Order is an order to buy or sell, which is activated and inserted into the order book after reaching or exceeding a pre-defined price namely trigger price. In Hybrid Market Model Stop orders are activated based on the Market Maker Quote.

Stop Limit remains inactive and is not displayed to the general market via Market Data until trigger price is reached. Once activated, Stop Limit is processed as a regular Limit Order and retains its original order type.

At the point of Stop Limit Order submission and modification, the following conditions must be met:

- for buy order: limit price > = trigger price > the Market Maker Sell Quote,
- for sell order: limit price < = trigger price < the Market Maker Buy Quote.

otherwise, the order is rejected.

Stop Limit orders can be submitted with the following validity conditions:

- Day (DAY),
- Good Till Time (GTT),
- Good Till Date (GTD),
- Good Till Cancel (GTC).

Selected validity applies to the inactive Stop Limit Order awaiting activation, as well as to the triggered order awaiting execution in the order book.

The Stop Limit Order trigger price may be modified by the exchange member as long as the order remains inactive.

10.2. VALIDITY CONDITIONS (TIF)

10.2.1. ORDER TYPES & VALIDITIES

Order validity condition defines:

- for how long an order remains in the order book (DAY, GTT, GTD, GTC),

GPW WATS Hybrid Market Model supports the following validity conditions:

10.2.1.1. Day (DAY)

Day order is valid for the current trading day only. Trading System expires Unexecuted Day orders at the end of the trading day during the post-session processing.

10.2.1.2. Good Till Time (GTT)

Good Till Time order is valid until the specified time of the current trading day. Then it expires at the end of that date during the post-session processing.

Expire time for GTT orders may be specified with 1 second granularity when exchange member submits an order.

10.2.1.3. Good Till Date (GTD)

Good Till Date order is valid until the end of the specified day and it expires at the end of that date during the post-session processing.

The exchange defines the maximum GTD expiration delay that is allowed to be used when submitting an order. If the exchange member requests an expiry date that exceeds set up delay, the order will be rejected. If the requested expiry date falls on a non-trading day, the order expires at the end of the previous trading day.

10.2.1.4. Good Till Cancel (GTC)

Good Till Cancel order is valid until it is fully executed or canceled by the submitter or Trading System.

Market Operator defines the maximum GTC expiry delay that is the maximum number of days that a GTC order is allowed to rest in the order book. After that period elapses, Trading System expires a GTC order during the post-session processing. If the calculated expiry date falls on a non-trading day, the order expires at the end of the previous trading day.

The table below presents allowed order types and possible validities (TIF) associated:

	DAY	GTT	GTD	GTC
Limit Order	yes	yes	yes	yes
Stop Limit	yes	yes	yes	yes

10.2.2. OTHER FUNCTIONALITIES

- a single line of quotation of an instrument (therefore neither block nor cross transactions),
- only one Market Maker per instrument, only one pair of the Market Maker Quotes at a time,
- an instrument suspension whenever Market Maker Quotes are not present in the order book,
- RFE activation whenever there is a possible execution of an order in which one side of the potential trade is Market Maker Quote,
- Instrument suspension whenever underlying is suspended (only when both instruments are listed on the same platform),
- Dedicated RFE – Request For Execution informing Market Maker about potential execution of their quote,
- Knock – Out feature allowing to automatically suspend an instrument if its barrier has been reached or when there is a confirmation Knock-Out event has taken place Reference mid-point calculation.

11.IPO/SPO Model

In general, an IPO/SPO process is similar to other auction processes, where orders are collected and matched after. Contrary to the standard auction, IPO/SPO processes offer additional functionalities which support various allocation algorithms.

The following allocation algorithms can be used:

- no reduction - number of shares allocated corresponds to the number of subscribed shares. IPO/SPO price is at a fixed price. Bid order limits may vary, however only the limits equal or higher than IPO/SPO price take part in further allocation. Orders with limits less than IPO/SPO price are excluded and do not take part in the process,
- proportional reduction - each bid order volume is reduced proportionally using the same percentage rate. If a surplus exists, it may be allocated starting from orders with the highest volume or lowest volume. IPO/SPO price is at a fixed price. Bid order limits may vary, however only the limits equal or higher than IPO/SPO price take part in further allocation. Orders with limits less than IPO/SPO price are excluded and do not take part in the process,
- proportional reduction with guaranteed volume - bid orders with volume equal or lower than guaranteed volume are executed in total. Bid orders with volume higher than guaranteed volume receive at least guaranteed volume while the surplus if exists is reduced proportionally. IPO/SPO price is at a fixed price. Bid order limits may vary, however only the limits equal or higher than IPO/SPO price take part in the further allocation,
- allocation - bid orders may have various limits. Bid orders with limit price equal or higher than IPO/SPO price are executed in total. Bid orders with limit price lower than IPO/SPO price are excluded and do not take part in the process,
- allocation with guaranteed volume - bid orders may be of various limits. A bid order with limits higher than IPO/SPO price are executed in total. Bid orders with limits equal to IPO/SPO price receive at least a guaranteed volume while a surplus if exists is reduced proportionally.

In the basic scenario, orders are entered into Trading System during an auction. Basic validation of orders is made at order entry and an order may be rejected if it does not meet specific conditions. Meanwhile orders previously entered may be cancelled or modified. No indicative matching price nor indicative matching volume is distributed through market data. Once the order acceptance phase is closed, particularly when over-subscription exists, various simulation of allocation algorithms may be performed without any impact on the existing order book. Distribution of the order book is usually closed, however it remains under the exchange' discretion and regulations.

Once an allocation algorithm is allocated all the orders are executed according to the rules of the allocation algorithm. Final trades are usually not distributed via market data but the decision remains under the discretion and regulations of the exchange.

The IPO/SPO process may last more than one day.

11.1. IPO/SPO Market Segments

In order to properly distinguish instruments to meet all the necessary obligations to report transactions:

- for financial instruments admitted to trading or traded on Market or for which a request for admission has been made,
- for financial instruments for which no request for admission to trading has been made.

Separate Market Segment will be created as well as appropriate MIC codes will be allocated to Market Segments and associated instruments.

11.2. IPO/SPO Order Type

Order type defines the behavior of an order in the order book and the manner in which it is executed.

The following section describes order types available in IPO/SPO Market Model.

11.2.1. LIMIT ORDER

Limit Order is an order to buy or sell at a stipulated price.

11.3. IPO/SPO Validity Conditions (TIF)

Order validity for IPO/SPO Market Model condition defines:

- for how long an order remains in the order book

IPO/SPO Market Model supports the following validity conditions:

11.3.1. GOOD TILL DATE (GTD)

Order is valid until the specified time of the current trading day. Additional limitations may be imposed regarding the maximum length of an order.

11.3.2. GOOD TILL CANCEL (GTC)

Order is valid until it is totally executed or canceled by the submitter or Trading System. Additional limitations may be imposed regarding the maximum length of an order.

11.4. IPO/SPO Compatibility Matrix

The table below presents the compatibility of specific validity conditions with an order type available for IPO:

Order Type / Validity	GTD	GTC
Limit Order	yes	yes

12. Tender Offer Model

A tender offer is a public offer created by an individual or a company aimed at purchasing a large block of company's shares from its existing shareholders.

12.1. Tender Offer Market Segment

In order to properly distinguish instruments subjected to tender offer procedure a dedicated Market Segment will be created based on a separate Trading Schedule.

12.2. Tender Offer Order Type

Order type defines the behavior of an order in the order book and the manner in which it is executed.

The following section describes order types available in Tender Market Model.

12.2.1. LIMIT ORDER

Limit Order is an order to buy or sell at a stipulated price.

12.3. Tender Offer Validity Conditions

Order validity for Tender Market Model condition defines for how long an order remains in the order book

Tender Market Model supports the following validity conditions:

12.3.1. DAY (D)

Day order is valid for the current trading day only. Trading System expires Unexecuted Day orders at the end of the trading day during the post-session processing.

12.3.2. GOOD TILL DATE (GTD)

Good Till Date order is valid until the end of the specified day and it expires at the end of that date during the post-session processing.

12.4. Tender Offer Compatibility Matrix

The table below presents the compatibility of specific validity conditions with an order type available for Tender Offer:

Order Type / Validity	GTD	GTC
Limit Order	yes	yes

12.5. Tender Offer Process

In general, a tender offer process is similar to any other auction process where orders are subsequently collected and matched.

The basic scenario where the final price is previously settled and the over-subscription process is made outside the exchange is similar to any other auction. During the auction - all the sell orders of participants accepting the price are entered into the system by their intermediaries and must follow the same price limit – tender price. On the other hand, a single buy order is entered with a tender offer limit price. Basic order validation is carried out at the order entry stage and an order may be rejected if it does not meet specific criteria.

During this stage orders previously entered may be cancelled or modified.

No indicative matching price nor indicative matching volume is distributed through market data. The distribution of the order book is closed, however it remains under Market discretion and regulations.

In this scenario both sell and bid volumes are always equal. No under or over-subscription exists. All orders are completed during the auction uncross process at the same price and the whole supply and demand is matched.

Final trades are distributed via market data.

Usually, the process of allocating orders within Tender Offer procedure lasts no longer than one day, yet it is technically possible to keep an order book open for more than one single day.

13. Tables Of Examples

13.1. Example: Random Opening

Trading Schedule	Start Time	ROP*	Effective Uncrossing Period
Market Closed	12:00 am		
Early Monitoring	7:00 am		
Opening Auction	8:30 am	+ 5 sec.	between 9:00:00 - 9:00:05 am
Continuous Trading at Variable Price	9:00 am		
Intraday Auction Intraday	11:30 am	+ 10 sec.	between 12:00:00 - 12:00:10 pm
Continuous Trading at Fixed Price	12:00 pm		
Closing Auction	4:30 pm	- 15 sec.	between 4:59:45 - 5:00:00 pm
Continuous Trading at Closing Price	5:00 pm		
Late Monitoring	5:30 pm		
Market Closed	6:00 pm		

* ROP - Random Opening Period (in seconds)

Random Opening Period may also be set up for Volatility Auctions which result from trade price collar breach.

13.2. Example: Auction

Auction examples:

1st principle: Maximum executable quantity

BUY			SELL				
Aggr. Volume	Vol. at Price	Price	Vol. at Price	Aggr. Volume	Auction Vol.	Surplus	Pressure
200	200	20		600	200	-400	Sell
500	300	19	200	600	500	-100	Sell
500		18	200	400	400	100	Buy
600	100	17		200	200	400	Buy
600		16	200	200	200	400	Buy

In this example the maximum executable volume quantity (500) is at 19 which is the IMP price.

2nd principle: Minimum surplus

BUY			SELL				
Aggr. Volume	Vol. at Price	Price	Vol. at Price	Aggr. Volume	Auction Vol.	Surplus	Pressure
200	200	20		800	200	-600	Sell
500	300	19	200	800	500	-300	Sell
500		18	400	600	500	-100	Sell
600	100	17		200	200	400	Buy
600		16	200	200	200	400	Buy

In this example the maximum executable volume (500) is at 19 and at 18, however minimum surplus (-100) is at 18 which is the IMP price.

3rd principle: Market pressure

BUY			SELL				
Aggr. Volume	Vol. at Price	Price	Vol. at Price	Aggr. Volume	Auction Vol.	Surplus	Pressure
200	200	20		400	200	-200	Sell
500	300	19		400	400	100	Buy
500		18	200	400	400	100	Buy
600	100	17		200	200	400	Buy
600		16	200	200	200	400	Buy

In this example the maximum executable volume (400) and minimum surplus (100) is at 19 and at 18, however the market pressure is on the buy side and therefore the higher price 19 is selected as the IMP price.

4th principle: Reference price

BUY			SELL				
Aggr. Volume	Vol. at Price	Price	Vol. at Price	Aggr. Volume	Auction Vol.	Surplus	Pressure
300	300	20		600	300	-300	Sell
600	300	19		600	600	0	
600		18	200	600	600	0	
700	100	17	200	400	400	300	Buy
700		16	200	200	200	500	Buy

In this example the maximum executable volume (600), minimum surplus (0) and equal market pressure (0) is at two price levels at 19 and at 18. The IMP price must be nearest or equal to the reference price.

If the reference price would be equal to or higher than 19, then 19 is the IMP price.

If the reference price would be equal to or lower than 18 then 18 is the IMP price

If the reference price would be between 18 and 19 then the reference price is the IMP price.

Special case

On both sides there are Market Orders and/or Market To Limit Orders.

BUY			SELL				
Aggr. Volume	Vol. at Price	Price	Vol. at Price	Aggr. Volume	Auction Vol.	Surplus	Pressure
300	300	Market		200	200	100	Buy
300		Market	200	200	200	100	Buy

In this example the IMP price is equal to the Reference Price.

13.3. Example: Uncrossing Algorithm

Let's assume the order book is at the end of Auction phase.

Auction price = 21.60; Auction volume = 180

BUY			SELL		
Order Seq. No.	Quantity	Price	Price	Quantity	Order Seq. No.
7	20	22.20	20.60	20	4
10	40	22.00	20.80	20	13
5	70	21.80	21.20	20	9
2	20	21.60	21.40	40	11
6	20	21.60	21.40	20	12
8	20	21.60	21.60	60	3
1	20	21.40	21.90	90	15
14	80	21.30	22.10	70	16

Selection of orders

Based on IMP and IMV data, a Buy auction list and a Sell auction list are created.

Buy auction list includes all Buy orders with price limits higher than and equal to IMP.

Sell auction list includes all Sell orders with price limits lower than and equal to IMP.

BUY AUCTION LIST			SELL AUCTION LIST		
Order Seq. No.	Quantity	Price	Price	Quantity	Order Seq. No.
7	20	22.20	20.60	20	4
10	40	22.00	20.80	20	13
5	70	21.80	21.20	20	9
2	20	21.60	21.40	40	11
6	20	21.60	21.40	20	12
8	20	21.60	21.60	60	3

Order numbers 1, 14, 15, 16 are removed from Auction Lists as they have price limits strictly worse than IMP.

Orders quantity allocation

On the short side all Sell orders are allocated for their quantity as Total Sell Qty = IMV.

On the long side Total Buy Qty > IMV thus some orders are not executed. In this case by taking into account price/time priority the last buy order no 8 will be partially executed (reduced to 10).

Order matching (trades generation)

All allocated orders are matched at Auction Price = 21.60. Orders are matched step by step starting from first lines (best prices) up to the end of Buy and Sell Auction List.

The following trades are generated:

Trade No.	Matched Orders	Quantity	Price
1	7 and 4	20	21.60
2	13 and 10	20	21.60
3	10 and 9	20	21.60
4	11 and 5	40	21.60
5	5 and 12	20	21.60
6	3 and 5	10	21.60
7	2 and 3	20	21.60
8	3 and 6	20	21.60
9	8 and 3	10	21.60

13.4. Example: Price and Time Matching

Example A

Incoming Limit Order (Trade Price collars not triggered)

Assumptions:

- Tick size = 0.10
- Trade Price Collars: upper limit - 10.50, lower limit - 9.50

Initial Order book:

BUY			SELL		
Order Seq. No.	Quantity	Price	Price	Quantity	Order Seq. No.
1	20	9.90	10.00	30	2
3	30	9.80	10.10	8	4
15	80	9.80	10.10	15	8
16	40	9.60	10.30	30	11
6	10	9.50	10.50	40	5
7	20	9.50	10.50	20	9
10	70	9.50	10.60	80	12
13	100	9.40	10.90	10	14

(Remark: lower Order Seq. No. depicts higher Time Priority - order submitted earlier)

Incoming Sell Limit Order no. 17 100@9.50

Selecting opposing orders with crossed limits

List of selected orders:

BUY		
Order Seq. No.	Quantity	Price
1	20	9.90
3	30	9.80
15	80	9.80
16	40	9.60

BUY		
6	10	9.50
7	20	9.50
10	70	9.50

Order quantity allocation

Sell order quantity 100 is allocated to buy orders according to Price/Time priority:

Order no. 1 - allocated for total quantity 20 - remaining Sell Qty = 80

Order no. 3 - allocated for total quantity 30 before order no. 15 (Time priority) - remaining Sell Qty = 50

Order no. 15 - partially allocated quantity 50 - leaves quantity 30 - remaining Sell Qty = 0 (Sell order filled)

Order book with allocated quantities:

BUY			SELL		
Order Seq. No.	Quantity	Price	Price	Quantity	Order Seq. No.
1	20	9.90	9.50	100	17
3	30	9.80			
15	50	9.80			

Order matching

- After order quantity allocation orders are matched and trades are generated:
- Trade no. 1: Order no. 1 - Order no. 17 - quantity 20
- Trade no. 2: Order no. 3 - Order no. 17 - quantity 30
- Trade no. 3: Order no. 15 - Order no. 17 - quantity 50
- Order book after processing Sell order:

BUY			SELL		
Order Seq. No.	Quantity	Price	Price	Quantity	Order Seq. No.
			10.00	30	2
			10.10	8	4
15	30	9.80	10.10	15	8
16	40	9.60	10.30	30	11
6	10	9.50	10.50	40	5
7	20	9.50	10.50	20	9
10	70	9.50	10.60	80	12
13	100	9.40	10.90	10	14

Example B

- Incoming Limit Order (Trade Price collars triggered)
- Assumptions:
    a) Tick size = 0.10
    b) Trade Price Collars: upper limit - 10.50, lower limit - 9.50
- Initial order book:

BUY			SELL		
Order Seq. No.	Quantity	Price	Price	Quantity	Order Seq. No.
1	20	9.90	10.00	30	2
3	30	9.80	10.10	8	4
15	80	9.80	10.10	15	8
16	40	9.60	10.30	30	11
6	10	9.50	10.50	40	5
7	20	9.50	10.50	20	9
10	70	9.50	10.60	80	12
13	100	9.40	10.90	10	14

- Incoming Buy Limit Order no. 17 200@11.00

Selecting opposing orders with crossed limits and with limits inside Trade Price Collars

- List of selected orders:

SELL		
Price	Quantity	Order Seq. No.
10.00	30	2
10.10	8	4
10.10	15	8
10.30	30	11
10.50	40	5
10.50	20	9

- Order numbers 12 and no. 14 are not included in the list of selected orders as their limits are greater than Upper Trade Price Collar.

Order quantity allocation

Buy order quantity 200 is allocated to Sell orders according to Price/Time priority:

Order no. 2 - allocated for total quantity 30 - remaining Buy Qty = 170
Order no. 4 - allocated for total quantity 8 - remaining Buy Qty = 162
Order no. 8 - allocated quantity 15 - remaining Buy Qty = 147
Order no. 11 - allocated quantity 30 - remaining Buy Qty = 117
Order no. 5 - allocated quantity 40 - remaining Buy Qty = 77
Order no. 9 - allocated quantity 20 - remaining Buy Qty = 57
Total allocated quantity of Sell orders is equal to 143 thus incoming Buy order is partially filled and unexecuted part is added to order book

Order book with allocated quantities:

BUY			SELL		
Order Seq. No.	Quantity	Price	Price	Quantity	Order Seq. No.
17	143	11.00	10.00	30	2
			10.10	8	4
			10.10	15	8
			10.30	30	11
			10.50	40	5
			10.50	20	9

Order matching

After order quantity allocation orders are matched and trades are generated:

Trade no. 1: Order no. 2 - Order no. 17 - quantity 30

Trade no. 2: Order no. 4 - Order no. 17 - quantity 8

Trade no. 3: Order no. 8 - Order no. 17 - quantity 15

Trade no. 4: Order no. 11 - Order no. 17 - quantity 30

Trade no. 5: Order no. 5 - Order no. 17 - quantity 40

Trade no. 6: Order no. 9 - Order no. 17 - quantity 20

After orders are matched, trading is stopped (Volatility Halt) and unexecuted part of an incoming order is added to the order book and Auction procedure starts.

Order book at the start of Auction procedure:

BUY			SELL		
Order Seq. No.	Quantity	Price	Price	Quantity	Order Seq. No.
17	57	11.00			
1	20	9.90			
3	30	9.80			
15	80	9.80			
16	40	9.60			
6	10	9.50			
7	20	9.50			
10	70	9.50	10.60	80	12
13	100	9.40	10.90	10	14

Example C

Incoming Buy Market Order with IOC validity (Trade Price collars not triggered)

Initial order book as in Example 2

Incoming Buy Market Order no. 17: 40 @ MO

Selecting opposing orders with crossed limits and with limits inside Trade Price Collars

List of selected orders:

SELL		
Price	Quantity	Order Seq. No.
10.00	30	2
10.10	8	4
10.10	15	8

Order quantity allocation

Buy Market Order quantity 40 is allocated to Sell orders according to Price/Time priority:

Order no. 2 - allocated for total quantity 30 - remaining Buy Qty = 10

Order no. 4 - allocated for total quantity 8 before order no. 15 (Time priority) - remaining Buy Qty = 2

Order no. 15 - partially allocated quantity 2 - leaves quantity 13 - remaining Buy Qty = 0 (Buy order filled)

Order book with allocated quantities

BUY			SELL		
Order Seq. No.	Quantity	Price	Price	Quantity	Order Seq. No.
17	40	Market	10.00	30	2
			10.10	8	4
			10.10	2	8

Order matching

After order quantity allocation orders are matched and trades are generated:

Trade no. 1: Order no. 2 - Order no. 17 - quantity 30

Trade no. 2: Order no. 4 - Order no. 17 - quantity 8

Trade no. 3: Order no. 8 - Order no. 17 - quantity 2

Order book after processing Buy Market order:

BUY			SELL		
Order Seq. No.	Quantity	Price	Price	Quantity	Order Seq. No.
1	20	9.90			
3	30	9.80			
15	80	9.80	10.10	13	8
16	40	9.60	10.30	30	11
6	10	9.50	10.50	40	5
7	20	9.50	10.50	20	9
10	70	9.50	10.60	80	12
13	100	9.40	10.90	10	14

Example D

Incoming Buy Market Order with IOC validity (Trade Price collars triggered)

Initial order book as in Example 2

Incoming Buy Market Order no. 17: 300 @ MO

Selecting opposing orders with crossed limits and with limits inside Trade Price Collars

List of selected orders:

SELL		
Price	Quantity	Order Seq. No.
10.00	30	2
10.10	8	4
10.10	15	8

10.30	30	11
10.50	40	5
10.50	20	9

Order nos. 12 and 14 with price limits 10.60 and 10.90 respectively are not selected as the price limits are outside Trade Price Collars.

Order quantity allocation

Buy Market Order quantity 300 is allocated to Sell orders according to Price/Time priority:

Order no. 2 - allocated for total quantity 30 - remaining Buy Qty = 270

Order no. 4 - allocated for total quantity 8 (before order no. 8 - Time priority) - remaining Buy Qty = 262

Order no. 8 - allocated quantity 15 - remaining Buy Qty = 247

Order no. 11 - allocated quantity 30 - remaining Buy Qty = 217

Order no. 5 - allocated quantity 40 (before order no. 8 - Time priority) - remaining Buy Qty = 177

Order no. 9 - allocated quantity 20 - remaining Buy Qty = 157

Total allocated quantity of Sell orders is equal to 143 thus incoming Buy order is partially filled. As incoming order is Market Order with IOC validity then unexecuted part of Buy order is canceled. In this case there no Volatility Halt and trading is continued.

Order book with allocated quantities:

BUY			SELL		
Order Seq. No.	Quantity	Price	Price	Quantity	Order Seq. No.
17	143	Market	10.00	30	2
			10.10	8	4
			10.10	15	8
			10.30	30	11
			10.50	40	5
			10.50	20	9

Order matching

After order quantity allocation orders are matched and trades are generated:

Trade no. 1: Order no. 2 - Order no. 17 - quantity 30

Trade no. 2: Order no. 4 - Order no. 17 - quantity 8

Trade no. 3: Order no. 8 - Order no. 17 - quantity 15

Trade no. 4: Order no. 11 - Order no. 17 - quantity 30

Trade no. 5: Order no. 5 - Order no. 17 - quantity 40

Trade no. 6: Order no. 9 - Order no. 17 - quantity 20

Order book after processing Buy Market order

BUY			SELL		
Order Seq. No.	Quantity	Price	Price	Quantity	Order Seq. No.
1	20	9.90			
3	30	9.80			
15	80	9.80			
16	40	9.60			
6	10	9.50			
7	20	9.50			
10	70	9.50	10.60	80	12
13	100	9.40	10.90	10	14

Example E

Incoming Buy Market To Limit Order with IOC validity (Trade Price collars not triggered)

Initial order book:

BUY			SELL		
Order Seq. No.	Quantity	Price	Price	Quantity	Order Seq. No.
3	30	9.80	10.10	8	4
15	80	9.80	10.10	15	8
16	40	9.60	10.30	30	11

Selecting opposing orders with crossed limits and with limits inside Trade Price Collars

Selection of orders is restricted to orders at the best opposite price level only.

First example (MTL order filled - matched with one opposing order)

Incoming Buy Market To Limit Order no. 17: 5 @ MTL

List of selected orders:

- Only order no. 4 is selected

Order quantity allocation:

- Order no. 4 - allocated quantity 5 (partially filled)

Order matching:

- Trade no. 1 order no. 4 with order no. 17 - quantity 5

MTL Buy order fully executed

Order book after processing Buy Market To Limit order

BUY			SELL		
Order Seq. No.	Quantity	Price	Price	Quantity	Order Seq. No.
3	30	9.80	10.10	3	4
15	80	9.80	10.10	15	8
16	40	9.60	10.30	30	11

Second example (MTL order filled - matched with two opposing orders)

Incoming Buy Market To Limit Order no. 17: 20 @ MTL

List of selected orders:

- Order no. 4
- Order no. 8

Order quantity allocation:

- Order no. 4 - allocated quantity 8
- Order no. 8 - allocated quantity 12 (partially filled)

Order matching:

- Trade no. 1 order no. 4 with order no. 17 - quantity 8
- Trade no. 1 order no. 8 with order no. 17 - quantity 12

MTL Buy order fully executed

Order book after processing Buy Market To Limit order

BUY			SELL		
Order Seq. No.	Quantity	Price	Price	Quantity	Order Seq. No.
3	30	9.80			
15	80	9.80	10.10	3	8
16	40	9.60	10.30	30	11

Third example (MTL order partially filled - matched with two opposing orders)

Incoming Buy Market To Limit Order no. 17: 40 @ MTL

List of selected orders:

- Order no. 4
- Order no. 8

Order quantity allocation:

- Order no. 4 - allocated quantity 8
- Order no. 8 - allocated quantity 15

Order matching:

- Trade no. 1 order no. 4 with order no. 17 - quantity 8
- Trade no. 1 order no. 8 with order no. 17 - quantity 15

MTL Buy order partially executed

As MTL order is IOC order then unexecuted part of order is canceled

Order book after processing Buy Market To Limit order

BUY			SELL		
Order Seq. No.	Quantity	Price	Price	Quantity	Order Seq. No.

BUY			SELL		
3	30	9.80			
15	80	9.80			
16	40	9.60	10.30	30	11

Example F

Incoming Buy Market To Limit Order with IOC validity (Trade Price collars triggered)

Trade Price Collars: upper limit - 10.50, lower limit - 9.50

Initial order book

BUY			SELL		
Order Seq. No.	Quantity	Price	Price	Quantity	Order Seq. No.
3	30	9.80	10.60	80	12
15	80	9.80	10.90	10	14
16	40	9.60			

Incoming Buy Market To Limit Order 50 @ MTL

As there are no instruments available inside Trade Price Collars - MTL order is canceled.

Example 4 - 8.3.3.2. Reference Price Matching

Order book building

Reference Price = 100

Let's assume that the following orders are submitted during CT@FP phase in the following sequence (the order sequence number depicts the time priority):

- #1 - Sell 100@105
- #2 - Buy 200@101
- #3 - Sell 150@102
- #4 - Buy 250@103
- #5 - Buy 270@103
- #6 - Sell 125@102
- #7 - Buy 55@98

Order book

BUY			SELL		
Order Seq. No.	Quantity	Price	Price	Quantity	Order Seq. No.
#2	200	100	102	150	#3
#4	250	100	102	125	#6
#5	270	100	105	100	#1
#7	55	98			

13.4.1. MATCHING EXAMPLES

Initial Order book

Reference Price = 100

BUY			SELL		
Order Seq. No.	Quantity	Price	Price	Quantity	Order Seq. No.
#2	200	100	102	150	#3
#4	250	100	102	125	#6
#5	270	100	105	100	#1
#7	55	98			

Example A

Incoming order #8 Sell 1000@98

Trades:

- Order #2 and #8 - matched quantity 200
- Order #4 and #8 - matched quantity 250
- Order #5 and #8 - matched quantity 270

Partially filled order #8 is added to the order book with the suppressed price 100 (leavesQty = 280)

Order book view after processing order #8

BUY			SELL		
Order Seq. No.	Quantity	Price	Price	Quantity	Order Seq. No.
#7	55	98	100	280	#8
			102	150	#3
			102	125	#6
			105	100	#1

Example B

Order modification:

- order #6: price limit from 102 to 97

Order book view after modifying order #6

BUY			SELL		
Order Seq. No.	Quantity	Price	Price	Quantity	Order Seq. No.
#7	55	98	100	280	#8
			100	125	#6
			102	150	#3
			105	100	#1

Example C

Incoming order #9 Buy 500@100

Trades:

- Order #9 and #8 - matched quantity 280
- Order #9 and #6 - matched quantity 125

Partially filled order #9 is added to the order book with the price 100 (leavesQty = 95)

Order book view after processing order #9

BUY			SELL		
Order Seq. No.	Quantity	Price	Price	Quantity	Order Seq. No.
#9	95	100	102	150	#3
#7	55	98	105	100	#1

Example D

Incoming Market Order IOC #10 Sell 400@MO

Trades:

- Order #9 and #10 - matched quantity 95

Unexecuted part of Market Order is cancelled (IOC).

Order book view after processing order #10

BUY			SELL		
Order Seq. No.	Quantity	Price	Price	Quantity	Order Seq. No.
#7	55	98	102	150	#3
			105	100	#1