NGM Market Model

Version 0.11.8

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Contents

References

[1] AktieTorget. *Member Rules AktieTorget.*

[2] Nordic Growth Market. *Elasticia Access and Technical Services - Price List.*

[3] Nordic Growth Market. *Member Rules.*

[4] Nordic Growth Market. *Network Connectivity in Elasticia.*

[5] Nordic Growth Market. *NGM - Reporting of Short Codes.*

[6] Nordic Growth Market. *NGM FIX Protocol.*

[7] Nordic Growth Market. *NGM Instrument Schema.*

Chapter 1

Introduction

This document describes the trading functionalities at Nordic Growth Market (NGM) and AktieTorget.

While the Member Rules [3], [1] are legally binding documents, this document tries to give additional and comprehensive information of the trading functionality that might not be covered in other documents. Furthermore, where the NGM FIX Protocol [6] contains technical details e.g. the details and fields of an order at a technical level, this document describes similar information in a non-technical way.

Chapter 2 gives an overview of the market, the market segments and the clearing and settlement. Chapter 3 describes the trading phases throughout the day. Order types and quote functionality is described in Chapter 4 and 5, respectively. Chapter 6 describes the matching rules. The process of manual trade reporting is detailed in Chapter 7.

Documents referenced in this document can be found at NGM's official web, NGM's Elasticia web or AktieTorget's official web.

Chapter 2

Market Overview

Trading at NGM and AktieTorget is conducted in the Elasticia® exchange trading system.

Trading in the Elasticia system is fully electronic and automatic. Participation in trading is allowed for members of NGM and AktieTorget. Figure 2.1 shows an overview of the market participants. Member firms may send orders, quotes and manual trades to the exchange. The exchange will publish relevant changes in the market data feed, which is disseminated to member firms and market data vendors. It is the responsibility of each member firm to forward trade details to the relevant clearing organization for clearing and settlement.

For information about network connectivity, see Network Connectivity in Elasticia [4].

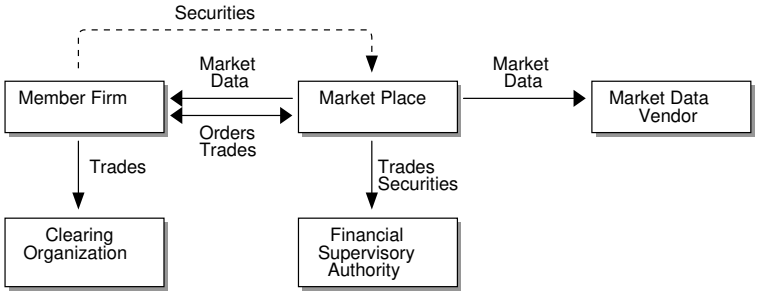

Figure 2.1: Overview of the market participants.

2.1 Securities

In this document the terms *security*, *order book*, and *instrument* are used interchangeable of each other, meaning that a security corresponds to exactly one order book. For example if a financial instrument is traded in multiple currencies then this would be represented as multiple securities in the NGM

trading system. Each security can be uniquely identified by any of the following combinations. The Security ID is the primary identifier.

- Security ID (a.k.a. Order book ID)
- ISIN + Market Segment + Currency + active period[1]
- Symbol + Market Segment + Currency + active period[1]

2.2 Market Structure

Securities are grouped into a hierarchical structure of market segments. Each market segment is identified by the Market ID (ISO 10383 MIC) together with the Segment ID. Table 2.1 shows the structure that is applied.

Note that the trading details of each security are specified at the security level, e.g. tick rules, round lot size, traded currency and instrument type. See the NGM FIX Protocol [6] and the NGM Instrument Schema [7] for more information.

Table 2.1: Market structure.

Name	*Market ID*	*Segment ID*	*Segment category when referenced in this doc*
NGM Equity	XNGM	NEST	
→ Equity Stockholm	XNGM	EQST	Equity
→ Nordic AIF Sweden	XNGM	AIFS	Equity
Nordic MTF	NMTF	NMTF	
→ MTF Oslo	NMTF	MOS	Equity
→ MTF Stockholm	NMTF	MST	Equity
→ MTF Helsinki	NMTF	MHE	Equity
AktieTorget	XSAT	AT	
→ AktieTorget SE	XSAT	ATSE	Equity
ETP	NMTF	ETP	ETP
→ ETP Denmark	NMTF	ETPD	ETP
⟶ Certificates DK	NMTF	EDCE	ETP
⟶ Exotics DK	NMTF	EDEX	ETP
⟶ Knock-Outs DK	NMTF	EDKO	ETP
⟶ Plain Vanillas DK	NMTF	EDPV	ETP
→ ETP Finland	NMTF	ETPF	ETP
⟶ Certificates FI	NMTF	EFCE	ETP
⟶ Exotics FI	NMTF	EFEX	ETP
⟶ Knock-Outs FI	NMTF	EFKO	ETP
⟶ Plain Vanillas FI	NMTF	EFPV	ETP

[1] Active period means that an instrument can be listed, delisted and then listed again and have the same identification as in the previous listing (although SecurityID) may be different between a listing and re-listing.

Table 2.1: Market structure.

Name	*Market ID*	*Segment ID*	*Segment category when referenced in this doc*
→ ETP Norway	NMTF	ETPN	ETP
⟶ Certificates NO	NMTF	ENCE	ETP
⟶ Exotics NO	NMTF	ENEX	ETP
⟶ Knock-Outs NO	NMTF	ENKO	ETP
⟶ Plain Vanillas NO	NMTF	ENPV	ETP
→ ETP Sweden	NMTF	ETPS	ETP
⟶ Certificates SE	NMTF	ESCE	ETP
⟶ Exotics SE	NMTF	ESEX	ETP
⟶ Knock-Outs SE	NMTF	ESKO	ETP
⟶ Plain Vanillas SE	NMTF	ESPV	ETP
Debt Securities Sweden	XNGM	DEBS	
→ Corporate Bonds SE	XNGM	CBOS	Other
→ Miscellaneous Debt Securities SE	XNGM	MDSS	Other
Debt Securities Sweden MTF	NMTF	DSSM	
→ Corporate Bonds SE MTF	NMTF	CBSM	Other
→ Miscellaneous Debt Securities SE MTF	NMTF	MDSM	Other
NDX Denmark	XNGM	NDXD	
→ Structured Products DK	XNGM	DDSP	Other
→ Miscellaneous Investment Products DK	XNGM	DDMP	Other
NDX Finland	XNGM	NDXF	
→ Structured Products FI	XNGM	DFSP	Other
→ Miscellaneous Investment Products FI	XNGM	DFMP	Other
NDX Norway	XNGM	NDXN	
→ Structured Products NO	XNGM	DNSP	Other
→ Miscellaneous Investment Products NO	XNGM	DNMP	Other
NDX Sweden	XNGM	NDXS	
→ Structured Products SE	XNGM	DSSP	Other
→ Miscellaneous Investment Products SE	XNGM	DSMP	Other
Investment Products MTF	NMTF	IPM	
→ Investment Products MTF Sweden	NMTF	IPMS	Other
⟶ Structured Products MTF SE	NMTF	IPMSSP	Other
⟶ Miscellaneous Investment Products MTF SE	NMTF	IPMSMP	Other
→ Investment Products MTF Finland	NMTF	IPMF	Other
⟶ Structured Products MTF FI	NMTF	IPMFSP	Other
⟶ Miscellaneous Investment Products MTF FI	NMTF	IPMFMP	Other
→ Investment Products MTF Denmark	NMTF	IPMD	Other
⟶ Structured Products MTF DK	NMTF	IPMDSP	Other
⟶ Miscellaneous Investment Products MTF DK	NMTF	IPMDMP	Other
→ Investment Products MTF Norway	NMTF	IPMN	Other
⟶ Structured Products MTF NO	NMTF	IPMNSP	Other
⟶ Miscellaneous Investment Products MTF NO	NMTF	IPMNMP	Other

2.3 Clearing and Settlement

Membership at NGM requires participation directly or indirectly in clearing and settlement systems where the securities traded by the member are cleared and settled. Table 2.2 shows the currently applicable clearing organizations.

Table 2.3 shows which clearing organizations that are used for each of the market segments. Note that information about which clearing organization that is used is present at the security level in the Central Securities Depository (CSD) field.

Table 2.2: Clearing organizations.

Clearing Organization	*BIC*
Euroclear Sweden AB	VPCSSESSXXX
Euroclear Finland Oy	APKEFIHHXXX
Verdipapirsentralen ASA	VPSNNOKKXXX
Euroclear Bank S.A/N.V	MGTCBEBEECL
VP Securities AS	VPDKDKKKXXX

The table does not prevent members from choosing a system for the settlement of transactions undertaken on a regulated market on condition that:

1. the links between, and agreements concerning, the designated settlement system and any other system assure an efficient and economical settlement of the transaction; and
2. the Swedish Financial Supervisory Authority has not decided that the chosen settlement system may not be used for settlement of transactions on the regulated market.

Table 2.3: Clearing organizations for each market segment.

Name						*Euroclear Sweden AB*	*Euroclear Finland Oy*	*Verdipapirsentralen ASA*	*Euroclear Bank S.A/N.V*	*VP Securities AS*
NGM Equity										
→ Equity Stockholm						x				
→ Nordic AIF Sweden						x				
Nordic MTF										
→ MTF Oslo						x				
→ MTF Stockholm						x				

Table 2.3: Clearing organizations for each market segment.

Name	*Euroclear Sweden AB*	*Euroclear Finland Oy*	*Verdipapirsentralen ASA*	*Euroclear Bank S.A./N.V.*	*VP Securities AS*
→ MTF Helsinki		x			
AktieTorget					
→ AktieTorget SE	x				
ETP					
→ ETP Denmark					
⟶ Certificates DK					x
⟶ Exotics DK					x
⟶ Knock-Outs DK					x
⟶ Plain Vanillas DK					x
→ ETP Norway					
⟶ Certificates NO			x		
⟶ Exotics NO			x		
⟶ Knock-Outs NO			x		
⟶ Plain Vanillas NO			x		
→ ETP Finland					
⟶ Certificates FI		x			
⟶ Exotics FI		x			
⟶ Knock-Outs FI		x			
⟶ Plain Vanillas FI		x			
→ ETP Sweden					
⟶ Certificates SE	x				
⟶ Exotics SE	x				
⟶ Knock-Outs SE	x				
⟶ Plain Vanillas SE	x				
Debt Securities Sweden					
→ Corporate Bonds SE	x				
→ Miscellaneous Debt Securities SE	x				
Debt Securities Sweden MTF					
→ Corporate Bonds SE MTF	x				
→ Miscellaneous Debt Securities SE MTF	x				
NDX Denmark					
→ Structured Products DK					x
→ Miscellaneous Investment Products DK					x
NDX Finland					
→ Structured Products FI		x			
→ Miscellaneous Investment Products FI		x			
NDX Norway					
→ Structured Products NO			x		

Table 2.3: Clearing organizations for each market segment.

Name	*Euroclear Sweden AB*	*Euroclear Finland Oy*	*Verdipapirsentralen ASA*	*Euroclear Bank S.A/N.V*	*VP Securities AS*
→ Miscellaneous Investment Products NO			x		
NDX Sweden					
→ Structured Products SE	x				
→ Miscellaneous Investment Products SE	x			x	
Investment Products MTF					
→ Investment Products MTF Denmark					
⟶ Structured Products MTF DK					x
⟶ Miscellaneous Investment Products MTF DK					x
→ Investment Products MTF Finland					
⟶ Structured Products MTF FI		x			
⟶ Miscellaneous Investment Products MTF FI		x			
→ Investment Products MTF Norway					
⟶ Structured Products MTF NO			x		
⟶ Miscellaneous Investment Products MTF NO			x		
→ Investment Products MTF Sweden					
⟶ Structured Products MTF SE	x				
⟶ Miscellaneous Investment Products MTF SE	x			x	

2.4 Trading Session Schedule

See `www.ngm.se` and `www.aktietorget.se` for information on the trading calendar.

Chapter 3

Trading Sessions and Phases

The trading session is divided into different phases; *Pre Open*, *Opening Auction*, *Open*, *Closing Auction*, *Post Open* and *Closed*. During these phases different rules apply for e.g. order entry and manual trade reporting. Also, in the transitions between the phases certain actions often occur. The details of each phase are described in the following sections. In the examples the Equity Stockholm schedule is used.

The state changes occur between the phases, i.e. the wordings *in the transition from the previous phase* versus *in the transition to the next phase* have great significance for when certain actions are performed in relation to the state changes.

NGM and AktieTorget use one regular trading session per day. No after hours trading sessions are used.

3.1 Pre Open

Pre Open is the first phase of the session. At the beginning of this phase the market data statistics, such as turnover, last price, average price etc., is reset.

During pre open members can enter orders and quotes, but no automatic matching is done. Full market data transparency apply to the *Pre Open* as well as for the *Opening Auction* and *Closing Auction*.

Manual trades can be reported during the pre open phase. They will be disseminated in the market data directly when they are confirmed.

Before the transition to *Opening Auction*, the equilibrium price is calculated and disseminated for each security.

3.2 Opening Auction

During the *Opening Auction* same rules apply as in *Pre Open*, in addition with continuous equilibrium price dissemination. The equilibrium price is recalculated and published every time an orderbook changes but no more than once

per second per orderbook. If *Order Protection Mode* is activated, the equilibrium price is only present if the market maker provides a double-sided quote and furthermore the equilibrium price will always be within bid and ask price of the quote.

In the transition to the next phase, *Open*, the call auction procedure is performed. During the call auction, the equilibrium price is calculated and the orders (and quotes) are uncrossed. Any remaining Immediate or Cancel (IOC) orders or Market Orders are canceled, unless the *Opening Auction* is extended into an *Order Protection Auction*. Finally all order changes are disseminated to the market data including the opening price and any trades that were made.

3.3 Open

Open (a.k.a. continuous trading) is the main phase, and the only phase when orders (and quotes) are automatically matched against any orders in the order book.

During continuous trading new orders are automatically matched against any orders on the opposite side in the order book. If the submitted order have any remaining volume it is placed into the order book and the order is disseminated on the market data. Full order depth is available in the market data.

Orders are matched according to the priority; price, internal, time.

Manual trades can be reported during the open phase. They will be disseminated in the market data directly when they are confirmed.

3.4 Closing Auction

Note that this phase only apply to the Equity segment category, instruments on other market segments will enter *Post Open* when exiting *Open*.

During this phase, no automatic matching is done but members can submit new or change existing orders or quotes with full market data transparency. The phase ends with a call auction where the same rules apply as for the open call auction. Equilibrium price will be continuously disseminated for each security during this phase.

3.5 Post Open

Post Open is similar to the *Pre Open* phase, in the sense that no automatic order matching is performed and no order bid/ask market data is disseminated.

In the transition from the previous phase any ongoing quote validation request is timed out, all pending one-party manual trades for pass-thru are canceled and the order expire procedure is performed.

In the order expire procedure all session orders (time in force = session) and all quotes are canceled. These and the following order changes are not disclosed, i.e. not disseminated in the market data. What is shown in the frozen market data is what the order book looked like just before the security entered *Post Open*.

The preliminary closing price is disseminated at the beginning of this phase. Trade cancelations that affect the closing price can be done during the entire

Post Open phase, and the adjusted closing price is sent directly in that case. After this phase the closing price will not change due to trade cancelations.

For ETP and Other segment instruments, the day and official day closing price can be set to the theoretical price of the instrument during the entire *Post Open* phase, but won't be disseminated until the transition to the Closed phase. A closing price with the MarketMakerQuote field set to 'Y' indicates that the closing price is theoretical and based on the quotation of the market maker.

For Equity segment instruments, the last trade price is the official day closing price.

If no events resulting in a new closing price for the trading day has occured, the closing price is inherited from the previous trading day.

During the post open phase manual trade reporting is not permitted. Session orders and quotes are not permitted during this phase, in order to avoid confusion about when they will expire. Other orders can be submitted, modified and canceled as if the operation was performed in the next *Pre Open* phase, and they will receive the same time priority.

3.6 Closed

When the session is *Closed* almost no operations are permitted. It is possible to query the current state (snapshots) and to cancel orders and quotes. This phase normally lasts until *Pre Open* the next trading day.

In the transition from previous phase *Post Open*, the official day statistics is generated and published.

During this phase corporate actions may be executed, possibly resulting in an adjusted closing price (disseminated directly) in case of e.g. a split. If a corporate action is executed, any orders or quotes in the order book will be canceled and this action is conveyed in the market data directly (opposed to if the user canceled the order/quote).

For NDX instruments, the day and official day closing price can be set to the theoretical price of the instrument during the entire *Closed* phase, and will be disseminated immediately. A closing price with the MarketMakerQuote field set to 'Y' indicates that the closing price is theoretical and based on the quotation of the market maker.

3.7 Trade Halt

Trading may be suspended for regulatory reasons or other (e.g. technical) reasons. The stop reason is published in the market data.

When a security is halted any pending one-party manual trades for pass-through are canceled. All orders and quotes are also canceled and this is also conveyed directly in the market data.

During trade halt only query operations (snapshots) may be performed. After a trade halt the trading is normally resumed with a *Pre Open* phase.

Chapter 4

Orders

4.1 Order Types and Validity

NGM exchange supports limit and market orders.

Limit A limit order stipulates a maximum purchase price or a minimum selling price.

Market A market order buys or sells at the best available limit on opposite side. During *Open* phase, the market order only matches against one price level, any remaining quantity will be cancelled.

During a *Call Auction*, market orders will be matched at the end of the auction and remaining quantity is cancelled, however if the *Opening auction* is extended into an *Order Protection Auction* due to a missing double-sided market maker quote when the instrument opens, market orders will remain in the orderbook during the *Order Protection Auction*.

Market orders have priority over limit orders during auctions.

Protected instruments alters the way a market order works, by only matching market orders against prices equal to or better than the market maker's price.

Each security defines whether it supports market orders and whether the market orders are protected or not. This information is communicated through the NGM FIX Protocol [6].

For protected instruments, market orders are:

Matched against all available levels *inside and including* the market maker's spread.

Canceled if no matching market maker order is present on the *opposite side* in the orderbook.

An order can have one of the following time in force instructions:

Session A session order is automatically canceled at the beginning of the next *Post Open* phase. The order can rest in the order book, unless filled. Session orders are only permitted in the pre open and open phases.

Good 'Til Date/Time (GTD) The order expires at the specified date and time. A time of at most 8 days (8 * 24 * 3600 seconds) into the future is permitted. The order can rest in the book, unless filled.

Good 'Til Canceled (GTC) The order will remain in the order book until it is canceled or filled.

Fill or Kill (FoK) Either the order is filled (entire volume) directly or it is canceled. The order cannot rest in the order book. FoK orders are only permitted during continuous trading (open).

Immediate or Cancel (IOC) Also known as Fill and Kill (FaK). As much of the volume as possible is filled, then the order is canceled. The order cannot rest in the order book. An IOC order submitted during pre open or post open is not canceled (nor matched) directly, instead it participates in the call auction and is then canceled before the security enters continuous trading. If the opening auction is extended into an *Order Protection Auction*, the same rule applies as for market orders, the IOC order will remain in the orderbook during the *Order Protection Auction*.

Reserve orders (a.k.a. iceberg orders) are supported when time in force is GTC, GTD or Session, i.e. for orders that can rest in the order book. When a reserve order is placed into the order book only a portion of the total order volume is displayed in the market data, i.e. the order has a display volume which is less than the total volume. When the display volume is filled (matched) it is refreshed (refilled) as long as the order has any remaining volume. Each time the display volume is increased the order loses its time priority. The order can be refreshed either when the display volume is exhausted (empty) or immediate on a partial fill. The amount of volume to refresh is determined by the refresh method that is specified:

Initial The initial display volume will be used each time the order is refreshed.

New The refresh volume is explicitly specified in addition to the initial display volume. Each time the order is refreshed, the refresh volume will be used to set the display volume.

Random Instead of a fixed refresh volume it is random within the interval that is specified. The minimum multiple of the random refresh volume can also be specified. For example if the random refresh interval lies within 200 and 500, with a minimum multiple of 50, then one of the following refresh volumes are picked at random; 200, 250, 300, 350, 400, 450 or 500.

Reserve orders are only allowed in the round lot, and display/refresh volume must be a multiple of the round lot size. Also, the ratio between the refresh volume and the total order volume must not exceed a factor of 100.

Orders with volume greater than, but not an even multiple of, the round lot size are modeled as reserve orders. The round lot part is displayed while the odd lot is hidden and displayed once the entire round lot part is filled (matched). Once the order is moved to the odd lot it is automatically converted from a reserve order to a normal order.

Starting on 3 January 2018, a reserve order's total value (price multiplied by volume) in euro must be greater than or equal to the security's min reserve

order euro value when the order is entered or modified by a client, otherwise the request will be rejected. For securities traded in other currencies than euro, the order's value will be converted to euro by the trading system when comparing the value to the minimum value.

Each security holds a property, *minimum trade volume*, which is the smallest tradable unit on the NGM exchange for a given security. The order volume has to be equal or a multiple of *minimum trade volume* of the security.

4.2 Suspend Order

An order can be suspended in which case it is removed from the order book but still present in the system. A suspended order do not participate in any matching or the call auction. Only non-momentary orders (i.e. time in force is either Session, GTC, or GTD) can be suspended, and the time in force is still honored and the order is expired accordingly.

4.3 Action on Connection Loss

The action on connection loss can be specified for each order and is executed when all traders in a trader group are disconnected for any reason other than a normal logout. This apply to securities in *Pre Open* and *Open* (continuous trading). The action can be set to suspend, delete or no action. The default is no action.

4.4 Order Origin Attributes

Orders contain information on its origination. Certain attributes must for regulatory reasons be provided in orders, whereas others are either required as per the Member Rules [3] or free to decide upon by the member itself.

4.4.1 Regulatory Required Origin Attributes

Identifications

The following identification information must be specified to orders:

- Client identification code
- Investment decision within firm
- Execution within firm

In the NGM FIX Protocol [6] the information is provided as short codes. See appendix D for more information about the use of short codes.

Order Attributes

The below listed order attributes may apply to orders. See the Member Rules [3] for more information on when they should be set.

- Liquidity Provision Activity Order

- Risk Reduction Order
- Systematic Internalizer Order
- Algorithmic Order

All attributes listed above, except for *Algorithmic* is set via the OrderAttributeGrp FIX group. An order is algorithmic if the FIX field PartyRoleQualifier for the investment decision within firm is set to Algorithm.

Trading/Order Capacity

The OrderCapacity (a.k.a Trading Capacity in MiFID II technical specifications) must be set in New Order Single messages and is an indication of whether the order submission resulted from the member or participant of the trading venue carrying out matched principal trading under Article 4(38) of Directive 2014/65/EU or dealing on own account under Article 4(6) of Directive 2014/65/EU.

Where the order submission did not result from the member or participants of the trading venue carrying out matched principal trading or dealing on own account, the field shall indicate that the transaction was carried out under any other capacity.

4.4.2 Member rules required Origin Attributes

Order Restrictions

An order has the following order restrictions that can apply (see the member rules [3], [1] for more information):

- Issuer Holding
- Issue Price Stabilization

4.4.3 Non required Origin Attributes

Orders have account information in the form of free text (ASCII) and account type, i.e. client side or non-client side, which will be copied to the trade reports for any fills of the order. The AccountType is deprecated and set to be removed in the future since more detailed information on the accounts related to an order or a quote are added as part of MiFID II regulatory effects.

Chapter 5

Quotes

The quote is an efficient way of keeping a spread in the market. A quote can be seen as two limit orders, buy and sell. The volume must be a multiple of the round lot size and a hidden volume (reserve order) is not supported. A quote expires at the beginning of the next *Post Open* phase, i.e. it is handled the same way as a session order.

Zero spread (same bid and offer prices) quotes are supported and will not result in a trade between the sides of the same quote. Crossing prices are however not supported.

5.1 Action on Connection Loss

When all traders in a trader group are disconnected for any reason other than a normal logout the action on connection loss is triggered, but only for securities in continuous trading (open). For quotes the action is always cancel.

5.2 Quote Origin Attributes

Quotes contain information on its origination. Certain attributes must for regulatory reasons be provided in quotes, whereas others are either required as per the Member Rules [3] or free to decide upon by the member itself.

5.2.1 Regulatory Required Origin Attributes

Identifications

The following identification information must be specified to quotes:

- Client identification code
- Investment decision within firm
- Execution within firm

In the NGM FIX Protocol [6] the information is provided as short codes. See appendix D for more information about the use of short codes.

Quote Attributes

Order Capacity and *Order Attributes* cannot be set explicitly. For quotes, *Order Capacity* is always "DEAL" (dealing on own account) and *Order Attributes* is always "Liquidity provision activity order".

Apart from the above named fixed field values, the below listed attributes apply to quotes. See the Member Rules [3], [1] for more information on when they should be set.

- Algorithmic Order

A quote is algorithmic if the FIX field PartyRoleQualifier for the investment decision within firm is set to Algorithm.

5.2.2 Non required Origin Attributes

Quotes have account information in the form of free text (ASCII), which will be copied to the trade reports for any fills of the quote.

5.3 Market Maker Quotes

A market marker quote is a quote that originates from the market maker organization of the security. Each security can have one market maker organization configured at a time.

Market maker quotes behave just as normal quotes, with the following exceptions:

- The public orders (market data) representing the market maker quotes are flagged in the market data feed.
- Market maker quotes are always considered passive in order matching (regarding price, however the aggressor side in trades is not affected). An exception occurs in the rare situation when market maker quote match against a quote with quote validation mechanism enabled or another market maker quote, then the active side always determines the trade price.

5.4 Quote Validation

The market maker often has thousands of derivatives to update, many with the same underlying. Because of the burstiness of quote updates and network bandwidth constraints market makers are particularly exposed to delays of their operations.

As an alternative of limiting the number of issued instruments or increasing the spreads, which are the traditional ways to counter this, the quote validation mechanism has been designed. When it is enabled the market maker must validate the price of the quotes in the market resulting in fewer mistrades and tighter spreads.

The quote validation mechanism can be enabled for one market maker at a time for each security. Only one quote with quote validation is allowed per security at any given time.

When the security is in continuous trading (open), and an order is entered for a security with the quote validation mechanism enabled, one of the following actions is taken (see appendix A for examples):

1. If the order would result in a match (trade) with a quote from the market maker. ⇒ Put the order in a queue.

2. If there already are other orders in the queue. ⇒ Put the order in a queue (regardless if it would match the quote with quote validation).

3. Otherwise. ⇒ Same as without quote validation, i.e. match the order against any other orders in the order book and put the remaining volume in the order book of the security.

Suspended orders are not affected, only active orders can be inserted into the queue. Orders that are placed in the queue are accepted but not executed nor visible in the market data. Orders that are deleted or suspended are removed from the queue immediately. An order in the queue that is modified will be moved to the end of the queue if the modification would cause the order to lose priority, otherwise the order will keep its place in the queue.

Immediately when an order is inserted into an empty queue a *Quote Request* message is sent to the market maker, indicating that a trade is imminent. Notice that no information about the order (price, type or volume) is given to the market maker. The market maker must reply to the *Quote Request* as fast as possible, within a specified time period. If no answer arrives within this period the quote is removed from the order book.

When a quote update is received from the market maker, one of the following actions is taken:

1. If the quote price changed (bid and/or offer). ⇒ Execute the quote update, possibly matching any previous orders in the order book. Execute all order operations in the queue and empty the queue. Notice that the market maker is the active party for any orders before the queue was executed, but passive against the orders in the queue.

2. Otherwise. ⇒ Execute all order operations in the queue and empty the queue.

The quote update is matched against the order book before the queue, this is because the update is modelled as occurring exactly before the first order was placed in the queue.

If no quote update is received within a specified timeout, which is currently 600 ms at NGM, the quote is automatically deleted and then all order operations in the queue are executed.

A quote update that is not a direct response to a *Quote Request* while awaiting a response, will be rejected. This way a market maker cannot accidentally accept a *Quote Request*. Once the reply is received or the timeout has been reached, spontaneous quote updates will be accepted again.

If the quote validation mechanism is enabled, orders will get the best possible price when matched against the quote and the security status is open. This means that regardless if the quote or the order was in the market first, the trade is done in favor of the order if the prices overlap. For example if there is

a buy order at the price 12 in the market and then a quote with offer price 11 is entered, the price of the resulting trade is 11. Note that if two orders were matched in this example the price of the trade would have been 12.

Notice that no *Quote Request* is sent if the market maker moves its bid and/or offer so that it hits an order that is already in the market as the trade is immediately executed.

Chapter 6

Matching

In this chapter the matching rules are briefly explained. Please see the member rules [3], [1] for more information.

6.1 Order Priority

During continuous trading (open) orders are automatically matched against orders on the opposite side, in the order book, given that prices are equal or overlap. Any remaining order volume is put into the order book. Orders are matched according to the following priority. Quotes are handled as two independent orders, priority wise.

1. Price
2. Internal
3. Time

Market orders will always receive a higher price priority than a limit order (only applicable during auctions). A buy order with higher price has higher priority and a sell order with lower price has higher priority. If the prices are the same, then internal orders, i.e. orders from the same member firm are given higher priority. Finally, orders with a lower timestamp (older) have higher priority. The time priority is updated, i.e. set to the currently lowest priority, as follows:

New order Time priority is assigned.

Modified order If the price was changed or the display volume was increased the time priority is changed. Otherwise unchanged.

Refill of reserve order Handled the same way as a modified order, i.e. if the display volume was increased the time priority is changed. Otherwise unchanged.

When matching orders from the same firm (internal trades), in case of a reserve (iceberg) order, the display volume is reduced first. The time priority is updated when the display volume is refilled. After a refill of the display volume

the order is placed last in the queue of the on-going matching sequence. I.e. after a refill, the order does not gain priority over non-internal orders already queued for matching at the same price level in the same matching sequence.

In the call auction orders are matched according to the following priority:

1. Price
2. Time

6.2 Round and Odd Lots

Each order book is divided into the *round lot* and the *odd lot*. The *round lot size* specifies the normal trading unit, e.g. 100 shares. Orders with a volume greater than or equal to the round lot size are placed into the round lot. Smaller orders are put into the odd lot. No matching is done between the different lots. Orders in the *odd lot* can only be matched to the last traded price (automatic trades only, not manual trades), or closing price, of the *round lot*. The opening price is calculated based on the orders in the *round lot* only.

Note that at NGM the round lot size is either 1 or it has the field *minimum trade volume* set to the round lot size for most securities, which disables the odd lot functionality.

6.3 Tick Size

Each security has a tick size table that specifies the minimum price tick, for each price interval, that is valid for the price of an order or quote.

- An order or quote that does not follow the tick rules is rejected.
- Manual trades do not have to respect tick size and can be submitted with a price of any decimal precision, as long as the price is not outside of the lower or upper band of the tick size table.
- The minimum tick size supported is 0.001. The maximum price value is 2 147 483.647 (a signed 32 bit integer).
- All orders and quotes will be cancelled for a security if its tick size changes.

For a list of some possible tick size tables, see appendix C - Tick Size Table - examples.

6.4 Equilibrium Price

At the end of a security's auction, *Opening Auction*, *Closing Auction*, *Circuit Breaker Auction* or *Order Protection Auction* the equilibrium price is calculated. The equilibrium price is the price where the maximum volume can be traded. If there is more than one such price, i.e. there is an interval of prices, the price is determined by the following rule:

There is excess supply at the lowest price in the interval Choose the lowest price in the interval.

There is excess demand at the highest price in the interval Choose the highest price in the interval.

Otherwise The average of the lowest and the highest prices in the interval is chosen, rounded to the nearest valid price tick. If two valid price ticks are equally close the price is rounded up.

If the substate *Order Protection Mode* is activated for the instrument, the equilibrium price will always be within the market maker's bid and ask price.

An equilibrium price is used to determine the opening price, the closing price for segments that employs a *Closing Auction*, and the new reference price of a *Circuit Breaker Auction*.

During any auction, the equilibrium price with accumulated buy and sell volumes are continuously disseminated for each security with a crossing order-book.

Note that in the *Knock Out Buyback*, *Buyback* and *Distribution* substates, see Chapter 9, no equilibrium price is calculated. Instead all orders are matched against the market maker's price.

Chapter 7

Manual Trades

For manual trade reporting, one-party report for pass-through to counterparty, is the only accepted trading model for *non-internal* trades. For internal trades, where the counterparty is the same as the reporting party, the two-party report trading model is also accepted.

Manual trades can be reported during *Pre Open* and *Open* (continuous trading). Each trade have an agreement time that in most case differs from the reporting time. The agreement time, also called trade time, is the time when the trade was agreed on prior the actual report to the market place. The reporting time is set by the market place once the trade report has been received.

The trade type can be one of *Regular Trade* or *Exchange Granted Trade* (EGT), see the [3], [1] for information on which one that should be used in different situations.

In MiFID II, the characteristics of the trade reported must be further specified. The list of characteristics that must be considered and filled in correctly for each reported trade are listed in Appendix A of the NGM FIX Protocol [6].

Each side of the trade have account information in the form of free text (ASCII).

7.1 Double volume cap

MiFID II imposes a cap on the usage of the Reference Price and Negotiated Transaction pre-trade transparency waivers. Note that reference price orders are not allowed in our markets. The caps reference volume traded on all EU venues and are calculated on a per instrument basis. The limits are 4% on any particular venue and 8% market-wide in any 12-month rolling period.

If the limit for an instrument of 4% has been hit on any of the venues operated by NGM the trading under that waiver will be suspended for the affected instrument. If the limit of 8% has been hit market wide in the EU then trading under that waiver will be suspended for the affected instrument. When the waiver is suspended, trade reports entered using the waiver will be rejected and the reject message will include a textual description indicating that it was related to the Double Volume Caps.

7.2 One-Party Report for Pass-Through

In the one-party report for pass-through model, the initiator fills in the trade details such as account for its own side (i.e. for one party). The market place forwards the trade to the counterparty which fills in the trade details of the other side. Finally the market place disseminates the trade to all parties. See figure 7.1. This trade model can be used for both internal trades and when the counterparty is another firm.

The initiator can cancel the trade as long as it is not confirmed by the counterparty.

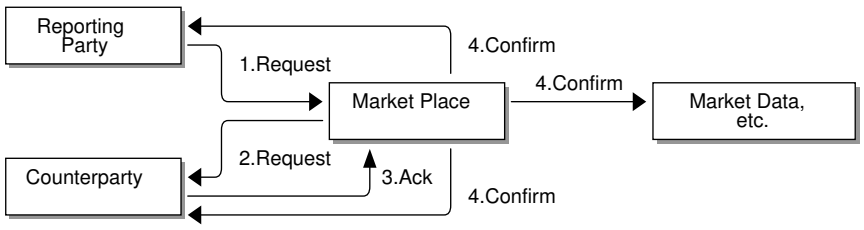

Figure 7.1: Privately negotiated trade, one-party report for pass-through to counterparty.

7.3 Two-Party Report

In the two-party report model the initiator fills in the trade details for both sides and the trade is confirmed by the market place directly. See figure 7.2. This model can only be used for internal trades, i.e. where the counterparty is the same firm as the reporting party.

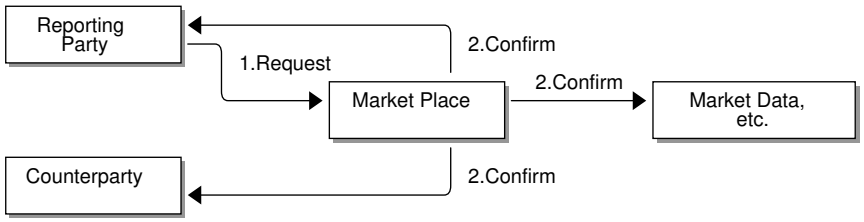

Figure 7.2: Privately negotiated trade, two-party report.

Chapter 8

On behalf of

Although the FIX fields for *OnBehalfOf* is present in the standard header in the NGM FIX Protocol [6], it is not scheduled for support in the NGM market model at this point in time.

Chapter 9

Financial Status substates

The Financial Status substates are used to indicate that an order book is no longer traded regularly. These substates exist in parallel with the trading phases, e.g. a security may be in *Pre Open* and *Knock Out Buyback* simultaneously.

A market maker can request that an order book enters a substate automatically (valid for certain substate transitions) by sending a request to update the security status over the NGM FIX protocol to the Exchange or manually by contacting NGM's market surveillance (valid for all substate transitions). More information is found below under Financial Status Messaging.

9.1 Knock Out substates

Securities that have a knock out component can enter one of the following substates:

Knock Out All trading is prohibited. Will be delisted after market closing.

Knock Out Buyback Restricted trading. May remain in the market after closing.

Knock Out Soft All trading is prohibited. Will not be delisted after market closing. The security remains in the market and trading in the security can later be resumed.

Upon entering any of the knock out substates, the order book is cleared. All of the knock out substates may be reversed.

9.1.1 Knock Out Buyback

Knock Out Buyback allows the market maker to buy back the outstanding volume of a knocked security at the redemption value, if the redemption value is greater than zero and the instrument is eligible for Knock Out Buyback. Clients can then immediately sell its volume back to the market maker instead of waiting out the redemption period to receive the payment.

In *Knock Out Buyback* the following restrictions apply:

Orders: Only sell orders allowed All sell orders will be considered momentary, regardless of the time validity specified in the order. The volume that is not immediately matched will be cancelled.

Orders: No suspended orders allowed

Quotes: Only buy quotes allowed Quotes must be single sided market maker quotes. Double sided quotes will be rejected.

No manual trades allowed

Matching All trades will be made at the price of the market maker quote and will be marked as a *Knock Out Buyback* trade.

When leaving the *Knock Out Buyback* substate the order book will be cleared.

9.2 Buyback substate

Certain types of securities can be set in the Buyback substate, meaning that the market maker might have sold all of its inventory or do not want to sell more quantity of a specific security. When this occurs, the market maker no longer continues to quote on the sell side.

For situations like those above, to avoid trading at incorrect sell prices, the security will enter the Buyback substate where certain trading restrictions apply, see below.

When the market maker decides to resume quoting on the sell side the Buyback substate is deactivated and the security returns to normal trading.

In the Buyback substate, the market maker continues to quote on the buy side, providing a "buy back" offer to investors who wish to sell back the security to the market maker at the current market price.

The buyback substate may be reversed.

Upon entering the *Buyback* substate, the following happens:

Buy quotes All market maker buy quotes will remain in the order book.

Sell quotes All quotes with a sell side will be canceled.

Buy orders All buy orders will be canceled.

Sell orders All sell orders will remain in the order book.

In *Buyback* the following restrictions apply:

Orders: Only sell orders allowed Sell orders submitted during *Buyback* will remain in the order book.

Orders: Suspended orders are allowed

Quotes: Sell side ignored Market maker quotes can be double sided or single sided, but the sell side will always be ignored.

Manual trades are allowed

Matching All trades will be made at the price of the market maker quote and will be marked as a *Buyback* trade.

9.3 Distribution substate

Upon entering the *Distribution* substate, the following happens:

Buy quotes All market maker quotes with a buy side will be canceled.

Sell quotes All market maker sell quotes will remain in the order book.

Buy orders All buy orders will be canceled.

Sell orders All sell orders will be canceled.

In *Distribution* the following restrictions apply:

Orders: Only buy orders allowed All buy orders will be considered momentary, regardless of the time validity specified in the order. The volume that is not immediately matched will be cancelled.

Orders: No suspended orders allowed

Quotes: Only sell quotes allowed Quotes must be single sided market maker quotes. Double sided quotes will be rejected.

Manual trades are allowed

Matching All trades will be made at the price of the market maker quote and will be marked as a *Distribution* trade.

9.4 Circuit breaker auction substates

Circuit breaker auctions are represented using the Financial Status substates *Circuit breaker dynamic* and *Circuit breaker static*. See Chapter 10 for more information.

9.5 Order Protection Mode

The *Order Protection Mode* substate indicates, when active, that the security only allows matching when the market maker is present with a double-sided quote. If for any reason the market maker does not have a double-sided quote, an *Order Protection Auction* will be triggered and matching is suspended. The *Knock Out Buyback*, *Buyback* and *Distribution* substates override the *Order Protection Mode*.

Order protection auction will be triggered for any of the following conditions:

- Quote is canceled
- Quote becomes single sided
- Trading phase passes to OPEN when a double-sided quote is not present
- Quote expires or is rejected in a Quote Validation process

9.5.1 Order Protection Auction

During the *Order Protection Auction*, no automatic matching is done but members can submit new or change existing orders or quotes with full market data transparency. The phase ends with a call auction where the same rules apply as for the open call auction. Equilibrium price will be continuously disseminated for the security during this phase.

The auction will end with an uncross if:

- Market maker provides a double-sided quote.

The auction will end without an uncross if:

- Order Protection Mode is deactivated
- Trading phase changes state from OPEN to any other state.
- Substate Knockout, BuyBack or Distribution is activated

In the case where the market maker provides a double-sided quote, the *Order Protection Auction* will end with a call auction, and the *Order Protection Auction* substate will be cleared. In order to reduce predictability, the auction will end at a random interval of 0.5-1 second *after* the market maker quote is received.

Note that if the *Order Protection Mode* substate is active, the equilibrium price at the uncrossing stage is always within the marker's bid and ask price. If at least one side of the market maker quote is completely matched during the uncross, another *Order Protection Auction* is immediately triggered.

9.6 Financial Substate Messaging

The NGM FIX protocol allows a market maker to update the financial status substate of their order books, provided that the market maker has at least one trader group with sufficient order book rights and that the market maker has requested and been granted the rights to perform this action. Available order book rights for a market maker are displayed in Table 9.1.

A market maker shall contact NGM's Technical Support with requests

- to enable the market maker to update the financial status substate using the FIX protocol.
- to add/remove order book rights.

Table 9.1: Market maker order book rights.

Financial substate	*Pre Open*	*Opening Auction*	*Open*	*Post Open*	*Closed*
Knock out → Activate → Deactivate	✓	✓	✓		

Table 9.1: Market maker order book rights.

Financial substate	*Pre Open*	*Opening Auction*	*Open*	*Post Open*	*Closed*
Knock out soft → Activate → Deactivate	✓	✓	✓		
Buyback → Activate → Deactivate	✓ ✓	✓ ✓	✓ ✓		
Distribution → Activate → Deactivate					
Order Protection Mode → Activate → Deactivate					

Chapter 10

Circuit Breakers

Circuit breakers is a mechanism for automatically suspending the execution of orders when a certain price limit is reached or exceeded.

If the price of a potential execution is more than, or equal to, a defined percentage above or below the applicable reference price(s), then no executions at that price will occur. Instead, automatic execution will be temporarily suspended and an auction triggered, to allow the price of the security to re-form in an orderly fashion and then be returned to regular trading as above.

If the automatic execution suspension period is triggered mid way through the execution of an order that is not Fill or Kill (FoK), a circuit breaker call auction will be triggered. The residual volume of the order triggering the circuit breaker call auction will take part in the call auction.

If the order that triggered the circuit breaker call auction is an IOC order or a market order, any remaining volume of that order will be eliminated after the call auction. For all other orders the remaining volume will be added to the order book after the call auction.

FoK orders that would breach a price monitoring threshold will be rejected and no circuit breaker will be triggered.

There are two types of circuit breakers, static (section 10.1) and dynamic (section 10.2) circuit breakers. Both types are only applicable during continuous trading.

When a static or dynamic circuit breaker is triggered, the circuit breaker auction is immediately initiated.

Note: Circuit breaker auctions are represented using the Financial status substates *Circuit breaker dynamic* and *Circuit breaker static*. See Chapter 9, for more information.

10.1 Static circuit breaker

The reference price for the static circuit breaker is the price from the last call auction. If no opening price has been generated then the previous trading day's closing price will be used as the reference price. If no previous closing price exists (i.e. the instrument has never been traded before, or has only been subject to late reported or outside spread Manual Trades), then the reference price will be

set to the price of the first trade (other than the types of Manual Trades listed above) when it occurs.

If the static circuit breaker has been triggered, without any trade resulting from the auction, the reference price of the static circuit breaker will be set to the price of the last intraday trade.

If the dynamic circuit breaker is triggered, without any trade resulting from the auction, no changes are made to the reference price of the static circuit breaker.

10.2 Dynamic circuit breaker

The reference price for the dynamic circuit breaker is the price of the last intraday trade (call auctions included). If no intraday trade exists, then the reference price for the dynamic circuit breaker is not set.

A new reference price is set immediately after the full set of trades resulting of an order action (new or update) has been executed. This means that if the order action results in multiple trades, the reference price is not set after each separate trade, but instead when the matching of the order has finished.

10.3 Configuration

Note that NGM or AktieTorget may deem necessary to alter the limits for individual instruments as well as whole market segments with very short, if any, notice.

Table 10.1: Circuit breaker configuration for each market segment.

Market segment	*Enabled*	*Dynamic limit table*	*Dynamic length (seconds)*	*Static limit table*	*Static length (seconds)*
NGM Equity (*), Equity instruments	✓	D1	60	S1	180
NGM Equity (*), Right instruments	✓	D2	60	S2	180
Nordic MTF (*), Equity instruments	✓	D1	60	S1	180
Nordic MTF (*), Right instruments	✓	D2	60	S2	180
AktieTorget (*), Equity instruments	✓(**)	D1	60	S1	180
AktieTorget (*), Right instruments	✓(**)	D2	60	S2	180
ETP (**)	-	-	-	-	-
Debt Securities Sweden (*)	✓(**)	D1	60	-	-
Debt Securities Sweden MTF (*)	✓(**)	D1	60	-	-
NDX Denmark (*)	✓(**)	D1	60	-	-

(*) The same apply to all sub segments.

(**) Will be enabled on 3 January 2018.

Table 10.1: Circuit breaker configuration for each market segment.

Market segment	*Enabled*	*Dynamic limit table*	*Dynamic length (seconds)*	*Static limit table*	*Static length (seconds)*
NDX Norway (*)	✓(**)	D1	60	-	-
NDX Finland (*)	✓(**)	D1	60	-	-
NDX Sweden (*)	✓(**)	D1	60	-	-
Investment Products MTF (*)	✓(**)	D1	60	-	-

(*) The same apply to all sub segments.
(**) Will be enabled on 3 January 2018.

Table 10.2: Dynamic circuit breaker limit table D1

Refrence price	*Percentage*
≥ 5	10%
≥ 0.25	25%
≥ 0.1	40%
≥ 0.05	50%
≥ 0	100%

Table 10.3: Dynamic circuit breaker limit table D2

Refrence price	*Percentage*
≥ 5	20%
≥ 0.25	50%
≥ 0.1	80%
≥ 0.05	100%
≥ 0	200%

Table 10.4: Static circuit breaker limit table S1

Reference price	*Percentage*
≥ 5	15%
≥ 0.25	50%
≥ 0.1	75%
≥ 0.05	100%
≥ 0	200%

Table 10.5: Static circuit breaker limit table S2

Reference price	*Percentage*
≥ 5	30%
≥ 0.25	100%
≥ 0.1	150%
≥ 0.05	200%
≥ 0	400%

Chapter 11

Pre Trade Control

Pre trade control is a mechanism for automatically rejecting orders (and non market maker quotes) with a price, volume or value (price * volume) which exceed a certain limit.

The price limit is calculated as a percentage above or below the applicable reference price(s). The value limit is a fixed value.

Reference prices

Equity segments the last trade price.

ETP segments the current market maker bid price. If no market maker bid price is available in the instrument, no reference price exists.

Other segments no reference price exists.

Buy limit orders with a *too high* price will be rejected.

Sell limit orders with a *too low* price will be rejected.

All orders (including market orders) with a *too high* value will be rejected.

11.1 Configuration

Note that NGM or AktieTorget may deem necessary to alter the limits for individual instruments as well as whole market segments with very short, if any, notice.

Table 11.1: Pre trade control (PTC) configuration for each market segment.

Market segment	*PTC price limit table*	*PTC max value table*	*PTC max volume table*
NGM Equity (*), Equity instruments	P1	VAL1	VOL1
NGM Equity (*), Right instruments	P2	VAL1	VOL1
Nordic MTF (*), Equity instruments	P1	VAL1	VOL1
Nordic MTF (*), Right instruments	P2	VAL1	VOL1
AktieTorget (*), Equity instruments	P1 (**)	VAL1	VOL1
AktieTorget (*), Right instruments	P2 (**)	VAL1	VOL1
ETP (*)	P3	VAL1	VOL1
Debt Securities Sweden (*)	-	VAL1	VOL1
Debt Securities Sweden MTF (*)	-	VAL1	VOL1
NDX Denmark (*)	-	VAL1	VOL1
NDX Norway (*)	-	VAL1	VOL1
NDX Finland (*)	-	VAL1	VOL1
NDX Sweden (*)	-	VAL1	VOL1
Investment Products MTF (*)	-	VAL1	VOL1

(*) The same apply to all sub segments.
(**) Will be enabled on 3 January 2018.

Table 11.2: Pre trade control price limit table P1

Refrence price	*Percentage*
≥ 5	25%
≥ 0.25	50%
≥ 0.1	75%
≥ 0.05	100%
≥ 0	200%

Table 11.3: Pre trade control price limit table P2

Refrence price	*Percentage*
≥ 5	50%
≥ 0.25	100%
≥ 0.1	150%
≥ 0.05	200%
≥ 0	400%

Table 11.4: Pre trade control price limit table P3

Refrence price	*Percentage*
≥ 5	25%
≥ 0.25	50%
≥ 0.1	75%
≥ 0.05	100%
≥ 0	unlimited

Table 11.5: Pre trade control value control table VAL1

Trading currency of the instrument	*Max value*
DKK	$10,000,000$
EUR	$1,000,000$
NOK	$10,000,000$
SEK	$10,000,000$

Table 11.6: PTC volume control table VOL1

Max volume
$100,000,000$

Chapter 12

Throughput control

Each login account has a throughput limit set, which limits the number of messages that can be sent to the exchange per second (the time interval).

The default throughput limit set for each type of NGM account is specified in the Elasticia Access and Technical Services price list [2].

When the throughput limit is exceeded for a time interval, the messages that exceed the limit are queued for the remaining period of the time interval. At the start of a new time interval, the throughput counter is reset and the processing of messages continues.

In order to prevent unintended queueing of messages, clients are advised to keep track of the messages sent to the exchange in relation to the throughput limit.

A client that exceeds the throughput limit during continuous trading is adviced to either:

- Order an increased throughput from the exchange, or
- Reduce the rate at which messages are sent to the exchange

If a client wishes to increase its throughput limit, the NGM Support should be contacted.

For a detailed description of how the throughput control works please refer to the NGM FIX Protocol [6].

Chapter 13

Market Data

Market data is generally disseminated continuously for events that happen in the trading system. Information about orders, quotes and trades is disseminated in real-time to the market, although orders and quotes are not distinguished in the market data feed. Market by orders is available and full order depth is published.

Orders (and quotes) contain price, volume, owner member firm, last modified timestamp and a flag that indicates if the public order originates from a market maker quote. Orders in the private feed have a cross reference to the public order identifier. Trades contain price, volume and buyer/seller member firms as well as trade and reporting timestamps. Trades also include various flags such as trade type, outside spread etc.

Reference data such as market structure and securities is available in real-time. However, normally changes will be scheduled when the market (all segments) is closed. Information about planned and previous corporate actions (e.g. a split) is also available in the market data feed. When a corporate action which affects the market price of a security is executed, all orders and quotes in the order book are canceled and the closing price is adjusted accordingly. A corporate action is only executed when the security is closed.

Market data statistics are maintained by the exchange for 1) the current trading session, 2) the current day, and 3) the last official (reference) day. The statistics include turnover, last traded price, high/low price, average price, etc.

Chapter 14

Direct Electronic Access

Direct Electronic Access (DEA) is supported in the form of Direct Market Access (DMA) and Sponsored Access (SA). Each legal entity conducting trading through DEA must use separate account(s) for all their trading activities.

Clients are advised to consult the Member Rules [3], [1] for more information on DEA and additional requirements.

Appendix A

Quote Validation Examples

This appendix shows some examples to highlight some details of the quote validation mechanism.

A.1 Confirm Quote

Figure A.1 shows a basic scenario of the quote validation mechanism. The market maker sends a quote with bid (B) price 90, volume 100 and offer (S for Sell) price 100, volume 100. A client sends a buy order price 100, volume 50, which matches the quote. The exchange sends a quote update request to the market maker and sets up a timeout, marked with the vertical line in the timeline. The market maker updates its quote, here with the same values as previously and a trade message is sent (to both parties).

The order is not visible on market data as it is never placed into the order book.

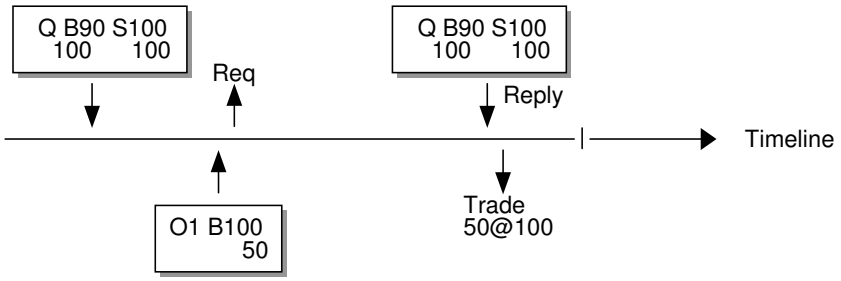

Figure A.1: Basic scenario.

A.2 Change Price

Figure A.2 shows a basic scenario where the market maker moves the spread (bid and offer price). The new price does not match the order and it is put into the order book and is made visible on the market data as well as the new quote price.

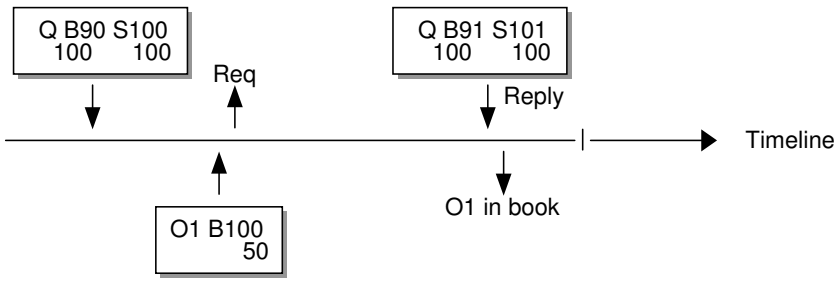

Figure A.2: Basic scenario.

A.3 Change Price (2)

Figure A.3 shows a basic scenario where the market maker moves the spread (bid and offer price), similar to base scenario 2 but in the other direction. The new price matches the order and a trade is generated. The market maker is the active party in the trade but the order will get the best possible price for the client.

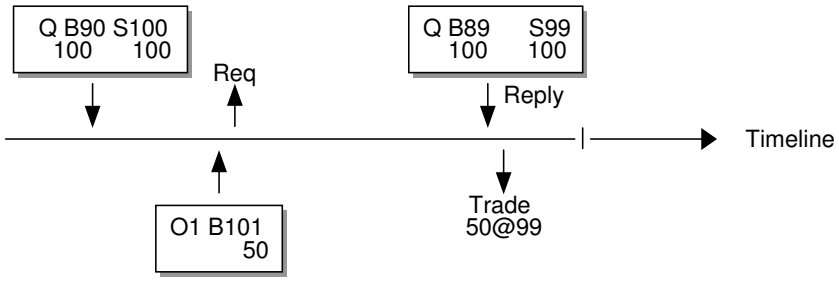

Figure A.3: Basic scenario.

A.4 Timeout

Figure A.4 shows another basic scenario, but here the market maker does not reply within the time frame. This is treated as if the market maker deleted the quote. The order is simply added to the order book and visible in the market data.

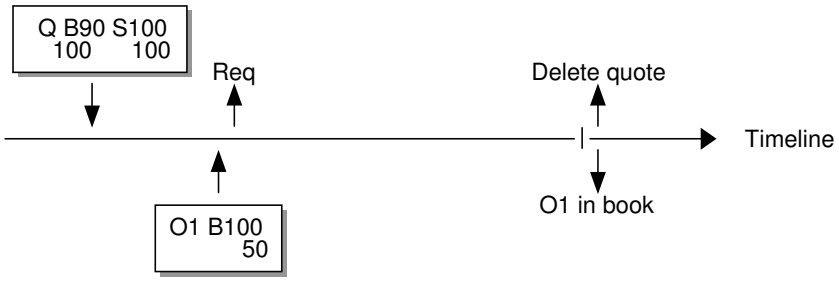

Figure A.4: Basic scenario.

A.5 Quote Hits Order

Figure A.5 shows another basic scenario; here the market maker quotes at 90 and 100. A client wants to buy at 99 and adds the order. As the prices does not match the quote it is directly added to the order book. The market maker then moves his quote to 88 and 98 and as the market maker hits the order already in the order book and is the active side a trade is immediately generated. The quote dictates the price (price is set in favor of the other party) since quote validation is enabled and the security status is ready to trade (open).

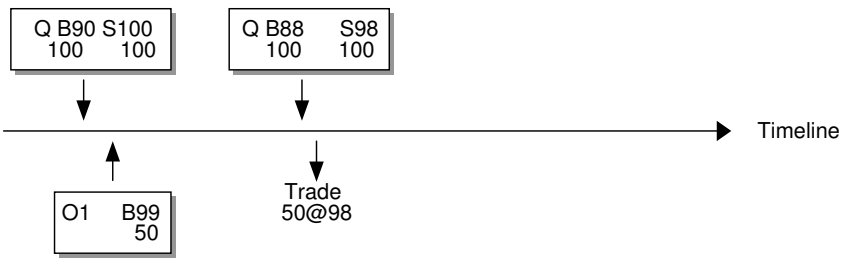

Figure A.5: Basic scenario.

A.6 Rejected Update

Figure A.6 shows a basic scenario where the market maker starts at 90 and 100. A client wants to buy at 101 and a quote update request is sent to the market maker. Before the market maker receives the request it sends an update of the quote, to 91 and 101. Since this update is not a direct response to the request it is rejected. When the market maker receives the request it replies with a new quote at 92 and 102. No trade is made and the order is placed in the order book.

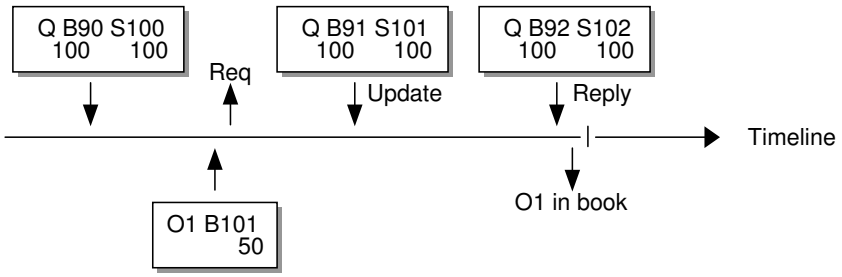

Figure A.6: Basic scenario.

A.7 Two Orders

Figure A.7 shows a scenario with two orders. Both orders match the quote but a request is only sent for the first quote. When the reply is received trades are generated for both orders, since both of them match the quote.

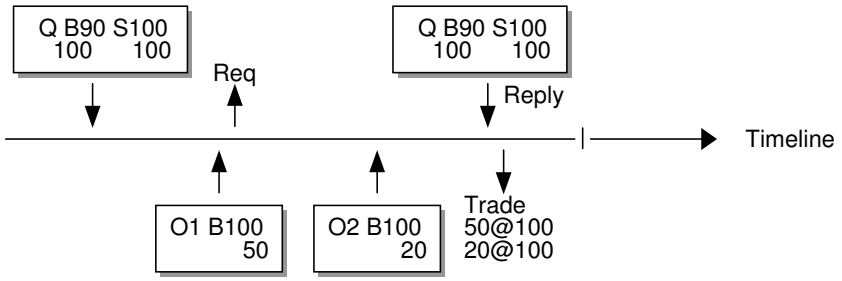

Figure A.7: Two order scenario.

A.8 Two Orders (2)

Figure A.8 shows a scenario with two orders. The first order matches the quote. The second order reaches the order book while the pending order queue is not empty and is also put into the queue, even though it does not match the quote. Once the quote reply arrives the first order is matched (trade) and the second order is put into the order book and visible on the market data.

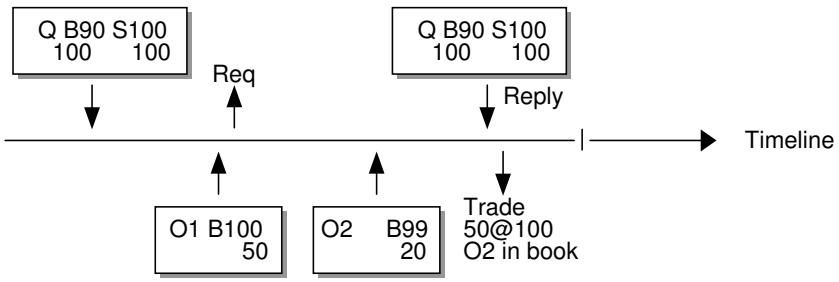

Figure A.8: Two order scenario.

A.9 Two Orders (3)

Figure A.9 shows a scenario with two orders. The first order does not match the quote and is put into the order book directly. The second order matches the quote and a request for quote is sent to the market maker. The market maker replies with an updated price that also matches the first order. The quote is the active party for all orders that already exist in the order book (the first order). For the orders in the pending order queue (the second order) the quote is the passive party. In either case, the quote dictates the price (price is set in favor of the other party) since quote validation is enabled and the security status is ready to trade (open).

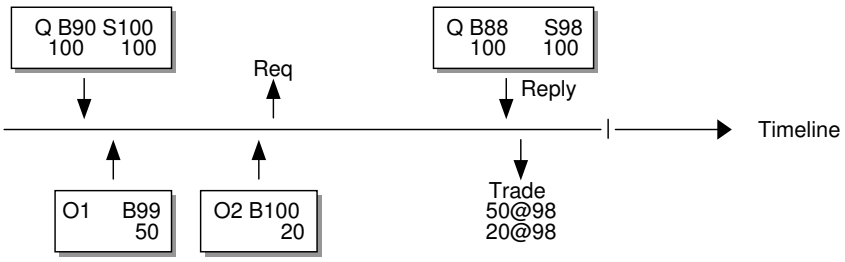

Figure A.9: Two order scenario.

Appendix B

Order Protection Mode Examples

B.1 Market Maker cancels quote during continuous trading

Figure B.1 show a scenario where the market maker cancels its' quote during continuous trading, as a result, an *Order Protection Auction* is triggered and matching is suspended. When the market maker re-enters the market with a new quote, the auction is ended within a random time interval.

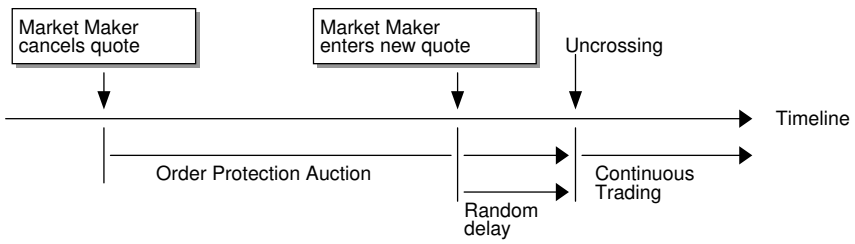

Figure B.1: Market maker cancels quote.

B.2 Missing quote when market opens

Figure B.2 show a scenario where the market maker does not provide a quote when the market opens. As shown in the figure, when the market opens the Opening Auction switches over to an *Order Protection Auction* and the matching of *Order 1* and *Order 2* is suspended until the end of the new auction.

Order 2 is completely matched whereas *Order 1* will remain in the orderbook with a rest quantity of 25.

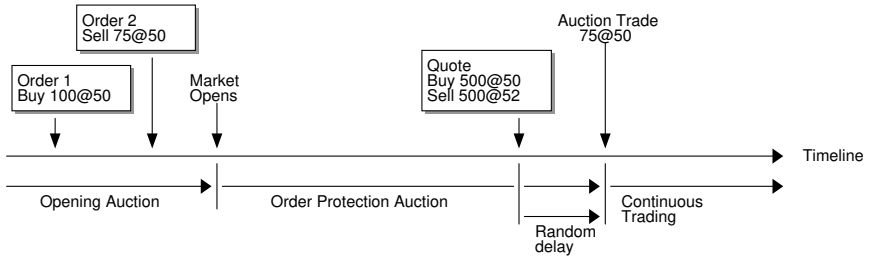

Figure B.2: Missing quote at market opening

B.3 Missing quote when market opens with market and IOC orders

Figure B.3 show a scenario where the market maker does not provide a quote when the market opens. Prior to the transition to *Open*, an IOC and a market order was submitted. As shown in the figure, when the market opens the Opening Auction switches over to an *Order Protection Auction* and the *Market order* and *IOC order* remain in the orderbook during the *Order Protection Auction*.

When continuous trading is initiated, the *IOC order* is completely matched while the *Market order* matched 75 units with 25 remaining units canceled.

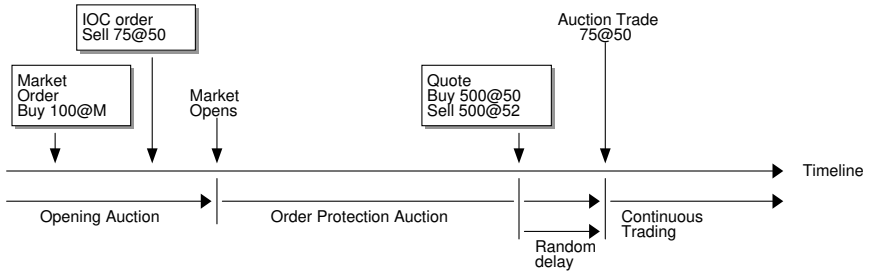

Figure B.3: Missing quote at market opening with market and IOC orders

B.4 Buyback activated during Order Protection Auction

Figure B.4 show a scenario where an *Order Protection Auction* is ongoing during which the market maker provides a bid quote. In addition there are 2 limit orders present in the order book. Buyback is activated during the auction which will take precedence over the *Order Protection Auction*.

In the transition to Buyback, all buy orders are canceled. The remaining sell order, *Order 2*, will match against the bid quote.

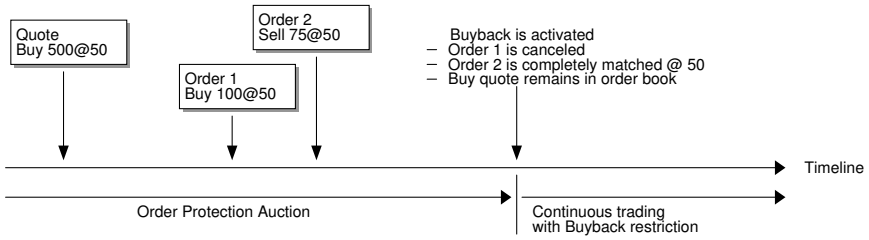

Figure B.4: Buyback is activated during order protection auction

B.5 Order Protection mode is deactivated

Figure B.5 show a scenario where *Order Protection Mode* is deactivted during an *Order Protection Auction*. When Order Protection Mode is deactivated the auction will end after a random time interval, an uncross will be performed and continuous trading is resumed.

Order 2 will be completely matched at the uncross while *Order 1* will remain in the order book with a rest quantity of 25.

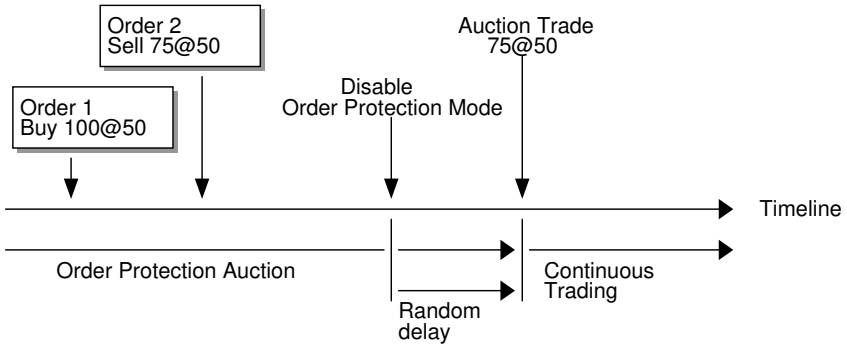

Figure B.5: Order Protection Mode is deactivated during an Order Protection Auction

Appendix C

Tick Size Table - examples

Table C.1 illustrates example of tick size tables. Note that other tick size tables than the ones listed below could occur. Furthermore, the tick size table should always be read directly from the inidividual instrument.

Table C.1: Tick size table

Segment	*Interval*	*Tick size*
Liquidity band 1	0.001 - 0.199	0.001
	0.200 - 0.498	0.002
	0.500 - 0.995	0.005
	1.000 - 1.990	0.010
	2.000 - 4.980	0.020
	5.000 - 9.950	0.050
	10.000 - 19.900	0.100
	20.000 - 49.800	0.200
	50.000 - 99.500	0.500
	100.000 - 199.000	1.000
	200.000 - 498.000	2.000
	500.000 - 995.000	5.000
	1 000.000 - 1 990.000	10.000
	2 000.000 - 4 980.000	20.000
	5 000.000 - 9 950.000	50.000
	10 000.000 - 19 900.000	100.000
	20 000.000 - 49 800.000	200.000
	50 000.0000 - infinity	500.000
Liquidity band 2	0.001 - 0.499	0.001
	0.500 - 0.998	0.002
	1.000 - 1.995	0.005
	2.000 - 4.990	0.010
	5.000 - 9.980	0.020
	10.000 - 19.950	0.050
	20.000 - 49.900	0.100
	50.000 - 99.800	0.200
	100.000 - 199.500	0.500
	200.000 - 499.000	1.000

Table C.1: Tick size table

Segment	*Interval*	*Tick size*
	500.000 - 998.000	2.000
	1 000.000 - 1 995.000	5.000
	2 000.000 - 4 990.000	10.000
	5 000.000 - 9 980.000	20.000
	10 000.000 - 19 950.000	50.000
	20 000.000 - 49 900.000	100.000
	50 000.0000 - infinity	200.000
Liquidity band 3	0.001 - 0.999	0.001
	1.000 - 1.998	0.002
	2.000 - 4.995	0.005
	5.000 - 9.990	0.010
	10.000 - 19.980	0.020
	20.000 - 49.900	0.050
	50.000 - 99.900	0.100
	100.000 - 199.800	0.200
	200.000 - 499.500	0.500
	500.000 - 999.000	1.000
	1 000.000 - 1 998.000	2.000
	2 000.000 - 4 995.000	5.000
	5 000.000 - 9 990.000	10.000
	10 000.000 - 19 980.000	20.000
	20 000.000 - 49 950.000	50.000
	50 000.0000 - infinity	100.000
Liquidity band 4	0.001 - 1.999	0.001
	2.000 - 4.998	0.002
	5.000 - 9.995	0.005
	10.000 - 19.990	0.010
	20.000 - 49.980	0.020
	50.000 - 99.950	0.050
	100.000 - 199.900	0.100
	200.000 - 499.800	0.200
	500.000 - 999.500	0.500
	1 000.000 - 1 999.000	1.000
	2 000.000 - 4 998.000	2.000
	5 000.000 - 9 995.000	5.000
	10 000.000 - 19 990.000	10.000
	20 000.000 - 49 980.000	20.000
	50 000.0000 - infinity	50.000
Liquidity band 5	0.001 - 4.999	0.001
	5.000 - 9.998	0.002
	10.000 - 19.995	0.005
	20.000 - 49.990	0.010
	50.000 - 99.980	0.020
	100.000 - 199.950	0.050
	200.000 - 499.900	0.100
	500.000 - 999.800	0.200
	1 000.000 - 1 999.500	0.500

Table C.1: Tick size table

Segment	*Interval*	*Tick size*
	2 000.000 - 4 999.000	1.000
	5 000.000 - 9 998.000	2.000
	10 000.000 - 19 995.000	5.000
	20 000.000 - 49 990.000	10.000
	50 000.0000 - infinity	20.000
Liquidity band 6	0.001 - 9.999	0.001
	10.000 - 19.998	0.002
	20.000 - 49.995	0.005
	50.000 - 99.990	0.010
	100.000 - 199.980	0.020
	200.000 - 499.950	0.050
	500.000 - 999.900	0.100
	1 000.000 - 1 999.800	0.200
	2 000.000 - 4 999.500	0.500
	5 000.000 - 9 999.000	1.000
	10 000.000 - 19 998.000	2.000
	20 000.000 - 49 995.000	5.000
	50 000.0000 - infinity	10.000
ETP segments	0.001 - 0.999	0.001
	1.00 - infinity	0.01
Other segments	0.01 - infinity	0.01

Appendix D

Order Record Keeping

D.1 Introduction

This appendix specifies the requirements for the daily reporting of short codes and their mapping to their actual values, a requirement that goes into effect on the 3rd of January 2018. For requirements on short codes in relation to order (and quote) entry in the protocol, please see the appendix on Order Record Keeping in the NGM FIX protocol [6].

D.1.1 Regulatory requirement for exchanges

Exchanges are required to collect and upon request by the National Competent Authorities provide various information related to orders. Among this information certain identification related to the client of the order[1] (if any), the investment decision maker and the responsible for the execution within the member firm.

The regulatory description of the relevant data to collect is the following:

Client identification code Code used to identify the client of the member or participant of the trading venue. In case of DEA, the code of the DEA user should be provided. Where the client is a legal entity, the LEI code of the client shall be used. Where the client is not a legal entity, the NATIONAL_ID shall be used. *Alternative flagging should be used in case of aggregated orders, pending allocations or if there is no client of the member or participant of the trading venue*

Investment decision within firm Code used to identify the person or the algorithm within the member or participant of the trading venue who is responsible for the investment decision. Where a natural person(s) within the member or participant of the trading venue is responsible for the investment decision the person who is responsible or has primary responsibility for the investment decision shall be identified with the NATIONAL_ID. Where an algorithm is responsible for the investment decision the field shall be populated in accordance with Article 8 of RTS 22 on transaction

[1] Note that the term orders in the context of Order Record Keeping and short codes includes **quotes** as well.

reporting under Article 26 of Regulation (EU) No 600/2014. This field shall be left blank when the investment decision was not made by a person or algorithm within the member or participant of the trading venue

Execution within firm Code used to identify the person or algorithm within the member or participant of the trading venue who is responsible for the execution of the transaction resulting from the order.
Where a natural person is responsible for the execution of the transaction, the person shall be identified by NATIONAL_ID
Where an algorithm is responsible for the execution of the transaction, this field shall be populated in accordance with Article 9 of RTS 22 on transaction reporting under Article 26 of Regulation (EU) No 600/2014.
Where more than one person or a combination of persons and algorithms are involved in the execution of the transaction, the member or participant or client of the trading venue shall determine the trader or algorithm primarily responsible as specified in Article 9(4) of RTS on trading obligations under Article 26 of Regulation (EU) No 600/2014 and populate this field with the identity of that trader or algorithm.

The Member Rules [3] contains more information on the legal requirements affecting members of the exchange.

D.2 Short codes

NGM has decided not to let members supply the actual identifiers over the normal NGM FIX protocol [6], but instead use a concept of short codes, where members provide short codes in the NGM FIX Protocol [6] and report their corresponding actual values outside of the protocol.

D.2.1 Short code requirements

Format The format of short codes in the NGM FIX Protocol [6] are 8 byte unsigned integers(*).

Reserved values The values 0-10 are reserved and must not be used for short codes.

Immutable Short codes are immutable and must not change over time. This holds true even in the case of a wrongly assigned short code.

As for some jurisdictions the long codes for a person (National ID) may change over time, it should be clarified that the short codes should remain the same for the same person. It is possible to update a mapping by assigning a start and end date for a short code mapping.

Short code series NGM support three series of short codes:

- Person (National ID)
- Entity (LEI)
- Algo (Algo ID)

In the order entry as well as in the mapping to long codes, participants will be required to reference each code to one of the three series above. The same short code numeric value can be used in each of the series.

(*) *Although 8 byte integers are allowed, clients are advised to use low numbers in order to keep the network footprint low.*

D.3 Reporting of short code mappings

For information on the reporting of short code mapings refer to the NGM - Reporting of Short Codes [5] document.