

## **T7 Release 5.0**

### **Functional Reference**

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# 1. Introduction

The Irish Stock Exchange will be migrating its electronic trading system, ISE Xetra, to the next generation T7 trading platform, effective 17<sup>th</sup> July 2017.

The migration to T7 represents the next stage in our successful strategic technology partnership with Deutsche Börse. ISE T7 will ensure that the ISE continues to enhance its trading architecture for the benefit of members by providing access to a new, world class platform. ISE T7 will provide low latency, high throughput and greater flexibility for ISE member firms.

The trading system T7 offers a wide range of trading functionalities for order book trading.

On the technical side, T7 provides an outstanding level of reliability and availability, and at the same time, it is characterized by a high throughput capacity and by low latency.

T7 is a pure trading system. Trades executed on this platform are forwarded to the clearing and settlement systems.

Off order book trade reporting will not be available via ISE T7. This functionality will continue to be provided by the ISE Xetra system until 4<sup>th</sup> December 2017 when it will be migrated to a new system, ISE OBOE.

## 1.1 Content of this document

This document provides a detailed description of the business functionality that is available in T7. It especially focuses on the following:

- Market structure
- Trading states
- Order and quote handling
- Matching and trade management

The document is targeted at everyone that needs detailed information on the business functionality that is implemented in the trading system. It is addressed especially to traders that need detailed information on the processing on the exchange side, but also, for example, to designers of advanced trading front-end applications.

There is no information in this document on participant and user maintenance. For more information on this topic, please refer to the *ISE T7 Cash Markets, Participant and User Maintenance Manual*.

This document does not contain any information on clearing and settlement.

This document focuses on the business logic. For detailed information on how to communicate with the system, please refer to the documentation on GUIs, trading interfaces, data interfaces and reports.

## 1.2 Usage Notes

This document describes the available business logic as implemented in the system for ISE T7. Business functionality relevant for other T7 markets, but not relevant for ISE T7, is not included. Set up information which is related to specific exchanges or products has been added to various places to inform readers of specific configurations that affect the availability of specific functionalities.

Even though care has been taken to represent the actual configuration settings at the time of publication, these configuration settings are subject to change. Especially the values of the configuration parameters given in various examples throughout this document, they should not be taken as actual values for these parameters.

Depending on the parameter, the actual values of the configuration parameters can be found in one of the following places

- In the contract specifications as published by the exchange,
- In the reference data stream of the T7 system,
- In the Product and Instrument Files available on the respective website:
  - For Eurex: [www.eurexchange.com](http://www.eurexchange.com)
  - For EEX: [www.eex.com](http://www.eex.com)
  - For Xetra: [www.xetra.com](http://www.xetra.com)
  - For Irish Stock Exchange: [www.ise.ie](http://www.ise.ie)
  - For Vienna Stock Exchange: [www.wienerbourse.at](http://www.wienerbourse.at)

## 1.3 Further reading

The following documents provide additional information to complement the information that is contained in this document:

- *Functional and Interface Overview*
- *Participant and User Maintenance – Manual*
- *Xetra Trader, Admin and Clearer GUI – Manual*
- *T7 Enhanced Trading Interface – Manual*
- *Xetra Enhanced Market Data Feed Interface, Market Data Feed Interface, Reference Data Interface – An Introduction*
- *T7 Market-, Enhanced Order Book- and Reference Data Interfaces – Manual*
- *T7 Extended Market Data Service – Manual*

These and other documents providing information on T7 can be found on the ISE website and also on the Xetra website:

<http://www.ise.ie/Products-Services/Trading-Members/Equity-Trading-Membership/>

<http://www.xetra.com/xetra-en/technology/t7/system-documentation-e>

## 2. Fundamental Concepts

This chapter introduces the fundamental concepts that define the structure of the markets and their participants in T7.

### 2.1 Order book Trading

T7 supports order book trading as well as off-book trading. Order book trading is characterised by a central order book, into which buyers and sellers enter their orders and quotes, and by automatic execution of these orders and quotes against each other, according to the rules as described in this document. Order book trading is anonymous, i.e. neither the owners of the orders on the book nor the counterparties of a trade are disclosed. Anonymous market data as e.g. best bid and ask prices as well as their respective aggregated bid and offer sizes are made available in real time to the market participants.

Off order book trading is facilitated by the ISE Xetra system, and from 4<sup>th</sup> December 2017 by the ISE OBOE System. No trade reporting facility is provided by ISE T7.

### 2.2 Participant Structure

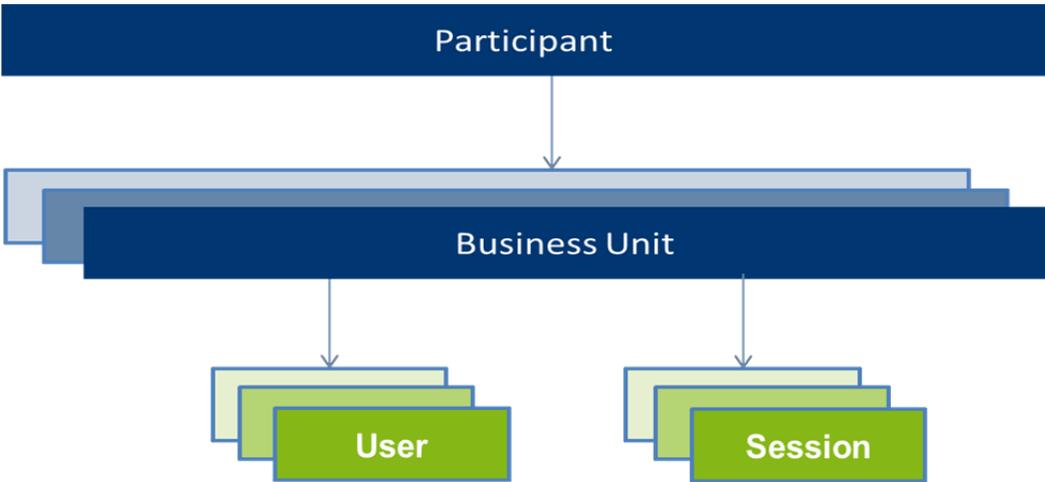


Figure 2-1: The participant hierarchy in T7

#### 2.2.1 Overview

The participant hierarchy in T7 has three levels:

1. The member firm is called a Participant.
2. Different units in a member firm, e.g. trading desks that trade independently from each other, are called Business Units.
3. A business unit has one or more Users, that represent individual people, typically traders, and each business unit has one or more Sessions. A Session is a permanently registered

connection channel to the exchange. Any request that is sent to the exchange, e.g. the entry of an order, is always sent by a logged-on user through a connected session.

## 2.2.2 Participant and Business Unit

A member firm of the ISE is set up as a Participant. In order to trade in T7, a participant must have at least one Trading Business Unit set up. The business logic of T7 makes use of the business unit rather than of the participant.

If an ISE member wishes to have several trading desks that trade independently, it is possible to have several trading business units being set up for the same participant. In T7, different trading business units trade completely independently from each other. For example, users from different trading business units cannot access each other's orders or quotes, even if these users belong to the same participant.

### Set Up Information:

*Currently, only one trading business unit is permitted per participant. Additional business units per participant may be made available at a later point in time.*

However, the trades of all business units of a participant are sent to the clearing house in the name of the participant. The clearing house does not distinguish between business units.

A Clearing Member of the ISE has a specific Clearing Business Unit that receives trade information for the trades of all own trading business units, as well as for the trades of the trading business units of related Non-Clearing Members.

Clearing members as well as Service Providers, that are not trading members, but that have access to the system, are also set up as participants in T7.

## 2.2.3 User

A User is a person, such as a trader or an administrator that interacts with T7. A user can also be a machine, like an order routing system or a quote machine. Every request that reaches T7 must carry the identifier of an executing user, which executes the request. Every order and every quote in T7 must carry the identifier of an owning user, which owns the order.

Every user of T7 belongs to exactly one business unit.

The ownership of an order and thus the permission to modify or delete that order depends on who is the order's Owing User. In general, the user who entered an order is the owning user of that order. See chapter 4.2 for details on the maintenance of orders.

A user may be given the User Level of a Supervisor. A Supervisor User may modify or delete an order, if the owning user and the supervisor user belong to the same business unit.

Several users may be set up as belonging to the same Trader Group. One or several of these users may be given the user level Head Trader. A Head Trader User may modify or delete an order, if the owning user and the head trader user belong to the same trader group.

Example 2-1:

The user structure of business unit XYZDB is illustrated in figure 2-2. XYZDB has set up two trader groups but has also users without a trader group.

- In the trader group GRP1 there are the users A, B and C, of which only user A is given the user level Head Trader. User A can thus access orders that belong to users B and C, while users B and C can access only their own respective orders.
- In the trader group GRP2, all users D, E and F are given the user level Head Trader, and can therefore access each other's orders.
- User G has the user level Supervisor and can thus access the orders of everyone in the business unit, independent of any trader groups.
- User H with the Head Trader level and user I with the normal Trader level do not belong to any trader group. Therefore, they cannot access each other's orders or the orders of anybody else. In addition, nobody can access their orders except for Supervisor user G. In fact, having the Head Trader level is meaningless for user H as long as user H does not belong to any trader group.

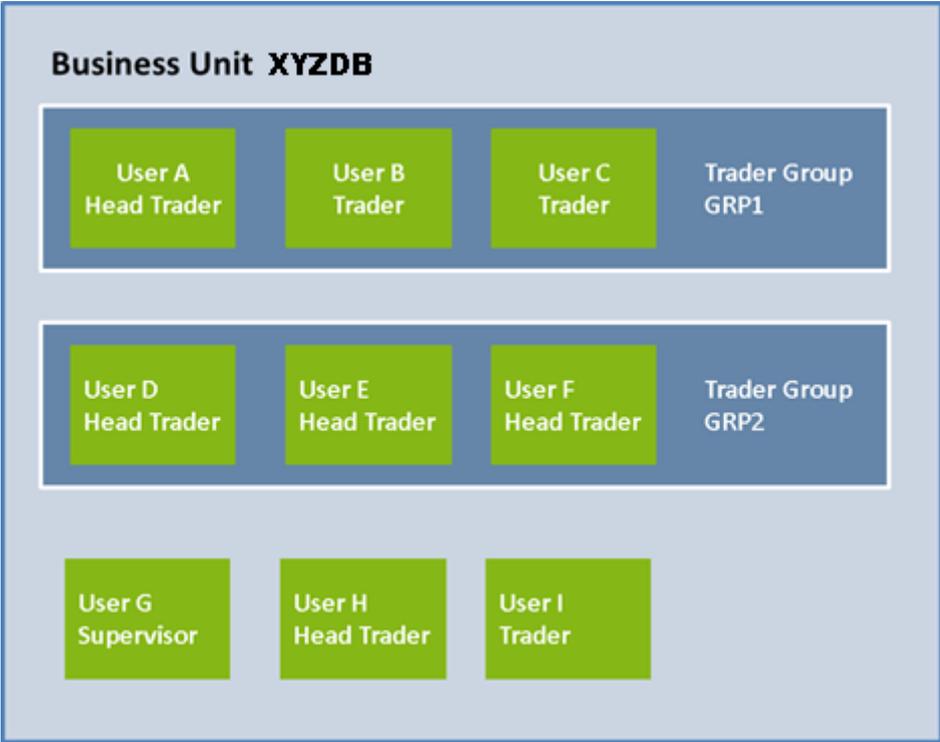


Figure 2-2: Illustration of the user structure of example business unit XYZDB as explained in the text.

Contrary to the case of orders, the permission to modify or to delete a quote does in no way depend on the owning user or his trader group, and being a supervisor user or a head trader user is of no relevance for the maintenance of quotes. The permission to modify or delete a quote depends solely on the quote's owning session (for more details see chapter 2.2.4 - Session).

**2.2.4 Session**

A Session is a permanently registered connection channel to ISE T7.

A session is set up for and belongs to exactly one business unit. In order to send requests to ISE T7, a user must use a session that is connected to ISE T7 and that belongs to the same business unit as the user. Besides that, there is no further relationship between users and sessions, i.e. a user does not belong to a specific session and a session does not belong to a specific user.

The ownership of a quote depends entirely on the quote's owning session. The owning session of a quote is the session through which the quote had been entered. A session can only have one quote per instrument, and the entry of a new quote results in the replacement of the quote that belonged to the same session. See chapter 5.2 and 5.3 for details on the ownership and the maintenance of quotes.

Also, orders know the concept of the owning session. While permissions to maintain orders depend mainly on the owning user, there are some restrictions with respect to the owning session as well. They are described in chapter 4.2.4 on order ownership.

A clearing business unit does not actively participate in trading, and therefore it needs only a Listening Session that allows it to receive the trade information being sent out by T7.

**2.3 Market Structure**

**2.3.1 Markets**

In T7, an exchange with its own trading rules, its own products and its own market supervision is represented as a Market. T7 is able to operate multiple markets in parallel on one technical system. Each product and thus each instrument belong to a specific market.

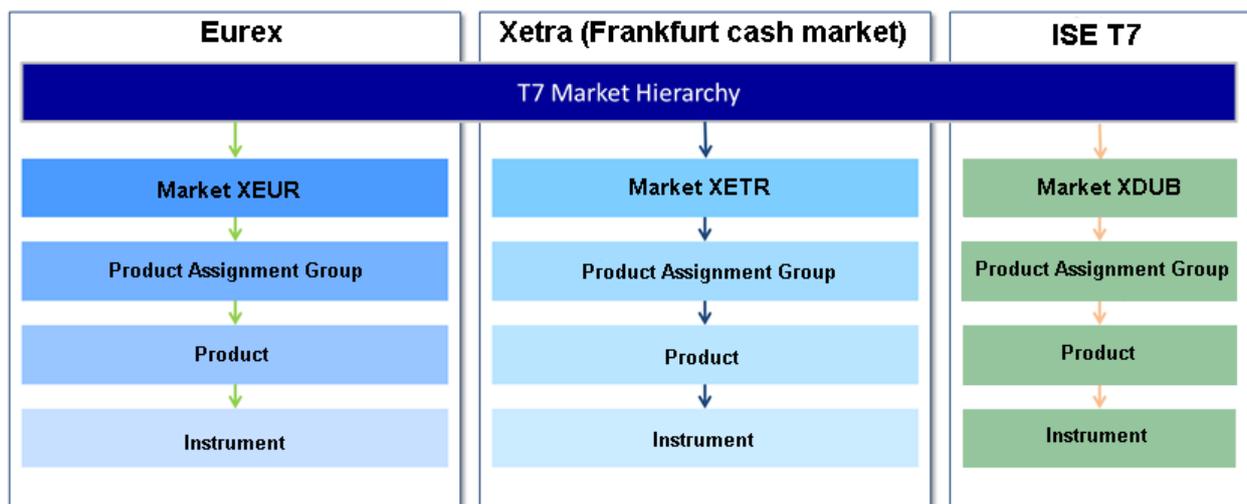


Figure 2-3: The market hierarchy in T7

In general, exchange participants are considered as exchange specific. However firms may become members of more than one T7 markets and therefore participants of more than one T7 market.

For details concerning the handling of participants' and users' access to products, please refer to the document *Participant and User Maintenance Manuals*.

### 2.3.2 Products and Instruments

In T7, trading is organized into Instruments and Products, whereby Instruments are the tradable entities, i.e. an order always refers to buying or selling a specified quantity of a certain Instrument.

Instruments of the same type can be grouped together to form Products. However, every tradable instrument must belong to a product.

Instruments of the same product are traded in the same way, i.e. trading parameters and trading schedules are defined for products or groups of products rather than for individual instruments. In ISE T7 there is a 1:1 relationship between products and instruments.

Order book trading is controlled by Trading States. A product has a trading state, but also every instrument has its own individual trading state.

### 3. The Business Day

#### 3.1 Overview

On T7, the order book trading state concept provides a comprehensive range of product and instrument states for proper functioning of an order book.

#### 3.2 Trading States

Order book trading on ISE T7 is controlled in conjunction with the market model by trading states. They control what activities are available to traders and what functions T7 will perform during each period.

ISE T7 has both Product States and Instrument States. While product states give a structure to the business day and control general access to the system, instrument states control order and quote maintenance and execution, and they control the availability of public market data.

##### 3.2.1 Instrument States

Instrument states control

- If order and quote maintenance is possible and to what extent,
- What order book information is published by the ISE,
- If orders and quotes are executed.

Figure 3-1 displays the instrument states and their hierarchy in terms of market activity. The following chapters describe each instrument state and instrument state transition in detail.

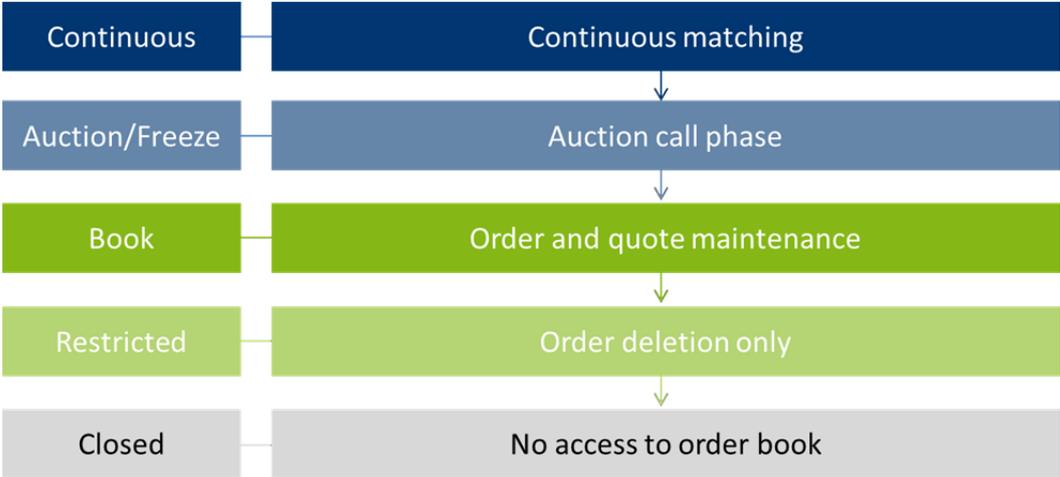


Figure 3-1: The instrument state hierarchy

### 3.2.1.1 Instrument State Continuous

The instrument state Continuous is the state where continuous trading takes place.

In the instrument state Continuous

- Order maintenance is possible.
- Quote maintenance is possible.
- Public market data in price-level aggregated form for 10 price levels is published by the ISE.
- Price and quantity information on an order-by-order basis is published by the exchange for selected products.
- There is continuous matching of orders and quotes.
- Trade data is published by the ISE via CEF (Consolidated Exchange Feed).

### 3.2.1.2 Auction Instrument States

There are four auction instrument states that represent the auction call phases of various types of auctions.

1. Opening Auction: An opening auction occurs once a day in the morning before continuous trading starts.
2. Closing Auction: For some products, there is a closing auction, either at the end of the continuous trading phase, or during the day to determine an auction price as a basis for a settlement price. There can be only one closing auction per day.
3. Volatility Auction: A volatility interruption results in a volatility auction. See chapter 7.6 for information on volatility interruptions.
4. Intraday Auction: The intraday auction interrupts continuous trading. This only may occur when trading is halted and re-started during the day, in this case there is always an intraday auction before continuous trading resumes.

#### Configuration Data:

*The information, whether there is a closing auction for a product, is available in the Products and Instruments Files on the website.*

In an auction instrument state

- Order maintenance is possible.
- Quote maintenance is possible.
- Only top of book market data is published by the ISE, i.e. either the best buy and sell prices or the potential auction price. In the case of an uncrossed order book, the accumulated volumes at the best bid and best ask are displayed in addition to the best bid and ask limits. In case of a crossed order book the executable volume for the indicative auction price and the 10 best bids and asks are displayed.
- No trading occurs, but at the end of an auction instrument state, an order book uncrossing

may occur, potentially resulting in an auction trade that is published by the exchange.

### 3.2.1.3 Auction Freeze Instrument States

An auction freeze state is a state where the exchange market supervision has frozen the market during an auction call phase, in order to control the order book situation. Like for the auction instrument states described above, for each type of auction, there is one auction freeze instrument state.

1. Opening Auction Freeze.
2. Closing Auction Freeze.
3. Volatility Auction Freeze.
4. In an auction freeze

state

- No order entry or modification is possible.
- No immediate order deletion is possible, but order deletion requests will result in the order being marked as pending deletion (see below).
- No quote entry or replacement is possible.
- No immediate quote deletion is possible, but quote deletion requests will result in the quote being marked as pending deletion.
- Only top of book market data is published by the exchange, i.e. either the best buy and sell prices or the potential auction price and the respective volumes.
- No trading occurs, but at the end of an auction freeze instrument state, an order book uncrossing may occur, potentially resulting in an auction trade, which is published by the exchange.

During an auction freeze state, any activity that changes the order book is not possible. Nevertheless, a trader may send requests to delete orders or quotes in an auction freeze state. T7 will not delete the orders or quotes immediately, but rather mark them as pending deletion. Orders and quotes that are marked as pending deletion are automatically deleted by the system, once the instrument enters a different instrument state.

It is important to note that orders and quotes that are marked as pending deletion, will still participate in an auction trade that is done at the end of the auction freeze state. Therefore, sending a deletion request for an order or a quote during an auction freeze state does not prevent the order or quote from being matched in the auction trade that ends the auction freeze state. It only guarantees that any remainder of the order or quote is deleted right afterwards.

### 3.2.1.4 Instrument State Book

The instrument state Book is the state where traders can maintain their orders and quotes, but no matching takes place.

In the instrument state Book

- Order maintenance is possible.
- Quote maintenance is possible.
- No public market data is published by the exchange.
- No matching occurs.

### **3.2.1.5 Instrument State Restricted**

The instrument state Restricted is a state where traders are only allowed to delete their orders.

In the instrument state Restricted

- No order entry and no order modification are possible, but order deletion is supported.
- No quote maintenance is possible and there are no quotes in the order book.
- No public market data is published by the exchange.
- No matching occurs.

ISE T7 does not support the presence of quotes in the order book during the instrument state Restricted. Therefore, all quotes of an instrument are automatically deleted by ISE T7, when the instrument enters the state Restricted.

### **3.2.1.6 Instrument State Closed**

The instrument state Closed is the state where no access to the order book is available.

In the instrument state Closed

- Maintenance of individual orders is not possible, but requests that require the deletion of all orders in a specified scope are still processed, provided that the product state allows access to the system at all.
- No quote maintenance is possible and there are no quotes in the order book.
- No public market data is published.
- No matching occurs.

ISE T7 does not support the presence of quotes in the order book during the instrument state Closed. Therefore, all quotes of an instrument are automatically deleted by the system when the instrument enters the state Closed.

## **3.2.2 Product States**

Product states give a structure to the business day. They also control the general access to ISE T7. In general, the instrument state changes with the product state.

The following chapters describe each product state in detail.

### **3.2.2.1 Start of Day**

The product state Start of Day represents the time in the morning before activity starts. Members have no access to the order books in this product state. All instruments are in the instrument state Closed.

### **3.2.2.2 Pre-Trading**

The product state Pre-Trading occurs in the morning before trading starts. It is typically a time where traders may maintain their orders prior to the start of trading. No matching occurs in this phase.

Normally, instruments are in the instrument state Book.

### **3.2.2.3 Trading**

The product state Trading represents the trading phase. The standard procedure for the product state Trading is that after an initial opening auction call phase, the instruments are in the continuous trading phase, possibly interrupted by volatility auction call phases.

Thus normally, instruments are in the instrument state Continuous, or they are in an auction or auction freeze instrument state.

### **3.2.2.4 Closing**

The product state Closing is a short phase that sits between Trading and Post-Trading. It covers the time between the end of continuous trading and the end of the last auction, typically a closing auction.

The product state Closing ends automatically when there is no more running auction in any of the product's instruments. The end of the product state Closing marks the moment when trades can no longer occur for the affected product for the rest of the day.

Normally, instruments are in an auction or auction freeze instrument state, or they are in the instrument state Book.

### **3.2.2.5 Post-Trading**

The product state Post-Trading terminates the trading session of a business day. It is typically a time where traders can maintain their orders in preparation of the next trading day. No matching occurs in this phase.

Normally, instruments are in the instrument state Book.

### **3.2.2.6 End of Day**

The product state End of Day represents the time in the evening that is reserved for the end-of-day processing. Members have no access to the order books in this product state.

All instruments are in the instrument state Closed.

### **3.2.2.7 Post End of Day**

The product state Post End of Day technically bridges the time between the end-of-day processing and the next Start of Day. Members have no access to the system in this product state.

### **3.2.2.8 Halt**

The ISE may halt the market if it judges that market conditions or technical conditions impair the integrity of the market. In such a case, a product will be set to the product state Halt. In the product state Halt, no matching occurs and order book access is restricted.

All instruments are in the instrument state Restricted.

**3.2.2.9 Holiday**

The product state Holiday applies to products that are not open for trading on that day, even though the exchange is open. Members have no access to the order books for a product that is in the product state Holiday.

All instruments are in the instrument state Closed.

**3.2.3 Sequence of Trading States**

The sequence of product states and the related instrument states depends on the associated market model. A market model defines a set of trading rules, e.g. applicable auction types and standard instrument states for specific product states. Each instrument is traded according to a particular market model.

The market model “Continuous Trading with Auctions” is used for ISE T7. The sequence of trading states for this market model is illustrated in the following figure:



Figure 3-2: The sequence of product states and the related instrument states

**3.2.4 Fast Market**

The ISE may declare a Fast Market for a product when an especially volatile market situation is expected. During a Fast Market, the following price and quantity validations may be relaxed:

- The Price Reasonability Check may be relaxed (chapter 6.2),
- The conditions for a Volatility Interruption to occur are relaxed (chapter 7.6).

In ISE T7, Fast is a special status of the product that the ISE can set independently of the product and instrument states. This allows, for example to have a product to be set to Fast Market already early in the morning before trading starts, without any impact on the sequence and timing of the product states.

### 3.3 Listing Status

The Listing Status of an instrument is a general status that controls whether an instrument is currently available for trading. The listing status exists in addition to the instrument state for order book trading that had been described before. The listing status of an instrument that can be traded is Active. An instrument that is not tradable has a listing status of Suspended or Stopped, as explained in the following.

#### 3.4.1 Instrument Suspension

The ISE may suspend an instrument intraday. A suspended instrument will acquire the listing status Suspended as opposed to Active.

The order book instrument state of an instrument with a listing status Suspended is either Restricted or Closed, depending on the product state.

#### Set Up Information:

*All orders and quotes are automatically deleted by ISE T7, when the listing status Suspend is acquired. In case the order book is not empty, a broadcast message of type "Instrument Suspension" is sent to all sessions indicating that orders and quotes have been deleted.*

#### 3.4.2 Instrument Stop

Stop is used by the ISE in order to temporarily stop an instrument from trading independently of the product state.

The order book instrument state of an instrument with a listing status Stopped is either Restricted or Closed, depending on the product state.

### 3.4 End-of-Day Processing

The order book End-of-day product state ends with the end-of-day processing. During the end-of-day processing, T7 regularly performs the following clean-up activities:

- Deletion of expired orders. All GFD orders and all GTD orders with an expiry date before the next trading day are deleted by ISE T7.

Furthermore, orders will be deleted under special circumstances, as e.g. in the case of corporate actions for an equity or an Exchange Traded Fund.

## 4. Orders

This chapter starts with the characteristics and the maintenance of orders in general, especially Regular Orders. Special types of orders as Stop Orders, Iceberg Orders, Book-Or-Cancel Orders, Auction-Only Orders and Closing-Auction-Only Orders, are dealt with further down in this chapter. Quotes are described in chapter 5.

### 4.1 Order Attributes

#### 4.1.1 Limit Price

An order can be either a Limit Order or a Market Order.

Limit orders have a limit price. The limit price indicates the maximum price at which a buy order is allowed to match, or the minimum price at which a sell order is allowed to match.

Market orders are orders that have no limit price. Since market orders are not protected by their limit price, there are other mechanisms provided by T7 that give market orders some protection against unreasonable trade prices.

For ISE T7 only strictly positive limit prices are accepted.

The Tick Size defines the minimum increment for trade prices in a product. Any trade price is an integer multiple of the tick size.

A valid limit price must be a valid price as defined by the Price Step Table that is relevant for the instrument. A price step table defines price intervals and the size of the price step for each price interval. The lower end of such a price interval is always a valid limit price. And inside each price interval, valid limit prices are those that can be obtained by adding a positive integer multiple of the price step to the lower end of the price interval. Price steps are always integer multiples of the tick size, and therefore, valid limit prices are always integer multiples of the tick size. Nevertheless, not every multiple of the tick size is a valid limit price.

#### Example 4-1:

*The tick size is 0.01. The price step table defines the first price interval to range from 0.00 to 10.00 with a price step of 0.01, and a second price interval from 10.00 to infinity with a price step of 0.10.*

*Then 9.98, 9.99 and 10.00 are valid limit prices, and so are 10.10, 10.20, 10.30 etc., but 10.01 is not a valid limit price. An order with a limit price of 10.01 would be rejected by T7.*

#### Configuration Data:

*The price step tables are published by T7's Reference Data Interface in the product snapshot message (RDI message group name: TickRules).*

#### 4.1.2 Quantity

The Total Quantity of an order is provided by the user that enters the order.

T7 provides the Open Quantity of an order, which is the part of the total quantity that is still available for matching, and the Accumulated Executed Quantity, which is the part of the total quantity that has already been matched. During the lifetime of an order, the total quantity of the order is always equal to the sum of the open order quantity and the accumulated executed quantity. When an order is deleted, the total quantity of the order is equal to the sum of the deleted order quantity and the accumulated executed quantity.

#### 4.1.3 Order Validity

The Order Validity limits the lifetime of the order. ISE T7 supports the following values for the Order Validity:

- Good-For-Day (GFD) orders are deleted automatically in the next end-of-day processing.
- Good-Till-Cancelled (GTC) orders are automatically deleted only after the instrument has expired.
- Good-Till-Date (GTD) orders carry an expiry business date and are automatically deleted in the end-of-day processing, if the next business date is later than the specified expiry business date.
- Immediate-Or-Cancel (IOC) orders are deleted automatically after having been processed on entry, without ever going to the order book.
- Fill-Or-Kill (FOK) orders must be fully executable on entry to be accepted by ISE T7, otherwise they get deleted.

#### 4.1.4 Order Identification

When a new order is accepted by ISE T7, the system assigns it an Exchange Order ID. The Exchange Order ID is guaranteed to be unique among all orders and quotes of the same product within a market that have an open quantity on the same business day.

The entering user may optionally assign a Client Order ID to the order. The client order ID is verified by ISE T7 to be unique across the instrument and session scope in the order book at the time of order entry. The client order ID is however not verified to be unique for IOC and FOK orders.

When modifying or deleting an order, the user identifies the order either with the Exchange Order ID or with the client order ID if available. The user may or may not assign a new client order ID to the order with each order modification or deletion. The Exchange Order ID remains in any case unchanged for the entire lifetime of the order, i.e. an order modification does not result in a change of the Exchange Order ID, even if the time priority of the order is changed.

#### 4.1.5 Time Stamps

ISE T7 sets the Entry Time Stamp of an order when the order is entered. It is for informational purpose only. Any modification of an order has no impact on the entry time stamp of the order.

Furthermore, ISE T7 sets and maintains the Priority Time Stamp. The priority time plays a role in the order allocation during matching. The priority time stamp of an order is updated in a number of well-defined situations:

- Modification of the limit price, or conversion of a market order to a limit order or vice versa.
- Modification of the total order quantity such that it is increased.
- Triggering of a stop order.
- Modification of the stop price of a stop order.
- Activation of an opening-auction-only order, a closing-auction-only order or an auction-only order.
- If the validity is extended.

Set Up Information:

*Shortening the validity period of an order has no impact of the priority time stamp.*

#### **4.1.6 Technical Order Attributes**

##### **4.1.6.1 Persistent and Non-Persistent Orders**

Any order can be entered either as Persistent order or as Non-Persistent order.

Non-persistent orders are automatically deleted in the following situations:

- The product state is changed to Halt.
- A volatility interruption has occurred.
- The owning session is disconnected.
- A technical back end partition overload has been detected.

Set Up Information:

*For Eurex and EEX products, non-persistent orders are automatically deleted by the T7 system when a volatility auction is started.*

*For Xetra products and for products traded on ISE and WBAG, non-persistent orders are not automatically deleted by the T7 system when a volatility auction is started.*

Persistent orders are persisted in a database of ISE T7. This prevents persistent orders from being lost in case of a technical system failure. During the restart after a system failure, ISE T7 will re-load the persistent orders from the database. The priority time stamp of these orders remains unchanged.

A non-persistent order is processed without the extra step of being persisted in a database. As opposed to persistent orders, non-persistent orders will not be re-loaded to the order book after a system failure, i.e. they will be definitively lost. Non-persistent orders cannot be entered with an order validity GTC or GTD, and therefore they cannot survive until the next business day.

##### **4.1.6.2 Lean Orders**

Any order can be flagged as a 'Lean' order once entered via ETI or the FIX GUI.

For lean orders, the receipt of status information messages is restricted to the session, through which the order had been entered. Furthermore, only such information messages may be recovered via a

retransmission request that is about executions and about events, which were not solicited by the owner of the order.

For an order that is not flagged as a lean order, the receipt of status information messages is not restricted to the session, through which the order had been entered, and information messages about all events regarding the order may be recovered via a retransmission request.

T7 does not accept orders that are both lean and persistent.

See the *Enhanced Trading Interface Manuals* for more information on the different types of sessions in T7, on receiving information messages about order events, including retransmission of such messages, and in general on the technical aspects of order maintenance.

#### 4.1.7 Other Attributes

The user may provide a Cross ID for an order, which prevents the matching against identically tagged orders, or quotes of the same business unit by means of the self-match prevention functionality (see chapter 7.7).

Several order attributes, which are sent by the user, are not directly relevant to the order matching but serve other purposes, e.g. in the post-trade processing or to satisfy requirements of the regulator. These are:

- The Trading Capacity distinguishing proprietary, agency and market-making orders.
- Clearing related attributes like Clearing Account, Take-Up Member and Open-Close Indicator.
- Free Format Text fields.

See chapter 8.2 for more information on the handling of clearing related attributes, and free format text fields.

## 4.2 Order Maintenance

### 4.2.1 Order entry

On order entry, ISE T7 validates that the order attributes, which are relevant for trading, contain valid values. Orders with invalid attribute values are rejected.

The entered total order value must not violate the maximum order value which is determined per user. The order is rejected if the maximum order value is exceeded whereby the order value is calculated as entered total order quantity multiplied by price.

The limit price of a limit order may be validated with the Price Reasonability Check (see chapter 6.2).

Entry of orders is possible during the instrument states Book and Continuous, and during auction instrument states. During the instrument states Closed and Restricted, and during auction freeze instrument states, order entry is not possible.

If the instrument state is Book or an auction state, an incoming order is written to the book without matching. IOC and FOK orders are deleted instead of being written to the book.

#### Set Up Information:

*Furthermore, orders with attribute BOC are only allowed in the instrument state Continuous, i.e. BOC orders cannot be entered during instrument state Book or Auction.*

In the instrument state Continuous, an incoming order will be possible if first matched against orders and quotes on the opposite side of the order book. See chapter 7.1 for the matching rules in continuous trading. The open quantity and the accumulated executed quantity of the order are determined. Any remainder is written to the order book, except for an IOC order, which is deleted instead.

#### 4.2.2 Order modification

A user can modify an order that rests on the order book. The modification request must identify the order with the help of its client order ID – if available – or of its exchange order ID.

See chapter 4.2.4 on order ownership and who is allowed to modify a specific order.

The user may modify the limit price and may modify the total order quantity. A new limit price and a new total order quantity are subject to the same validations as for order entry.

The accumulated executed quantity is carried forward to the modified order while the open order quantity gets recalculated if the total order quantity is modified. An attempt to modify the total quantity of an order to a value below the already executed quantity results in the deletion of the order.

The priority time stamp of an order is updated, when:

- The limit price of the order is changed, or
- a market order is modified to become a limit order or vice versa, or
- the total order quantity is increased, or
- the validity is extended

The modification of any other order attribute has no impact on the time priority of an order.

#### Set Up Information:

*Shortening the validity period of an order has no impact of the priority time stamp.*

If the instrument state is Continuous, and if any of the above listed conditions for the update of the priority time stamp is fulfilled, then ISE T7 will make a fresh attempt to match the modified order as if for a new incoming order.

Note that a fresh attempt to match a book order, the quantity of which has been changed, is irrelevant for limit orders, but it could result in a match in the case of a book market order.

The following attributes of an order cannot be modified:

- Instrument identifier
- Side (Buy or Sell)
- Technical order attributes *Persistent* and *Lean* (see chapter 4.1.5 above)

Furthermore, orders cannot be modified to change their category as defined in chapter 4.9.1 below.

If the user wishes to modify any of these attributes of the order, the user would have to delete the existing order and place a new one.

### 4.2.3 Order deletion

A user can delete an order that rests on the order book. The deletion request must identify the order with the help of its Client Order ID – if available – or its Exchange Order ID. Furthermore, T7 supports the deletion of all of a user's orders in a product or in an instrument with one request.

See chapter 4.2.4 on order ownership and who is allowed to delete a specific order.

During an auction freeze state, a deletion request for an order results in this order being marked as pending deletion, rather than being deleted right away. See chapter 3.2.1 for details.

### 4.2.4 Ownership concept

Every order is attributed an owning user, an owning session and an owning business unit. On order entry, the user who entered the order becomes the owning user of the order, his business unit becomes the owning business unit, and the session through which the order was entered, becomes the owning session of the order.

In general, only the owning user of an order can modify or delete the order. Exceptions are the following two cases:

- A user that is not the owning user can modify or delete the order, if he is configured as a Supervisor user and belongs to the owning business unit.
- A user that is not the owning user can modify or delete the order, if the user is configured as a Head Trader and belongs to the same trader group as the owning user.

A Supervisor or a Head Trader that modifies an order, which belongs to a different user, may choose either to take over the ownership of the order, or to let the order keep its original owning user.

In general, the modification or the deletion of an individual order is possible through any session that belongs to the owning business unit. However, the modification of an individual order through a session that is not the owning session is not permitted in the following cases:

- If the order is a lean order (see chapter 4.1.6 above).

These restrictions do not apply to order deletion.

## 4.3 Stop Orders

### 4.3.1 Overview

A stop order is an order that is initially inactive. It is not able to match and it is not included in the public market data. When the market reaches the price level that is given by the stop limit of the stop order, then the stop order is triggered, i.e. it is converted to an active regular order and, if possible, matched according to the rules for incoming regular orders.

A buy stop order is normally placed at a stop limit above the current market limit, and a sell stop order is normally placed at a stop limit below the current market limit.

There is no guarantee that a triggered stop order is matched immediately after it is triggered. It is treated just as any incoming regular order and will be placed on the order book, if it cannot be matched.

A stop order can be a Stop Limit Order or a Stop Market Order. A triggered stop limit order is converted to a limit order, and a triggered stop market order is converted to a market order.

**4.3.2 Stop Order Maintenance**

A stop order must have a stop limit. The stop limit is used to determine under which condition the stop order is triggered. See chapter 4.3.3 below for the rules on stop order triggering.

A stop limit order additionally must have a limit price. This limit price is the limit price of the limit order that the stop limit order is converted to when being triggered.

A stop market order has no limit price. Upon being triggered, it is converted to a market order.

Both the limit price and the stop limit must be valid prices in respect to the rules for limit prices as outlined in chapter 4.1.1.

The stop limit and the limit price can be modified, but the stop order loses its time priority in this case. The same happens, if a stop market order is modified to become a stop limit order or vice versa.

A stop order can be entered with an order validity of GFD, GTC or GTD. The entered order validity continues to apply after the order has been triggered.

When a stop order is entered, then the stop limit of the stop order is validated against the current market limits. Only buy stop orders the stop limit of which is greater than the Best Available Buy Limit, and sell stop orders the stop limit of which is smaller than the Best Available Sell Limit, are accepted and saved as stop orders on the order book. The best available limit is normally given by the limit price of the best limit order on the order book side.

Stop orders that fail this validation are rejected.

The same validation is applied for a modification request, if the stop limit or, in case of a stop limit order, the limit price is modified, or if the quantity of the stop order is increased. A rejection of the modification request means here that the stop order remains on the order book unchanged.

**4.3.3 Stop Order Triggering**

When stop orders are triggered, they are converted to incoming regular orders and treated as such thereafter. However at this point, there is no Price Reasonability Check for triggered stop limit orders. The priority time stamp is updated. The Exchange Order ID is not modified.

Stop orders are triggered one by one in separate transactions. They are always triggered at the end of the transaction, which creates the triggering condition.

Example 4-2:

*An incoming sell order matches against the order book at the price levels 80, 75 and then 70. The first match at 80 creates the condition for triggering a stop order on the book. T7 will first complete the matching of the incoming order at 75 and 70, and process the triggering of the stop order afterwards.*

*If the incoming order causes a volatility interruption while attempting to match at 70, the instrument state change to the volatility auction is done first and the processing of the stop order that got triggered by the match at 80, is done last.*

ISE T7 supports two types of trigger conditions, triggering based on the last trade price, and triggering based on the best buy or best sell limit. The methods are described in the following.

**1. Stop order triggering based on the last trade price:**

During the product state Trading, a new trade price can trigger stop orders. The cause of the trade is of no relevance, i.e. the trade could be caused by a matching incoming order, by an auction trade or by another stop order that is triggered and matched itself. The only exception is that stop orders are not triggered by leg trade prices resulting from the decomposition of pure complex instrument trades.

A buy stop order is triggered, if the new trade price is higher than or equal to the stop limit of the stop order. A sell stop order is triggered, if the new trade price is lower than or equal to the stop limit of the stop order.

#### 4.3.4 Triggering Priority

At the end of a transaction, several buy and/or sell stop orders can be triggered and each triggered stop order can potentially match again and trigger new stop orders. Hence, a triggering priority must be established. No special priority is given to the stop market orders compared to the stop limit orders. In addition, the limit of a stop limit order does not play a role for the trigger priority. In the following, stop market orders, and stop limit orders are referred to as stop orders.

Buy and sell stop orders of the same instrument can be thought of as saved on the book on two separate lists sorted by stop limit and priority time ("stop order book"). Buy orders with the lowest stop limit are listed first on the buy stop order list. Sell orders with the highest stop limit are listed first on the sell stop order list. When two stop orders have the same stop limit, the older order is listed first.

When several stop orders of both lists (Buy and Sell) can be triggered, they are triggered one after the other in a round-robin processing. The first stop order of the buy stop order list is triggered first. Then the first stop order of the sell stop order list is triggered, and then the second stop order on the buy stop order list and so on.

It is also possible that stop orders in more than one instrument are triggered in one transaction, e.g. in state change transactions, or in mass quote transactions. The lists of triggered buy or sell stop orders are then be created for each of the affected instruments, and the above-described round-robin processing is extended to the stop order lists of all affected instruments.

I.e. first the first buy stop order of the first instrument is triggered, and then the first sell stop order of the first instrument, then the first buy stop order of the second instrument, and so on until all stop orders that are the first on their respective list are triggered. Then the procedure continues with all stop orders that are second on their respective list.

The processing continues until all stop orders have been triggered in all the instruments. Any new incoming orders or quotes are processed only afterwards.

#### Example 4-3:

*Assume the following stop order lists for two ISE instruments. Assume further that in this example, the numeric order IDs happen to reflect the sequence of order entry and thus the time priority of the orders. (Note however that in general, T7 does not guarantee such a correlation.)*

ABC plc Jun16				XYZ plc Sep16			
Buy Stop Orders		Sell Stop Orders		Buy Stop Orders		Sell Stop Orders	
Order ID	Stop Limit	Order ID	Stop Limit	Order ID	Stop Limit	Order ID	Stop Limit
1	32.53	5	32.56	4	32.44	2	32.46
3	32.55	6	32.56	8	32.45	7	32.45

Assume that a match event with trade prices of 32.55 for ABC plc Jun16 and of 32.45 for XYZ plc Sep16 occurs, such that all listed stop orders are triggered.

The triggering of the stop orders would be processed in the sequence: 1, 5, 4, 2, 3, 6, 8, and 7.

## 4.4 Iceberg Orders

### 4.4.1 Overview

The Iceberg Order is an order type supported for cash instruments only.

Iceberg orders are large limit orders with quantities only partially visible in the order book. An iceberg order is characterized by its total order quantity and the peak quantity, which represents the visible part of the order. Once the visible part of the order is fully executed, it will be refilled from the hidden part. The refill can be configured to be random within predefined limits. The cycle ends when the total order quantity is executed completely or the order is cancelled.

### 4.4.2 Iceberg Order Maintenance

An iceberg order always provides a limit price and can be entered with an order validity of GFD, GTC or GTD.

No trading restrictions are supported for iceberg orders.

In addition to standard order attributes like buy or sell side, total order quantity, limit price etc. the following iceberg order specific attributes are entered by the user:

- Initial display quantity.
- Random low quantity.
- Random high quantity.

The random low quantity and random high quantity are optional but either both have to be specified or none. If the random low quantity is specified, it must be less than or equal to the random high quantity.

The iceberg order necessarily has to meet a certain size given by the "Minimum Iceberg Volume" and the "Minimum Peak Volume". Both values are amounts defined in the trading currency of the instrument. That means the total order quantity multiplied by the limit price must be greater or equal to "Minimum Iceberg Volume" and the initial display quantity multiplied by the limit price must be greater or equal to "Minimum Peak Volume". Furthermore, if present, the random low quantity multiplied by the limit price must be greater or equal to "Minimum Peak Volume".

If the "Maximum Iceberg Ratio" is defined, the initial display quantity and the total order quantity are validated accordingly, i.e. the ratio of the total order quantity and the initial display quantity must not

exceed the defined “Maximum Iceberg Ratio”, same applies for the ratio of total order quantity and random low quantity, if present.

An iceberg order cannot be modified to become a non-iceberg order and vice versa.

Increasing the total order quantity of an iceberg order leads to a new priority timestamp. Reducing the total order quantity has no impact on the iceberg order’s time priority.

The modification of the initial display quantity of an iceberg order is processed as follows:

The increase results in a recalculation of the display quantity and a new time priority.

The decrease never changes the time priority. A decrease of the initial display quantity to a value higher or equal to the current display quantity does not change the display quantity. A decrease to a value lower than the current display quantity results in a reduced display quantity.

A change of the limit price is processed like a new incoming iceberg order, i.e. new time priority and new display quantity.

#### **4.4.3 Determination of the Display Quantity**

Upon iceberg order entry, when the open order quantity is not fully executed, the display quantity is set to the minimum between the initial display quantity entered by the user and the remaining unmatched open order quantity.

The display quantity of sitting iceberg orders is refreshed from the remaining open order quantity when the former display quantity is fully executed. Refreshing the display quantity is regarded as a new order entry from a time priority point of view.

If the random low quantity and the random high quantity are not specified, the new display quantity will always be the initial display quantity. In the event the remaining open order quantity is smaller than the initial display quantity then the remaining quantity will be displayed.

If the random low quantity and the random high quantity are specified, a peak refill of the iceberg order is processed with a random quantity between the random low quantity and the random high quantity. When the remaining open order quantity is smaller than the calculated random quantity then the remaining open order quantity will be displayed.

#### **4.4.4 Matching**

In instrument state continuous, an incoming iceberg order matches with its total open order quantity. There is no distinction between display and hidden quantity for an incoming iceberg order. The display quantity is determined once the remainder of the order is written to the order book with the minimum between the initial display quantity entered by the user and the remaining unmatched open order quantity.

The display quantity of a book iceberg order behaves as an order. Each time the displayed quantity is replenished from the hidden part of the order and the hidden part is reduced, the order will receive a new priority timestamp.

The open order quantity of the iceberg order participates in an uncrossing procedure. This is also true for volatility auctions. After the end of the uncrossing, if the open order quantity is not fully executed, the display quantity is set to the minimum between the value of the display quantity before the start of the auction and the remaining unmatched open order quantity.

## 4.5 Book-Or-Cancel Orders

BOC orders are orders that are never matched on entry.

BOC orders, which could be partially or fully executed upon entry, are immediately deleted without execution. BOC orders that are not executable on entry are accepted and written to the order book.

It is possible to modify a BOC order in the order book. If the BOC order crosses the current spread and is eligible for execution due to the modification, the BOC order is deleted.

BOC orders are only valid with a limit and without a trading restriction. BOC market orders are not supported.

### Set Up Information:

*Orders with attribute BOC are only allowed in the instrument state Continuous, i.e. BOC orders cannot be entered during Auctions. Sitting BOC orders will be deleted in the state transition to Auction.*

## 4.6 Closing-Auction-Only Orders

Closing-Auction-Only orders are orders that are active only in the instrument states Closing Auction and Closing Auction Freeze. In all other instrument states, they are inactive, i.e. they can be entered, modified or deleted, but they are not available for matching and they do not contribute to the published market data.

When the instrument enters the Closing Auction state, all Closing-Auction-Only orders become automatically active, and they receive a new priority timestamp. The Closing-Auction-Only orders participate then in the closing auction as any regular order.

Unexecuted Closing-Auction-Only orders are not automatically deleted by ISE T7 after the Closing Auction is terminated. Instead, they become inactive.

Closing-Auction-Only orders can be market orders or limit orders.

## 4.7 Opening-Auction-Only Orders

Opening-Auction-Only orders are similar to closing-auction-only orders, i.e. they are active only in the instrument states Opening Auction and Opening Auction Freeze. In all other instrument states, they are inactive, i.e. they can be entered, modified or deleted, but they are not available for matching and they do not contribute to the published market data.

When the instrument enters the Opening Auction state, all Opening-Auction-Only orders become automatically active, and they receive a new priority timestamp. The Opening-Auction-Only order participates in the opening auction as any regular order.

Unexecuted Opening-Auction-Only orders are not automatically deleted by ISE T7 after the Opening Auction is terminated. Instead, they become inactive.

Opening-Auction-Only orders can be market orders or limit orders.

## 4.8 Auction-Only Orders

Auction-Only orders are orders that are active only in the instrument states Opening Auction or Opening Auction Freeze, and Closing Auction or Closing Auction Freeze. In all other instrument states, they are inactive, i.e. they can be entered, modified or deleted, but they are not available for matching and they do not contribute to the published market data.

When the instrument enters one of the above mentioned states, all Auction-Only orders become automatically active, and they receive a new priority timestamp. The Auction-Only order participates in Opening-or Closing Auction states as any regular order.

Unexecuted Auction-Only orders are not automatically deleted by ISE T7 after an Auction is terminated. Instead, they become inactive.

Auction-Only orders can be market orders or limit orders.

## 4.9 Order Profiles

### 4.9.1 Specific Order Maintenance Rules for Order Categories

All orders that are supported by ISE T7 fall in exactly one of the categories of the following list:

- Normal limit and market orders
- Closing-Auction-Only Orders
- Opening-Auction-Only Orders
- Auction-Only Orders
- Iceberg Orders
- Book-Or-Cancel (BOC) Orders
- Stop Orders

ISE T7 does not support orders that fall in more than one of these categories.

#### Example 4-4:

*It is not possible to enter an OCO order with a BOC restriction.*

Furthermore, it is not possible to modify an order so that it changes the category in this list.

#### Example 4-5:

*It is not possible to modify a Stop order to become a normal limit or market order. Nevertheless, it is possible to modify a Stop Limit order to become a Stop Market order.*

### 4.9.2 Definition and Assignment of Order Profiles

ISE T7 categorizes orders according to Order Profiles. The ISE defines these order profiles and enables or disables them for individual products.

When defining order profiles, the order types and order restrictions play a role, which are used internally by ISE T7. ISE T7 distinguishes

1. The following internal order types:
  - Regular
  - Stop
  - Iceberg Order
2. The following optional internal order restrictions:
  - Closing-Auction-Only (CAO)
  - Opening-Auction-Only (OAO)
  - Auction-Only (AO)
  - Book-Or-Cancel (BOC)

Example 4-6:

*A normal limit order has an internal order type Regular and no internal order restriction.*

*A Book-Or-Cancel order has an internal order type Regular and an internal order restriction BOC. An order with internal order type Stop and an internal order restriction BOC would theoretically be possible, but has been explicitly excluded by the rules outlined in chapter 4.9.1 above.*

Note that this notation has been designed to support in an optimal way the business functionality of T7 and therefore differs from the notation used in the external interfaces of the system, which follows the FIX standard.

The following table shows the order profiles available on ISE T7:

Order Profile	Order Profile Attributes												
	Order Types and restrictions							Allowed Price Condition		Allowed Time Validity			
	Regular	Stop	Iceberg	AO	OAD	CAO	BOC	Limit	Market	IOC	FOK	Day	GTD/GTC
Regular Limit Order	✓							✓		✓	✓	✓	✓
Regular Market Order	✓								✓	✓	✓	✓	✓
Closing Auction Limit Order	✓					✓		✓				✓	✓
Closing Auction Market Order	✓					✓			✓			✓	✓
Opening Auction Limit Order	✓				✓			✓				✓	✓
Opening Auction Market Order	✓				✓				✓			✓	✓
Auction Only Limit Order	✓			✓				✓				✓	✓
Auction Only Market Order	✓			✓					✓			✓	✓
Book-Or-Cancel Order	✓						✓	✓				✓	✓
Stop Limit Order		✓						✓				✓	✓
Stop Market Order		✓							✓			✓	✓
Iceberg Order			✓					✓				✓	✓

Configuration Data:

Order profiles and the assignment of order profiles to ISE T7 products are available in the Static Reference Data File on the Xetra website, see chapter 1.2 Usage Notes.

#### 4.10 Cross Announcement

The Cross Announcement functionality serves to announce a Cross Trade or a Pre-Arranged Trade to the market. A cross trade is a trade where a member trades against an own order in the order book. In a pre-arranged trade, orders from at least two participants are executed against each other as previously negotiated.

When a user enters a cross announcement, specifying the instrument and the quantity, ISE T7 publishes this information to the market. The corresponding matching orders must then be entered within a certain time frame.

## 5. Quotes

### 5.1 Quote Characteristics

A Quote is a special kind of order with some specific functionality and a minimal set of attributes. Quotes are sent as pairs of buy and sell quotes, referred to as Double-Sided Quotes.

Quotes are used for market-making purposes.

#### Set Up Information:

A quote in T7 belongs to the session through which it had been entered. A session can only have one buy sell quote per instrument. If a quote is entered through a session that already has a quote on the same side of the same instrument's order book, then the old quote is replaced by the new one.

A quote must have a limit price. There is no such thing as a market quote without a price limit.

Quotes do not carry clearing related information. However, trades resulting from the execution of quotes may be automatically enriched with such information by ISE T7. See chapter 8.2.3 for details.

### 5.2 Quote Ownership

A quote in ISE T7 is owned by the session through which it had been entered. An old quote is replaced by a new one, if the new quote is sent through the session that owns the old quote.

Each quote has also an owning user, which is the one that entered the quote, but the owning user is only of legal relevance. That means that if a user owns a quote on the book and then enters a new quote for the same instrument through a different session, the new quote will be added alongside the old one, rather than replacing it.

However, if a user enters a quote through a session that has already a quote in the order book, then the old quote is replaced by the new quote, even if the old quote had been entered by a different user.

#### Example 5-1:

*There is a quote in the book with owning session 1000 and owning user XYZLOLTR001.*

- 1. User XYZLOLTR001 enters a new quote through the same session 1000.  
→ The old quote is replaced by the new quote.*
- 2. User XYZLOLTR002 enters a new quote through the same session 1000.  
→ The old quote is replaced by the new quote.*
- 3. User XYZLOLTR001 enters a new quote through the other session 1001.  
→ The old quote remains in the book alongside the new quote, because they are owned by different sessions.*

Replacing a quote is thus only possible through the session that owns the quote. ISE T7 does not support a way to replace a quote that is owned by a different session.

## **5.3 Quote Maintenance**

### **5.3.1 The Mass Quote Request**

Users maintain individual quotes using Mass Quote Requests. A mass quote request is a list of requests to enter, replace or delete individual quotes.

Traders may supply a Mass Quote Identifier when entering quotes, which takes the place of the client order identifier known for orders. The mass quote identifier identifies the mass quote request and is therefore the same for all quotes contained in the same mass quote request.

In the instrument state Continuous, the entry or the replacement of a quote implies that ISE T7 attempts to execute the incoming quote against the order book. The sequence of the processing of the individual requests in the mass quote request is of relevance only in the case that quotes are executed on entry,

The requests that are contained in a single mass quote request are processed by T7 in a two-step approach. In the first step, all quotes are logically entered into the book, thereby replacing any old quotes. In the second step, T7's matching engine picks out those quotes that improved the best price on their order book, and attempts to match them as incoming quotes, one after the other, in the sequence, in which they occurred in the mass quote request. Furthermore the buy side is processed before the sell side.

### **5.3.2 Quote Entry**

A user may enter quotes in Quote Entry Mode.

When a new quote is entered in quote entry mode for a specific side in a specific instrument, and if there is no quote belonging to the same session already on that side of the order book for that instrument, then the new quote is simply added.

If there is already an old quote belonging to the same session on that side of the order book for that instrument, then the new quote replaces the old quote. The entered quantity of the new quote becomes the open quantity, while the accumulated executed quantity of the new quote is initialized to zero.

Nevertheless, the new quote will receive the priority timestamp of the old replaced quote, if the price remains the same, and if the new quantity is not higher than the old quote's remaining open quantity. In all other cases, the entry time of the quote defines its time priority.

### **5.3.3 Quote Modification**

Alternatively, ISE T7 supports the entry of quotes in Quote Modification Mode, which adheres to rules that resemble those valid for order modification.

When a new quote is entered in quote modification mode for a specific side in a specific instrument, and if there is no quote belonging to the same session already on that side of the order book for that instrument, then the new quote is not added by ISE T7.

If there is already an old quote belonging to the same session on that side of the order book for that instrument, then the new quote replaces the old quote. The entered quantity of the new quote becomes the total quantity of the new quote, and the accumulated executed quantity of the old quote is taken over as starting value for the accumulated executed quantity of the new quote.

The open quantity of the new quote is then derived as the total quantity of the new quote minus the accumulated executed quantity of the old quote.

In case that the total quantity of the new quote is not greater than the accumulated executed quantity of the old quote, the request to enter a new quote is automatically interpreted as a request to delete the old quote, and no new quote is entered.

Like in quote entry mode, the new quote will receive the priority timestamp of the old replaced quote, if the price remains the same, and if the new open quantity is not higher than the old quote's open quantity. In all other cases, the entry time of the quote defines its time priority.

#### **5.3.4 Quote Deletion on Request**

It is possible to delete an individual quote that rests on the order book. The deletion request identifies the quote by instrument, and assumes that the quote is meant that belongs to the same session as the one through which the deletion request is sent. It is not possible to delete an individual quote through a different session.

In addition to the deletion of individual quotes with a mass quote request, ISE T7 supports also a special Delete All Quotes Request. With the help of this request it is possible to cancel all own quotes in a product as well as all quotes in a product of another session belonging to the same business unit. Such a request can be sent through any session that belongs to the same business unit.

During an auction freeze instrument state, just as for orders, ISE T7 cannot delete quotes, as this would change the order book situation. Like for orders, a request to delete a quote during an auction freeze state is accepted by ISE T7, but the quote is merely marked as pending deletion. The handling of quotes that are marked as pending deletion is identical to the handling of orders in this situation as described in chapter 4.2.3.

#### **5.3.5 Automatic Quote Deletion**

Quotes are deleted automatically in the following situations:

- The instrument enters the state Restricted or the state Closed.
- The product enters the state Halt.
- A Volatility Interruption occurs (depending on the exchange configuration).
- The owning session gets disconnected.
- In the case of certain risk protection events that require the deletion of all orders and quotes.
- A technical back end partition overload condition has been detected
- A technical failure requires a restart of the central matching engine.

Quotes are always considered as having an order validity of Good-For-Day. However, since quotes are always deleted when the instrument enters one of the instrument states Restricted or Closed, they

are in any case already deleted when the End-Of-Day processing starts.

#### Set Up Information:

*Quotes as well as non-persistent orders are not deleted when the instrument state on ISE T7 moves to the state Volatility Auction.*

### **5.3.6 Quote Deactivation**

It is possible to deactivate or reactivate all quotes of a session that belong to the same product and optionally to the same instrument type. The deactivation or reactivation is always valid for all the quotes of a session for the specified product and instrument type. It is not possible to deactivate or reactivate individual quotes.

The deactivation or reactivation of the quotes of a session can be requested through any session that belongs to the same business unit.

When a session's quotes are inactive, it means that they do not participate in matching and ISE T7 does not consider them for the calculation of market prices. However, inactive quotes can still be maintained just like active quotes. A trader can thus continue to perform normal quote maintenance, like adding, modifying, and deleting individual quotes, while all the session's quotes for the product and instrument type, including new ones remain inactive, even if all the price validations are done for inactive quotes in the same way as for active quotes.

*Note: It is preferable to consider inactive quotes or active quotes as being a status of the owning session in respect to a specific product and optionally instrument type, and this status of the session then affects the behaviour of its quotes. In this way, it is easy to understand that quotes being active or inactive is a status that exists independently from quotes actually being on the order book. If a trader deactivates quotes, deletes them all afterwards and enters new quotes later on, then these new quotes will still be inactive as long as the trader did not send a reactivation request.*

When the quotes of a session are reactivated, T7 does the following for each quote one after the other:

1. The priority timestamp of the quote is updated.
2. If the instrument state is Continuous and the quote is executable, the quote is matched as if it were an incoming quote.
3. From then on, if the quote has still an open quantity, it is treated as any active quote on the order book.

ISE T7 processes quote reactivation requests asynchronously, i.e. with a minor delay. This has the effect that a quote reactivation request might be surpassed by another order or quote maintenance request that arrived shortly later. What concerns quote deactivation requests, they are processed immediately upon arrival, and the same as it is done for all other order or quote maintenance requests.

In general, ISE T7 processes a buy quote before the sell quote of the same instrument. This can be of relevance e.g. if the reactivation of a buy quote which turns out to be immediately executable, triggers a buy market order on the book (chapter 7.3.1.3), before the corresponding sell quote is reactivated. At that moment, the session's sell quote for the same instrument is not yet reactivated and thus not yet eligible to match against the triggered market order.

The status of a session's quotes being active or inactive is persistent. It survives all situations when

quotes are deleted intra-day, including session disconnect and a technical failure of the central Matching Engine. Quotes being entered after such an event are still inactive, if quotes had been inactive before the event. However, at the start of day, all sessions are set to having active quotes, even if they had their quotes being inactive at the end of the previous trading day.

### 5.3.7 Safeguards

The user may provide a cross ID which prevents the matching against identically tagged orders or quotes of the same business unit by means of the self-match prevention functionality, see chapter 7.7.

In any case, ISE T7 applies the following rules in order to prevent unwanted matching between quotes of the same session or to remove unwanted quotes from the order book:

1. A crossed double-sided quote is rejected by ISE T7.
2. The ISE defines requirements for the minimum quantity, the maximum bid/ask spread, and the minimum time the quote has to remain on the order book. Details of these parameters are outlined in the Market Parameters of the ISE.
3. When many quotes are sent in one mass quote request, they are processed in sequence. T7 prevents a new quote matching against an old quote that is due to be replaced or to be deleted by the same request.
4. If the entry or the deletion of an individual quote is rejected by ISE T7, then ISE T7 rejects both sides of the new quote and it deletes both sides of the session's old quote in the affected instrument.

## 5.4 Quote Validations

### 5.4.1 Standard Limit Price Validations

The limit price of a quote is subject to the same validations as the limit price of an order:

- It must comply with the price step table that is relevant for the instrument.
- The entering user may request, that the limit prices of the quotes be validated with the Price Reasonability Check. See chapter 6.2 for the details of the Price Reasonability Check.

### 5.4.2 Minimum Quote Size

When a quote is entered, the total quantity of a quote must be greater than or equal to the Minimum Quote Size, which is defined individually for each instrument/product by the ISE.

The quantity being relevant here is the total quantity of the quote and not its open quantity (see chapter 4.1.2 for the definitions of these terms).

Due to partial executions, the open quantity of a quote may fall below the value of the Minimum Quote Size, but this is not considered to be a violation of the Minimum Quote Size. It is even possible to enter a new replacing quote in Quote Modification Mode (see chapter 5.3.3 above), leaving the open quantity below the Minimum Quote Size, as long as the total quote size remains greater than or equal to the Minimum Quote Size.

# 6. Price Range Tables and their Applications

## 6.1 Price Range Table Basics

### 6.1.1 Functionality Overview

T7 makes extensive use of price range tables. The standard Price Range Tables are used to calculate price ranges that are applied for the following purposes:

- The Price Reasonability Check can be used by traders to test the reasonability of their order's or quote's limit price on entry. It is described in chapter 6.2.
- The Market Order Matching Range helps to protect market orders by setting a limit to the trade price at which a market order is executable. The procedure is described in chapter 7.3.
- The Maximum Quote Spread Validation limits the allowed price spread between the buy side and the sell side of a quote. See chapter 6.3 for details.

### 6.1.2 Calculation of Price Ranges

A price range table enables the calculation of a price range depending on a reference price. The table consists of a list of consecutive price intervals together with the parameters to be applied for the calculation of the price range, if the reference price falls into the price interval. The price intervals in the table are defined for positive prices. For negative reference prices, the price interval applicable for their absolute value (i.e. the same number without the minus sign) is used.

There are two parameters, the Absolute Price Range Parameter and the Percent Price Range Parameter. The price range is then calculated depending on the reference price as

$$\text{Price Range (Reference Price)} = APR + |\text{Reference Price}| \times \frac{PPR}{100}$$

where the values for the Absolute Price Range Parameter *APR* and the Percent Price Range Parameter *PPR* are taken from the table entry for the price interval that contains the reference price.

Price range tables contain only entries for positive reference prices. In case of a negative reference price, the absolute value of the reference price has to be used, i.e. the value without the minus sign.

During a Fast Market, the values for the price range are doubled:

$$\text{Price Range Fast} = \text{Price Range} \times \left(1 + \frac{100}{100}\right) = \text{Price Range} \times 2$$

### 6.1.3 Availability of Price Range Tables

Standard Price Range Tables are set up by product and by instrument type. Standard Price Range Tables for instruments are defined by instrument.

Standard Price Range Tables are always available for all products.

There is an independent version of the Extended Price Range Tables to be applied for the validation of stop limit orders that are not triggered on entry or modification.

### Configuration Data:

The standard price range tables for a specific product are published by T7's Reference Data Interface in the product snapshot message (RDI group message name: PriceRangeRules). The identifier of the relevant standard price range table for a specific instrument is then available in T7's Reference Data Interface's instrument snapshot message (RDI group message name: PriceRangeRules).

## **6.2 Price Reasonability Check**

When a user enters or modifies a limit order or a quote, the user can optionally request ISE T7 to perform a Price Reasonability Check on the limit price of the order or quote, and to reject the order or quote, if it fails the check.

The Price Reasonability Check is based on the volatility range. The two concepts are described in the following.

### **6.2.1 Price Reasonability Check based on the Volatility Range**

#### **6.2.1.1 Procedure**

For ISE instruments, the price reasonability check applies to all instrument states where order maintenance is allowed to new or modified limit orders and quotes.

The price reasonability check is optional and can be specified by the user whether the check should be applied or not. When enabled, the price reasonability check validates that the new limit price does not exceed the volatility range. The volatility range is a special interval around the last trade price to prevent large deviations of execution prices. See chapter 7.6 for details on the Volatility Interruption functionality.

Market orders are not considered for price reasonability check.

#### **6.2.1.2 Validation Rules**

With a given last trade price, the limit price of an order or quote is checked for buy/sell side as follows:

The incoming buy limit is not reasonable if

$$\text{Buy Limit Price} > \text{Last Trade Price} + \text{Volatility Range (Last Trade Price)}$$

The incoming sell limit is not reasonable if

$$\text{Sell Limit Price} < \text{Last Trade Price} - \text{Volatility Range (Last Trade Price)}.$$

### 6.3 Maximum Quote Spread Validation

Quotes are accepted only if the price difference between the buy side and the sell side of the quote does not exceed the Maximum Quote Spread.

The Maximum Quote Spread is determined either as being equal to the Price Range being calculated on basis of the price of the buy quote, or as being equal to the Price Range being calculated on basis of the price of the sell quote, whichever Price Range value turns out to be larger:

$$\text{Maximum Quote Spread} = \max[\text{Price Range (Buy Quote Price)}, \text{Price Range (Sell Quote Price)}]$$

The quote is rejected, if the quote spread is greater than the Maximum Quote Spread, i.e.:

$$\text{Sell Quote Price} - \text{Buy Quote Price} > \text{Maximum Quote Spread}$$

## 7. On-book Matching

### 7.1 Definitions

#### 7.1.1 Orders

For the matching process, ISE T7 treats orders and quotes identically. Therefore, throughout this chapter, the term Order is generally applied to both orders and quotes.

#### 7.1.2 Matching

Matching is the procedure of finding pairs or groups of orders that are executed against each other.

In its simplest form, there is one buy order and one sell order that are both executed at the same execution price and with the same quantity. However, in general, several orders on the buy side can be executed against several orders on the sell side. The execution price is the same for all involved orders and the accumulated executed quantity on the buy side must equal the accumulated executed quantity on the sell side. ISE T7 informs the owners of the orders with an execution confirmation, and then creates a trade and forwards this trade to the clearing system.

#### 7.1.3 Direct Matching

The matching of orders that all belong to the same instrument is called Direct Matching.

#### 7.1.4 Incoming Orders and Book Orders

The matching procedure makes a difference between Incoming Orders and Book Orders. Strictly speaking, an incoming order is an order that is in the process of being entered, and a book order is an order that is on the order book already.

In the context of matching however, book orders are sometimes treated as incoming orders. These cases are

- Orders that are being modified such that the price is improved,
- Quotes that are reactivated,
- Market orders that are triggered (see chapters 7.3.1.3 and 7.3.1.4),
- Stop orders that are triggered (see chapters 4.3),

In this chapter therefore, the term *Incoming Order* is applied not only to actual incoming orders, but extended also to book orders given in the above list.

#### 7.1.5 Full Match and Partial Match

An order will match fully if its entire open quantity is executed. Since there is nothing left to match, a fully matched book order is removed from the order book, and a fully matched order that is in the process of being entered, is not written to the book.

An order matches partially if not all its open quantity is executed. In this case, an order that was already on the order book remains on the order book, and an order that is in the process of being entered and is not an IOC order, is written to the order book. The quantity that was executed is removed from the open quantity and added to the accumulated executed quantity.

It is possible for a single order to get involved in multiple executions at different points in time. For example, an order may be partially executed upon entry, while the remaining open order remains in

the order book. The open portion may then be executed a minute later, an hour later, or even days later.

### 7.1.6 Continuous Trading and Uncrossing

ISE T7 supports essentially two different matching procedures:

1. **Continuous Trading:** In the instrument state Continuous, the matching engine of ISE T7, attempts to execute an incoming order in the extended sense as described above, immediately against orders on the order book. The rules for Continuous Trading are described in chapter 7.2 below.
2. **Uncrossing:** An auction phase usually ends with an uncrossing procedure that may result in an auction trade. Orders at both sides of the order book are executed against each other at one single auction price, so that afterwards the order book is uncrossed, i.e. there are no longer two orders left on the order book that can be executed against each other.

## 7.2 Continuous Trading

### 7.2.1 Matching Procedure in Continuous Trading

Continuous trading is the matching procedure that is exclusively applied in the instrument state Continuous.

In continuous trading, the matching engine of ISE T7 attempts to execute a single incoming order, incoming in the extended sense as explained in chapter 7.1 above, against book orders on the other side of the order book of the same instrument.

To be executable against a book order, the incoming order must be:

- Either an order to buy at a price at or above the limit price of the sell book order,
- or
- An order to sell at a price at or below the limit price of the buy book order.

For market orders, there are special rules, which are explained in detail in chapter 7.3 below.

In ISE T7, the procedure for matching an incoming order against several book orders, in any case follows a strict price priority.

The following steps are repeated by the matching engine of ISE T7, for each available limit price level on the order book, until either the quantity of the incoming order is exhausted, or until no more orders on the order book are executable against the incoming order:

1. It finds the best available limit price level on the side of the order book that opposes the incoming order. This is the highest price for the buy side and the lowest price for the sell side.
2. It distributes the remaining available quantity of the incoming order to the book orders at this price level, according to the applicable order allocation method.
3. When all available book orders on the price level have been matched, the price level is exhausted, and the matching engine of T7 continues with the next best available price level.

If at the end, there are no more orders left on the order book against which the incoming order can be executed, and if the incoming order still has a remaining open quantity, then the incoming order is written

to the order book, if it was not there already.

The allocation method applied in step 2, matters only if the remaining quantity of the incoming order is less than the accumulated quantity of the book orders at this price level.

## **7.2.2 Match Event Structure**

### **7.2.2.1 Match Event**

The matching of a single incoming order against possibly many orders on the book at various price levels constitutes a Match Event.

### **7.2.2.2 Match Step**

A match event is subdivided into Match Steps. In direct matching, which is described in this chapter, a match step comprises all matching at a specific price level.

### **7.2.2.3 Match Step Identifier**

Each match step has a Match Step Identifier that is unique on a product level for the business day. The match step identifier is included in the publicly distributed trade volume reporting data, and at the same time, the match step identifier is also contained in the order execution messages that are received by the owners of the involved orders. In this way, participants are given the ability to link their own order execution information with the public trade volume reporting data.

## **7.3 Market Order Matching in Continuous Trading**

Market orders are treated as having no price limit, i.e. their volume is available at any price in the execution price determination protected by the volatility range limits.

An incoming market order always crosses the book if there is an active order on the opposite side. The best available limit of the opposite order book side defines the execution price for an incoming market order.

In case there are resting market orders in front of the best available limit, the last traded price constitutes the execution price if it is better than the best available book limit or no book limit is available.

Since an incoming market order is always executed as long as there is quantity on the opposite side of the book, a crossed book situation is prevented.

For an incoming limit order, the pricing of booked market order also depends on the incoming limit.

The execution price for a booked buy market order is set as follows:

$$\text{Execution Price} = \max\{\text{Last Trade Price, Best Bid Limit, Best Ask Limit}\}$$

The execution price for a booked sell market order is set as follows:

$$\text{Execution Price} = \min\{\text{Last Trade Price, Best Bid Limit, Best Ask Limit}\}$$

### 7.3.1.1 Matching of Incoming Market Orders

An incoming market buy order can match against orders on the sell order book.

An incoming market sell order can match against orders on the buy order book.

Continuing the use of the definition given in chapter 7.1 above, the term incoming includes

- Orders that are modified from being limit orders to being market orders,

### 7.3.1.2 Matching of Book Market Orders

If there are one or more book market orders resting on the side of the order book that is opposite to the side of the incoming order, then these book market orders are executed at a trade price that is equal to the best available limit price on the side of the resting market orders.

When book market orders are matched at the same price as the best priced book limit orders, the book market orders are matched together with the best priced book limit orders in one single match step. However, in the order allocation, these market orders and limit orders are allocated separately, and the market orders are allocated first.

### 7.3.1.3 Book Market Order Triggering by Incoming Orders

An incoming limit order or market order on the same side as a book market order cannot be matched before that book market order.

The term incoming order also applies here to the following:

- Orders that are being modified such that the limit price is improved.
- Quotes that are reactivated.
- Stop orders that are triggered (see chapter 4.3),

Thus, in case that an incoming order could be executed, but that there are one or several market orders in the book on the same side as the executable incoming order, then all these book market orders are triggered one after the other, before the incoming order is processed.

The condition for the triggering to occur is strictly that the incoming order would match, at least if the book market order triggering would not be done first. The mere fact that there is an incoming order, or that this order has a better limit price than the currently available best buy price is not sufficient for triggering book market orders.

Market order triggering means that based on the time priority, the book market orders are re-processed one after the other as incoming orders.

In the end, if all book market orders to be triggered have been processed, ISE T7 processes the incoming order. Any stop orders that are triggered by the execution of the triggered book market orders are processed only after the incoming order has been processed.

BOC orders (see chapter 4.5) never match on entry and therefore do not trigger book market orders.

**7.3.1.4 Book Market Order triggering by Incoming Quotes**

Incoming executable quotes trigger book market orders in the same way as incoming orders, see chapter 7.3.1.3 above. Additionally, quotes that are not executable on entry may trigger book market orders as well, if the conditions outlined in the following are fulfilled. The triggering of the book market orders takes place immediately after the incoming quote has been written to the order book.

The condition to be applied is that the spread of the incoming quote is smaller than or equal to the max spread. This condition depends on whether a market order is a buy order or a sell order, i.e. in the case of an incoming double-sided quote,

- buy market orders are triggered, if

$$\text{Sell Quote Price} - \text{Buy Quote Price} \leq \text{Price Range (Buy Quote Price)},$$

- and sell market orders are triggered if

$$\text{Sell Quote Price} - \text{Buy Quote Price} \leq \text{Price Range (Sell Quote Price)},$$

The condition is also considered to be fulfilled in the following cases:

- The same conditions are applied when quotes are reactivated rather than real incoming.

The triggering of the book market orders occurs immediately after the quote has been written to the order book. This means that the triggered market orders might match against the quote that triggered it at the limit price of the quote.

If there are market orders eligible to be triggered on both sides of the order book, then only the market orders are triggered on the side of the order book, where the accumulated quantity of market orders is higher. If the quantities on both sides are equal, only the buy market orders are triggered. This will then automatically result in the book market orders on the other side of the order book being fully matched by the triggered market orders.

The price limit for the execution of market orders that are triggered due to the conditions of this chapter is identical to the limit that is applied to incoming market orders. The rules are described in chapter 7.3.1.1 above.

Example 7-1:

**A market order meets an order book with market orders and limit orders on the other side of the order book.**

Bid					Ask
Time	Quantity	Limit €	Limit €	Quantity	Time
9:01:00	6000	Market			
9:02:00	1000	1.95			

Bid				Ask	
Time	Quantity	Limit €	Limit €	Quantity	Time
9:01:00	6000	Market			
9:02:00	1000	1.95			

Incoming order:  
Ask market  
order, quantity  
6,000 shares

The reference price is €2.00 which is higher than or equal to the highest bid limit.

The incoming ask market order is executed against the bid market order in the order book at the reference price of €2.00 (see rule 3, page 32).

## 7.4 Auctions and Order Book Uncrossing

### 7.4.1 Uncrossing Procedure

The uncrossing procedure executes one or more buy orders on the order book against one or more sell orders on the order book at one single execution price, so that:

1. The limit prices of the executed orders are not violated, and
2. Afterwards the order book is uncrossed, i.e. there are no longer two orders left on the order book that can be executed against each other.

The rules that are applied to determine the execution price for an uncrossing procedure are described in chapter 7.4.2 below.

The uncrossing procedure is normally applied at the end of an auction phase. An auction phase is a phase where the instrument state is an auction state, possibly alternating with an auction freeze state. See chapters 3.2.1 for details on these instrument states.

Under exceptional circumstances however, an auction can be cancelled without an uncrossing being done.

Furthermore, the uncrossing procedure must be applied whenever an instrument's state is moved to the Continuous instrument state, even without a previous auction phase.

Since the main application of the uncrossing procedure is the generation of an auction trade at the end of an auction phase, the uncrossing trade is also called an Auction Trade, and the corresponding trade price is also called an Auction Price, even if no auction phase was involved.

An uncrossing trade is performed as one match event with a single match step (see ch.7.2.2 above for the definitions of these terms). It is reported as an auction trade in the public Trade Volume Reporting.

### 7.4.2 Auction Price Determination

All orders that are executed in a specific uncrossing procedure are executed at the same execution price, irrespective of their limit price. This execution price is the auction price of the specific uncrossing procedure.

The auction price is calculated as the maximum executable volume with the lowest surplus.

In the following, both methods to determine the auction price and their underlying matching rules are

described.

#### 7.4.2.1 Auction Price Determination

The auction price is determined according to the principle of highest executable volume and lowest surplus.

Should this process determine more than one limit with the highest executable order volume and the lowest surplus, than the surplus is referred to for further price determination:

1. The auction price is stipulated according to the highest limit if the surplus for all limits is on the buy side (bid surplus).
2. The auction price is stipulated according to the lowest limit if the surplus for all limits is on the sell side (ask surplus).

If the inclusion of the surplus does not lead to a clear auction price, the reference price (the last trade price) is included as additional criterion. This may be the case:

- If there is a bid surplus for one part of the limits and an ask surplus for another part.
- If there is no surplus for all limits.

In both cases, the reference price is considered for stipulating the auction price:

3. If the reference price is higher than or equal to the highest limit, the auction price is determined according to this limit.
4. If the reference price is lower than or equal to the lowest limit, the auction price is determined according to this limit.
5. If the reference price lies between the highest and lowest limit, the auction price equals the reference price.

If only market orders are executable against one another, they are matched at the reference price.

#### Example 7-2:

*For an equity, the order book contains two orders on each side as follows.*

- *Buy order book:*
  - *Order 1: buy 300 at price 202*
  - *Order 2: buy 200 at price 201*
- *Sell order book:*
  - *Order 3: sell 300 at price 199*
  - *Order 4: sell 200 at price 198*

*There are several possible limits (199 and 201) and no surplus on hand. The auction price either equals the reference price or is fixed according to the limit nearest to the reference price:*

- *If the reference price is € 201, the auction price will be € 201*
- *If the reference price is € 202, the auction price will be € 201*
- *If the reference price is € 198, the auction price will be € 199.*

An auction price cannot be determined if orders are not executable against one another.

## 7.5 Order Allocation Methods

### 7.5.1 Overview

An Order Allocation Method describes how a tradable quantity is shared amongst a group of eligible orders, if the tradable quantity is insufficient to allow all eligible orders to be fully executed.

ISE T7 always observes a strict price priority. This means that an eligible limit order receives a share only, if all market orders and all limit orders with a better limit price are fully matched. Therefore, the different order allocation methods describe different ways on how to distribute a tradable quantity to be shared amongst orders of the same price level, if that tradable quantity is lower than the accumulated quantity of the orders at that price level.

On ISE T7 orders are matched using Time Allocation. The price best orders are sorted by their time priority. The first price best order is filled as much as possible and the remaining quantity of the incoming order is passed to the next price best order. Usually, the number of orders that receive a share in the case of the Time Allocation is smaller compared to the case of the Time-Pro-Rata Allocation or of the Pro-Rata Allocation. The Time Allocation method is described in chapter 7.5.2.

### 7.5.2 Time Allocation

The time allocation method first sorts the eligible orders by their priority time stamp, orders with an older priority time stamp coming first.

It then determines the allocation for one eligible order after the other in the sequence that they have just been sorted. Each order receives an allocated quantity that is equal to its open quantity, provided that the quantity left to be allocated after the previous orders in the list got their share, is sufficient. If that quantity is not sufficient, then the order is allocated whatever remaining quantity was left to be allocated. In this way, it is possible that orders, which are last in the list, receive nothing.

Note that the term “Time Allocation” is a synonym of the term “Price-Time Allocation”. The term “Time Allocation” is applied here, because price priority is something that is a common feature of all matching procedures in T7, independent of the order allocation method. What distinguishes the time allocation method from other order allocation methods is the priority time being the only criteria for the allocation among orders of the same price level.

This calculation of the allocated share can also be expressed with the help of a mathematical formula:

$$a_i = \text{MIN}[q_i, A_i]$$

where:

$a_i$  is the quantity that is allocated to the order at position  $i$  in the sorted list of eligible orders,

$\text{MIN}$  is the minimum function, i.e.  $\text{MIN}[X, Y]$  is either  $X$  or  $Y$ , whichever is smaller,

$q_i$  is the open quantity of the order at position  $i$  in the sorted list of eligible orders,

$A_i = \left( A - \sum_{k=1}^{i-1} a_k \right)$  is the quantity available to be allocated to the order at position  $i$  in the sorted list of eligible orders, which is given by the total quantity to be allocated  $A$  minus the sum of the quantities that were already allocated to the orders, which have a higher priority.

Example 7-3:

*A quantity of 25 is to be allocated among three orders in the order book with a total open quantity of 90. Their time priority is given by the sequence in the following list, highest time priority first:*

- Order 1, Quantity 20
- Order 2, Quantity 20
- Order 3, Quantity 50

*For the time allocation, these orders are sorted by time priority. The first order is fully allocated. The remaining quantity is given to the second order, and since nothing is left, the third order receives nothing.*

Order Priority	Order Quantity	Quantity Available To be Allocated	Allocated Quantity
Order 1	20	25	20
Order 2	20	$25 - 20 = 5$	5
Order 3	50	$25 - 20 - 5 = 0$	0

*Since order 3 has the lowest time priority, it receives nothing, even though it is the largest order.*

## 7.6 Volatility Interruption

### 7.6.1 Overview

The Volatility Interruption is a special mechanism that is applied during Trading, in order to prevent large deviations of execution prices.

To this end, ISE T7 compares each execution price to recent execution prices in the same instrument, and if the price difference is considered excessively large, it stops trading and automatically starts a volatility auction in the affected instrument.

A volatility interruption is triggered if a potential trade price lies outside the predefined fixed or floating volatility boundaries.

### 7.6.2 Volatility Interruption Functionality

During continuous trading, it is checked whether the potential trade price lies within a predefined floating volatility range around the last price. In addition, it is checked whether the potential trade price lies also within a predefined range around the last auction price (fixed range). If at least one of the condition is not fulfilled, trading is interrupted by a volatility auction.

Same procedure applies during auction call phases, i.e. a volatility interruption is initiated if the indicative auction price lies outside the floating and/or fixed price range at the end of the call phase during auction commit processing. In such a case, an auction call phase is followed by another call phase, the volatility auction call phase. Volatility interruptions in an auction are specifically announced.

If, at the end of a volatility interruption, the potential price lies outside an extended range, which is broader than the floating price range, the volatility interruption is extended until it is terminated manually.

Extended volatility boundaries are calculated at volatility auction termination. Upper and lower extended volatility boundaries are calculated around the last traded price and using the floating volatility ranges multiplied by an extended volatility factor.

## 7.7 Self-Match Prevention

Self-match prevention is an optional functionality, which allows a business unit to prevent that certain own orders of the same instrument match against each other. Self-match prevention is supported during continuous trading, but not in any matches in an auction or order book uncrossing.

When an incoming order (in the extended sense as defined in chapter 7.1) and a book order would match against each other, T7 checks whether they are owned by the same business unit and whether they carry the same user supplied cross ID. If that is the case, the match between the two orders is prevented and the quantity, which would have matched, is removed from the order quantity, for both the incoming order and the book order. For a book order that would have partially matched, the total order quantity is reduced by the quantity that would have matched, and the remainder remains on the book. A book order that would have fully matched is deleted.

For the incoming order, if there is still a remaining open quantity left after its quantity is reduced by the prevented match quantity, then this remainder of the incoming order is allowed to match further but only on the same price level. It is also possible that further matches on that price level are again

prevented due to self-match prevention. After matching completed on that price level, any remaining open quantity left for the incoming order is cancelled, effectively preventing the incoming order to match on further price levels.

Example 7-4:

Initial order book with orders sorted according to their price/time priority looks as follows:  
**Self Match prevention – a new sell order meets a resting buy order with the same Cross ID from the same member.**

BID					ASK		
Time	Volume	Member/Cross I.D.	Limit €	Member/Cross I.D.	Volume	Time	
			2.11	XYZFR/5566	100	9:04:00	
			2.10		50	9:05:00	
9:01:00	50		2.09				
9:03:00	20	XYZFR/9987	2.08				
9:04:00	500		2.08				
9:05:00	10	ABCFR/1234	2.07				
9:06:00	50	ABCFR/9987	2.07				
9:07:00	5		2.07				
9:08:00	10		2.06				
9:09:00	40	ABCFR/9987	2.06				

A new sell order with quantity 650 and limit €2.06 from member ABCFR with CrossID “9987” is entered into the order book.

This order matches according to price/time priority first with Buy Order (50 @ €2.09), then with Buy Order (20 @ €2.08) which has the same CrossID but was entered by a different member, and then with Buy Order (500 @ €2.08).

Then it matches with Buy Order (10 @ €2.07) which was entered by a trader of ABCFR but with a different CrossID. A quantity of 70 shares remains from the incoming Sell Order.

The remaining quantity of the incoming SMP-Order now hits the resting SMP Buy Order (50 @ €2.07) and the conditions for Self Match Prevention (same member, same CrossID) are fulfilled. As the (remaining) quantity of the incoming SMP-Order is bigger, the resting order is deleted and the quantity of the incoming order is decreased by the same quantity so that its remaining quantity is 20.

The incoming Sell SMP Order is now checked for executions on the same price level where SMP was triggered and Buy Order (5 @ €2.07) gets executed. The remaining quantity of incoming Sell Order (15 @ €2.06) is deleted afterwards since no further matching on the same price level is possible.

The order book after the executions is as follows:

BID				ASK		
Time	Volume	Member/Cross I.D.	Limit €	Member/Cross I.D.	Volume	Time
			2.11	XYZFR/5566	100	9:10:00
			2.10		50	9:11:00
9:08:00	10		2.06			
9:09:00	40	ABCFR/9987				

# 8. Trade Management

## 8.1 Overview

ISE T7 is a trading system, the purpose of which is to receive orders and quotes, and to match these, thereby creating trades. Finally, it forwards all created trades to the CCP.

ISE T7 offers therefore no clearing functionality and only limited trade management functionality, which is described in this chapter.

The trade management functionality offered by ISE T7 includes:

- For both, orders and quotes, the automatic enrichment of trade items with the identification of the trading member and of the clearing member as known to the clearing system.
- For quotes and for a specific type of orders, the automatic enrichment of trade items with pre-defined values for clearing related information.
- A trade reversal facility available exclusively to market supervision.

## 8.2 Handling of Clearing Related Information

### 8.2.1 Member Information for the CCP

ISE T7 automatically adds to each trade item the corresponding information about the trading member and the clearing member as known to the CCP that receives the trade.

The underlying assumption is that all the trades of a specific participant are cleared by the same clearing member.

### 8.2.2 Entering Clearing Related Information for Orders

On an order, it is possible to specify values for the following attributes that are not trading related and are forwarded in the trade items to the clearing system:

- Clearing Account: The clearing account is the position account used in the CCP.
- Text Fields: There are printable text fields that can be freely used for various purposes.

ISE T7 does not validate or modify the values of these attributes, but forwards them unchanged to the CCP. The CCP will then handle invalid data in an appropriate way.

### 8.2.3 Automatic Trade Enrichment

For quotes and for orders, which are sent with a special small message layout, clearing related information as described above cannot be provided directly on the order or quote. Instead, participants can submit trade enrichment rules that are then used by ISE T7's trade manager to fill clearing related attributes on trade items before sending them to the clearing system.

This automatic trade enrichment is available for quotes, and it is available for orders, which are sent with the small message layout. It is not available for orders, which are sent with the normal long message layout, which contains the fields for the clearing related attributes. See the document *Enhanced Trading Interface – Manual* for details on order message layouts.

The automatic trade enrichment is available for the following attributes:

- Clearing Account
- Text Fields

Participants may submit several different trade enrichment rules to the ISE, identifying them with different integer numbers. For each order or quote, the trade items of which shall be automatically enriched, the identifier of the desired trade enrichment rule needs to be supplied on the order or quote.

If no trade enrichment rule with the supplied identifier exists, or if the desired trade enrichment rule contains no value for a specific attribute, ISE T7 forwards the trade item to the CCP without giving any value to this attribute. The clearing system may then set the clearing account.

### **8.3 Trade Reversal**

In exceptional circumstances and with approval by the ISE, DGAB market supervision may reverse a trade when a mistrades has been declared

Such events may have an effect on the trade statistics data that is published through the market data interfaces of ISE T7. See chapter 9.3 for more information on this topic.

## 9. Market Data Publishing

ISE T7 provides market data in several ways:

1. The Enhanced Market Data Interface (**EMDI**) provides price level aggregated market data without netting for high bandwidth customers. Without netting means that every single change to the market data is made visible, and every single match is reported individually. Price level aggregated market data means that EMDI delivers order book information in the form of the accumulated available quantities for price levels. The number of reported price levels is limited. For instruments with synthetic matching, this includes synthetic price and quantity information on the best available price level.
2. The Market Data Interface (**MDI**) provides price level aggregated market data with netting for low bandwidth customers. Netting means that changes of the order book information are aggregated over a time interval with a product dependent duration. And the same happens to the trade reporting, such that only snapshots of the general trade statistics are provided, but there is no reporting of every individual match. Like EMDI, also MDI delivers order book information in the form of accumulated available quantities for a limited number of price levels, including synthetic price and quantity information on the best price level where applicable.
3. The Enhanced Order Book Interface (**EOBI**) provides order-by-order market data without netting for high bandwidth customers. Order-by-order means that EOBI delivers order book information by reporting price and quantity data of each individual visible order. EOBI does not provide any price level aggregated data, and therefore, no information on synthetic prices.

The following information is provided on the EOBI:

- Market state information, as e.g. Product states and Instrument states.
  - Best price and quantity information.
  - Order book depth price and quantity information.
  - Price, quantity and time priority of individual visible orders.
  - Individual trade volume reporting.
  - General trade statistics.
  - Requests for Quotes and Cross Announcements.
4. The Extended Market Data Services (**EMDS**) is market data interface that provides a real time dissemination of all on- and off-book trade prices with a replay service. The replay service allows participants to recover from any data loss for on-exchange and off-exchange trades.

For further details on the market data streams, especially on which data is contained in which stream, please refer to the *T7 Market-, Enhanced Order Book-and Reference Data Interfaces - Manual* and to the *T7 Extended Market Data Services - Manual*.

### 9.1 Market State Information

The public market data contains the following information related to the general state of the market:

- Product states (see chapter 3.2.2).
- Instrument states (see chapter 3.2.1).

- On-book listing status for instruments (see chapter 3.3).
- Fast market indicator (see chapter 3.2.4).

## 9.2 Order Book Information

Published order book information gives an indication at which price an incoming order can be executed, and how much can be executed at that price. In general, public order book information is based exclusively on limit orders. Market orders on the order book may add to the available executable order volume, but this is never reflected in the published order book data, except for the potential auction price.

Orders that are not available for matching are ignored. Thus, for example stop orders or trailing stop orders are ignored before they are triggered.

The order book information that is published in the public market data depends mainly on the instrument state:

- During the instrument state Continuous, ISE T7 publishes:
  1. The order book depth prices and the related accumulated quantities.
  2. Price, visible quantity and time priority for each visible order.
- During auction instrument states and during auction freeze instrument states, ISE T7 publishes:
  1. Either the potential auction price, or the accumulated volume, if an uncrossing at this moment would lead to an auction trade,
  2. Or the best buy and sell prices available in the order book together with their quantity information. This price information contains only direct prices but no synthetic prices.
- During other instrument states, no up-to-date order book information is published by ISE T7. However, during the product state Post-Trading, ISE T7 publishes the best direct buy and sell prices that were available in the order book in the moment when the product entered Post-Trading.

The order book depth data shows the quantities that are available for matching at the best price level and at a limited number of further price levels. The ISE decides by product on the number of published price levels.

The data on visible individual orders is complete, i.e. it can be used by participants to construct an unlimited order book depth. The individual orders can be identified through the combination of the instrument identifier, the side and the priority time stamp. However, the owners of the individual orders remain undisclosed.

Maintenance of not visible orders, e.g. market orders, Closing-Auction-Only orders outside a closing auction or stop orders before being triggered, is not reported.

The Potential Auction Price is the auction price that would result, if an uncrossing would take place at this moment. See chapter 7.4 for details.

## 9.3 On-book Trade Reporting

ISE T7 publishes general trade statistics data as well as information on individual trades.

### 9.3.1 Trade Volume Reporting

The term Trade Volume Reporting refers to the publication of data about individual matches, which is available only in the Enhanced Market Data Interface. A single incoming order can be matched at several different prices.

Such a match event is structured into match steps, so that there is only one execution price for a single match step. See chapter 7.2.2 for a description of match events and match steps.

The trade volume reporting publishes data about individual match steps.

The trade volume reporting consists of one data set per match step. A single trade volume reporting data set contains the following information:

- **Match Step Identifier:** The match step identifier provides a unique identification of the match step in the scope of the product. It is also reported in the private execution information that T7 sends to the owner of an executed order. It can thus be used to relate private information about the executions of own orders to the public information given in the trade volume reporting.
- **Execution Price:** The execution price is the price at which the orders were executed.
- **Execution Quantity:** The execution quantity is the executed quantity in the match step for the instrument. This quantity may be shared among several orders.
- **Aggressor Side:** The Aggressor Side indicates the side of the incoming order. Here, the term incoming order is understood in the extended sense as explained in chapter 7.1. The aggressor side is not specified in auction trades.
- **Aggressor Time Stamp:** The Aggressor Time Stamp is reported only if a real incoming order is matched in the match step. It is not reported for auction trades, and it is not reported if the incoming order is a book order, as is the case for example for a triggered stop order. The aggressor time is the time when the incoming order arrived at the exchange backend ("Matching Engine In"). This arrival time may be slightly earlier than the transaction time of the match step. The arrival time is also provided in the response to order maintenance requests, and it can therefore be used to determine the difference between the arrival time of an own order and the arrival time of the incoming order in the match step.
- **Number of Buy Orders:** The number of buy orders that were executed in the match step.
- **Number of Sell Orders:** The number of sell orders that were executed in the match step.

A Trade Reversal is the deletion of a mistrade in ISE T7. Trade reversals are reported in the trade volume reporting as well.

See the *T7 Market-, Enhanced Order Book and Reference Data Interfaces - Manual* for examples on trade volume reporting.

### 9.3.2 Last Trade Price and Quantity

The trade volume reporting data as described in chapter 9.3.1 above is available only in the Enhanced Market Data Interface, which provides market data without netting. The Market Data Interface, which provides netted market data, reports only the execution price and the execution quantity of the last

match step before the aggregated market data is sent out.

A customer using the netted data provided by the Market Data Interface receives the following data on individual matches:

- **Last Trade Price:** The Last Trade Price is the latest execution price that occurred either in continuous trading or as an auction price. If an incoming order matches at various price levels, this price reports the last executed price level. An execution price becomes a last trade price only, if an order of the concerned instrument was involved in the match.
- **Last Trade Quantity:** The Last Trade Quantity is the quantity that was executed in the last match step at the last trade price. If an incoming order matches at various price levels, this quantity contains therefore only the executed quantity at the last price level.

Trade reversals are also not reported as such, but they may affect the last trade price and quantity, if it was the last match that had been reversed.

### 9.3.3 General Trade Statistics

General trade statistics are published by all market data interfaces. The statistics strictly refer to trades of the same business day and contain the following data:

- **Last Auction Trade Price:** The Last Auction Trade Price is reported separately for each type of auction. It is the auction price of the last auction, so far for that day, for a given auction type, where an auction trade occurred. If an auction ends without an auction price, because the order book was not crossed, the content of this data is not changed, and so it may contain the auction price of an earlier auction.
- **OCP:**
  - If a security is traded in the closing auction the auction price will be the Official Closing Price (with a cut off time of 17:00 Irish time for potential extended conclusion of closing auctions).
  - If there are trades during the opening auction or during continuous trading for a security on the day, but the security does not trade in the closing auction or the closing auction is extended beyond 17:00, the Last Traded Price previous to 16:30 will be the Official Closing Price. Off order book on exchange trade reports submitted via ISE Xetra are considered in this calculation.
  - If there are no trades for a security on a particular day, the Official Closing Price defaults to the previous day's Official Closing Price.
  - This price determination will occur at 17:00 Irish time and is published via the Deutsche Börse Consolidated Exchange Feed (CEF) within 5 minutes of determination for all securities which have traded on the day.
- **High Price:** Determined per security as the Highest valid trade price executed on the day, including off order book trades (reported via ISE Xetra) reported during post-trading.
- **Low Price:** Determined per security as the Lowest valid trade price executed on the day, including off order book trades (reported via ISE Xetra) reported during post-trading.
- **Total Traded Quantity:** The sum total of trade volume for every valid trade executed on the day, including off order book trades (reported via ISE Xetra) reported during post-trading.

Except for the last auction trade price, T7 automatically adjusts the general trade statistics data in case of a trade reversal.

## 10. Risk Protection

The system offers a variety of functionalities that help participants to mitigate their risk:

### Stop/Release Trading Functionality

On T7 a Stop/Release Trading functionality is available. The effect of this functionality is on a business unit level or for an individual user. When a business unit or an individual user is stopped, all open orders and quotes of the affected BU / user are deleted immediately. Additionally the affected entity will not be able to enter new orders and quotes. Stop or release can be performed by a trading participant or by market supervision. If a participant wants to stop himself, e.g. in case of an emergency, another user will have to confirm the request.

### Emergency Mass Deletion

The Emergency Mass Deletion enables the market wide deletion of all orders and quotes for all products via the Trader GUI or the Admin GUI. This functionality is available for all markets and is relevant for the trading business unit only.

Deletion of orders can be performed for a specific user or for the entire business unit. The scope of orders allowed to be selected for deletion is controlled by the assigned user level. For example, a user with level *trader* can mass delete own orders only, and a user with *supervisor* level can mass delete all orders for an entire business unit. However, the scope of quotes allowed to be selected for mass deletion does not depend on the user level.

### Price Validation Functionalities

The Price Validation Functionalities represent a further safety guard for all trading participants. Whenever an order or a quote with a limit is entered in the system, the participant can make use of this functionality in order to ensure a proper quality of the set limit. Additional information is given in chapter 6.

### Max Order Value

The Maximum Order Value (MOV) is an optional parameter for members, determining the maximum value of an order that a trader is allowed to enter. The value of each incoming order/quote is compared against this limit and rejected in case the limit is exceeded whereby the order/quote value is calculated as quantity multiplied by price for buy limit orders and as quantity multiplied by last traded price for market orders and sell limit orders. The MOV is stored in the currency of the instrument.