



Turquoise

London Stock Exchange Group

TURQUOISE EQUITIES TRADING SERVICE DESCRIPTION

Version 3.4

Updated 27 April 2012

This service description is being distributed by Turquoise Global Holdings Limited only to, and is directed only at (a) persons who have professional experience in matters relating to investments who fall within Article 19(1) of the FSMA 2000 (Financial Promotion) Order 2005 and (b) persons to whom it may otherwise lawfully be communicated (together “relevant persons”). Any investment or investment activity to which this document relates is available only to and will be engaged in only with, relevant persons. Any person who is not a relevant person should not act or rely on this service description or any of its contents.

Turquoise Global Holdings Limited is an authorised investment firm by the Financial Services Authority.

1.	About Turquoise	4
2.	About this Document	5
3.	Change History	6
4.	Terms and Acronyms.....	7
5.	Market Structure, Products and Reference Data.....	8
5.1.	Turquoise Order Books.....	8
5.2.	Turquoise Integrated Order Book	8
5.3.	Turquoise Dark Midpoint Order Book.....	8
5.4.	Lot Size.....	9
5.5.	Tick Sizes.....	9
5.6.	Currencies and Lines Traded	9
5.7.	Reference Data / Security Identification	9
5.8.	Large in Scale (LIS) Thresholds	10
5.9.	US Securities	10
6.	Membership and Sponsored Access.....	11
6.1.	Eligibility for Membership.....	11
6.2.	Sponsored Access.....	11
6.3.	Nodes and Users	11
6.4.	Trading.....	11
6.5.	Clearing and Settlement	12
6.6.	Fungibility.....	12
6.7.	Settlement Instructions	12
6.8.	Choice of Sending Trades to Clearing.....	12
6.9.	Risk Management and Exposure Monitoring.....	12
6.10.	Hosting and Network Connectivity.....	12
7.	Reference Prices	13
7.1.	Turquoise Last Trade Price (TLTP).....	13
7.2.	Primary-market Close Price (PCP).....	13
7.3.	Primary-market Close Price Adjusted (PCPA)	13
7.4.	Turquoise Reference Price (TRP)	13
7.5.	Primary-market Best Bid and Offer (PBBO)	13
7.6.	Primary-market Midpoint Price (PMP)	13
8.	Price, Value and Market Checks	14
8.1.	Price Band Validation for Limit Orders	14
8.2.	Maximum Order Value (for Market and Limit Orders)	14
8.3.	Market Order Execution Limit (MOEL)	14
8.4.	Well Formed Market Checks	15
9.	Turquoise Order Types.....	16
9.1.	Target Book	16
9.2.	Display Quantity.....	16
9.3.	Duration (Time in Force).....	17
9.4.	Price.....	17
9.5.	Size	18
9.6.	Execution Instruction	18
10.	Trading at Turquoise.....	19
10.1.	Trading Calendar	19
10.2.	Trading Sessions and Support	19

10.3. Order Amendment and Cancellation during Trading Sessions	20
11. Normal Trading	21
11.1. Execution Priority	21
12. Trading Halts	22
12.1. Within Turquoise	22
12.2. Within Primary-markets	22
12.3. Impact of a Trading Halt	22
13. Test Securities	23
13.1. Within Production	23
14. Trading Tariff Model	24
14.1. Trading Tariff model	24
14.2. Categorisation of Trades	24
14.3. Types of Trade for Billing	24
15. Interfaces and Information Dissemination	25
15.1. Native Trading Gateway	25
15.2. FIX Trading Gateway	25
15.3. FIX Drop Copy Gateway	25
15.4. FIX Post Trade Gateway	25
15.5. Native Market Data Gateway	26
15.6. Detailed information regarding interfacing and information dissemination	26
16. Appendix 1	27

1. About Turquoise

Turquoise Global Holdings Limited ("TGHL") is an investment firm authorised by the Financial Services Authority of the United Kingdom. Initially founded by a consortium of nine investment banks, it is now majority owned by the London Stock Exchange Group (LSEG). In addition to LSEG, its shareholders now include twelve of the leading investment banks.

Turquoise was established to engender greater competition in the secondary trading of European equities, and offers a combination of innovative services, superior technology and competitive pricing. With the integration of EDX, Turquoise extended its services to include equity and index derivatives, a market characterised by a lack of competition and high costs.

Turquoise operates a multilateral trading facility ("Turquoise") with two discrete trading platforms; one for cash equities and another for derivatives. Members of Turquoise can access both equity and derivatives platforms providing they have the appropriate post-trade arrangements in place.

- The Turquoise Equity platform offers the secondary trading of Pan-European and US equities, Exchange Traded Funds, Global Depositary Receipts, American Depositary Receipts, Exchange Traded Currency funds and Exchange Traded Commodity funds. Turquoise Equities comprises the TQ Integrated Order Book and TQ Midpoint Dark Order Book, each covering some 2,000 securities (includes 175 liquid US equities, ETFs, GDRs and ADRs) over 19 countries, including all major European markets, Spain, Czech, Hungary and the United States. Turquoise supports member-choice of central clearer under an interoperable CCP model.
- The Turquoise Derivatives platform offers trading of single stock, index and dividend derivatives based on Pan-European and International Order Book (IOB) equities. Further details are available on the Turquoise website at http://www.tradeturquoise.com/tq_derivatives_products.shtml

The Turquoise trading platforms are hosted in the data-centres of the LSEG and have interfaces common to other markets of LSEG, ensuring that customers accessing other LSEG markets can enjoy access to Turquoise with little incremental cost or effort.

TQ LENS is Turquoise's liquidity aggregation service, which parses incoming orders and distributes them according to a series of sophisticated algorithms to otherwise inaccessible, fragmented liquidity sources. As such, it mediates access to the multiple liquidity partners via a single, independent connection.

Users of the Turquoise MTF and TQ LENS benefit from fully risk-managed clearing solutions, and industry-leading market surveillance to ensure fair and orderly operations.

Membership is uniformly open to qualified firms, with members today ranging from the largest global banks and brokers to institutions with local, regional and sector focus, and specialist trading and market-making firms. Sponsored Access and Direct Market Access are available to non-members.

2. About this Document

The objective of this document is to provide an understanding of the most relevant Technical, Operational and Business features of the Equities platform of the Turquoise MTF.

This document is not intended to be used as a Technical Specification for the development of any software application.

This document has been updated to reflect changes to the service being introduced as part of the migration to the Millennium Exchange platform.

Anyone already familiar with previous versions of the document is strongly encouraged to read this update.

For any feedback or queries about this document please contact products@tradeturquoise.com

3. Change History

Date	Version	Changes
27/4/12	3.4	<ul style="list-style-type: none">• Updates to functionality of the Dark Midpoint Order Book<ul style="list-style-type: none">○ Change in priority of resting orders from Time to Size/Time○ Change in Minimum Fill logic from MAQ to MES○ Addition of a Continuous-only execution instruction• Updates to reflect the availability of Sponsored Access• Update to reflect the imminent availability of EMCF as an interoperable CCP in addition to ECCP, LCH and X-Clear

4. Terms and Acronyms

Term/Acronym	Description
Dark Midpoint Order Book	Dark-only Order Book for orders pegged to the PMP.
FAK	Fill And Kill, also referred to as Immediate or Cancel (IOC).
FOK	Fill Or Kill.
Integrated Order Book	Integrated Order Book consisting of Displayed Orders, Iceberg Orders, and LIS Hidden Orders.
IOC	Immediate or Cancel, also referred to as FAK (Fill And Kill).
LIS	Large In Scale.
MAQ	Minimum Acceptable Quantity (multiple fill match).
MES	Minimum Execution Size (single fill match).
MiFID	Markets in Financial Instruments Directive (Directive 2004/39/EC)
Non-persistent order	An order which may execute only against persistent orders, but which will not itself rest on the Order Book.
PBBO	Primary-market Best Bid and Offer.
PCP	Primary-market Closing Price.
PCPA	PCP Adjusted for Corporate Actions.
Persistent order	An order which will rest on the Order Book until execution, cancellation or expiry.
PMP	Primary-market Midpoint Price.
Primary-market	The market on which Turquoise Management determines a Security has its primary listing.
Security	Security eligible for trading on Turquoise
TLTP	Turquoise Last Trade Price.
TRP	Turquoise Reference Price.

For an exhaustive list of Turquoise terms, as defined in the Turquoise Rulebook, and all other documentation, please refer to www.tradeturquoise.com/tq_resources

5. Market Structure, Products and Reference Data

Turquoise offers Pan-European and US trading with Clearing and Settlement provided by EuroCCP in approximately 2000 Securities and ETFs from the following Markets:

- Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Hungary, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom and United States.

5.1. Turquoise Order Books

Turquoise operates two discrete Order Books:

- The Integrated Order Book – which is transparent on a pre-trade and post-trade basis
- The Dark Midpoint Order Book – which is transparent on a post-trade basis only

Most of the instruments are available for trading in both books, but ETFs, US securities and funds, and Czech, Hungarian and Luxembourg securities are available only in the Integrated Order Book.

5.2. Turquoise Integrated Order Book

The Integrated Order Book supports continuous trading and executes persistent orders on a Price, Display type, Time priority basis.

The Integrated Order Book is transparent pre-trade and post-trade, and a full depth-of-book feed including all displayed persistent orders and all trades are published to members and market data vendors.

Supported persistent order types are Limit Orders (displayed), Iceberg Orders (partly displayed), LIS Hidden Orders (non-displayed). Supported non-persistent order types, all of which are non-displayed, are IOC/FAK Orders, FOK Orders and Market Orders. Minimum Accepted Quantity (MAQ) is supported on non-persistent order types only.

5.3. Turquoise Dark Midpoint Order Book

The Dark Midpoint Order Book is a 'dark' Price-referencing Order Book:

- All trades take place at an instrument's Primary-market Midpoint Price (PMP). When a well-formed PMP is not available (e.g. because an instrument is in an auction phase on its Primary-market, or because the Primary-market fails the Well Formed Market Checks defined by Turquoise), no matching occurs. The Well Formed Market Checks are described in section 8.4.
- It executes persistent orders on a Size, Time priority basis, and offers both continuous and randomised periodic uncross trading.

The Dark Midpoint Order Book is transparent post-trade but not pre-trade, and hence only trades are published. All orders are non-displayed.

The Dark Midpoint Order Book will operate with two matching modes:

- Continuous – allowing the submission and matching of both persistent and non-persistent order types
- Randomised Periodic Uncrossing – allowing the submission and matching of persistent order types only

Persistent orders can be designated to trade in one, other or both of Continuous trading and Randomised Periodic Uncrossing, and by default will be eligible for both.

Orders designated for Randomised Periodic Uncrossing only will not interact with non-persistent (immediacy demanding) orders. This provides participants with discretion over whether to interact with immediacy demanding flow, or to constrain interaction to patient flow.

Non-persistent orders are only accepted for Continuous trading.

Supported persistent order types are Midpoint Peg Orders (with or without a Peg Cap/Floor), Limit Orders (which are interpreted as Midpoint Peg Orders with a Peg Cap/Floor), and Market Orders (which are interpreted as Midpoint Peg Orders without a Peg Cap/Floor). Supported non-persistent order types are IOC/FAK Orders and FOK Orders. For all order types a Limit Price or Peg Cap/Floor determines an order's eligibility to be matched at the prevailing PMP, and will not otherwise influence the execution price.

MES is supported on both persistent and non-persistent order types. Members can specify whether MES will apply to the first execution only (default for non-persistent orders) or to persist for the lifetime of the order (default for persistent orders).

5.4. Lot Size

A Lot Size of one (1) is utilized for all the Securities in both Order Books.

5.5. Tick Sizes

The Turquoise Integrated Order Book typically follows the tick size structure as defined by the Primary-market for the instrument.

The Turquoise Dark Midpoint Order Book normally follows a tick structure that is half of the tick sizes defined by the Primary-market for the instrument.

Management of changes to tick size regimes at the Primary-markets is handled by Turquoise Market Operations. Changes made by Market Operations are subsequently propagated to Turquoise Members.

Whilst Turquoise follows the tick size structure of the underlying Primary-market, it retains the ability to amend tick sizes to a Turquoise-specific value as appropriate. These tick sizes are in line with other existing tick size tables and in common with the European initiative to implement a uniform tick size structure. Turquoise advises the specific tick size table via a daily reference file and on the Turquoise website. Turquoise endeavours to provide a reasonable period of notice prior to implementing any change.

5.6. Currencies and Lines Traded

Trading is supported for the following currencies:

- GBX (for clarification, this acronym refers to GBP in pence), EUR, CHF, DKK, NOK, SEK, USD, CZK and HUF.

Turquoise only supports billing in GBP and EUR, not in local currencies.

5.7. Reference Data / Security Identification

All messages use the common symbology naming scheme; a string that consists of the Primary-market symbol, plus an identifier for the Primary-market e.g. "RDSA1" and "RDSAa". Additionally, orders submitted via the FIX Trading gateway can use a combination of ISIN, Currency and Primary-market MIC to specify the Security.

For further information on Reference Data see Turquoise Market Data specification document "[TQ501 – Guide to Reference Data Services](#)".

For further information on the FIX Trading Gateway refer to the specification document "[TQ201 - Trading Gateway \(FIX 5.0\)](#)".

5.8. Large in Scale (LIS) Thresholds

For MiFID instruments, CESR defines a LIS quantity threshold above which Limit Orders may be hidden in the Integrated Order Book.

5.8.1. Eligibility to qualify as LIS under MiFID MAR 5.7.10

“An order shall be considered to be large in scale compared with **normal market size** if it is equal to or larger than the minimum size of order specified in Table 2 in Annex II [of the *MiFID Regulation*]. For the purposes of determining whether an order is large in scale compared to **normal market size**, all shares admitted to trading on a regulated market shall be classified in accordance with their average daily turnover, which shall be calculated in accordance with the procedure set out in Article 33 of the *MiFID Regulation*”.

The Committee of European Securities Regulators (CESR) website maintains the reference values and FX rates used for determining the LIS criteria which as of 06/05/2008 were as follows:

Class in terms of Average Daily Turnover	ADT < €500K	€500K ≤ ADT < €1M	€1M ≤ ADT < €25M	€25M ≤ ADT < €50M	ADT ≥ €50M
Min Size of order qualifying as LIS compared with normal market size	€50K	€100K	€250K	€400K	€500K

For non-MiFID instruments (including ETFs and US Securities), Turquoise has set the LIS to zero. Hidden Limit Orders of any size can therefore be accepted into the Integrated Order Book for these instruments.

5.9. US Securities

The following applies for US Securities

- Market hours for US Securities trading remain in line with the present Turquoise trading cycle.
- Trading is restricted to the Integrated Order Book (i.e. members are not allowed to submit to the Dark Midpoint Order Book).
- LIS is set to 0 (as LIS relates to MiFID instruments only)
- Turquoise uses the previous day's US closing price as its opening price for US Securities
- EuroCCP clears all US Securities for Turquoise. Firms are required to have a settlement account with DTCC in the US, either directly or indirectly via a GCM.

6. Membership and Sponsored Access

6.1. Eligibility for Membership

Applicants are eligible to apply to become Members of Turquoise provided they meet the following criteria:

- (i) The applicant must be an EEA regulated investment firm or credit institution (as defined under MiFID)
Or
- (ii) The applicant must show that it is fit and proper and that it has a sufficient level of ability and experience in trading cash equities and has adequate risk management and other relevant system and controls; Where an applicant has already been admitted as a participant by another regulated trading venue (RIE, MTF, etc) in the EEA, a simplified due diligence will take place.

Your account manager will be able to assist you with this application process.

The applicant will also have to complete conformance testing prior to conducting any business on Turquoise.

In addition, members must have clearing arrangements in place with a Central Counterparty connected to Turquoise (currently this includes EuroCCP, LCH and X-Clear, with EMCF connection imminent), either as an independent clearing member of the central clearing party or by having an arrangement with a General Clearing Member (GCM).

6.2. Sponsored Access

Non-members may access Turquoise through the infrastructure of a member (Direct Market Access) or as a Sponsored User trading under the membership of a Sponsoring Member and subject to pre-trade risk controls developed by Turquoise.

Further information on Sponsored Access can be found on the Turquoise website at www.tradeturquoise.com/tq_resources under 'Sponsored Access'.

6.3. Nodes and Users

Trading members can organise their Turquoise activity into Nodes, Trader Groups and Users (Traders/Sessions). Nodes can be used by a Firm to align its marketplace activity along certain defined organisational units, or to achieve flexibility in clearing.

A Firm must have at least one Node, and each User must belong to a single Node.

Each Node can have its own permissions with respect to Instrument Groups that can be traded, and its own clearing arrangements per Instrument Group. Permissions can also be set at a User level, should such degree of flexibility be required.

Further information on setting up Nodes is included in the Turquoise Technical Specifications found on the Turquoise website at www.tradeturquoise.com/tq_resources.

6.4. Trading

Turquoise supports the following trading capacities modelled after the standard market implementation. These are merged to Agency and Principal (covering all Principal trading capacities) for all engaged CCPs:

- Principal
- Riskless Principal
- Agency

A trading Member is required to flag each order with the relevant trading capacity. If this information is not included, the order will be rejected by Turquoise.

6.5. Clearing and Settlement

It is necessary to specify Clearing Instructions (the Clearing Member and Account) for each Node and Instrument Group combination. Without appropriate clearing instructions, a User associated with a Node will not be permitted to submit orders.

For the avoidance of doubt, membership with Turquoise as a Trading Member is entirely separate from clearing membership with the CCP, although a clearing and settlement relationship must exist for each and every Trading Member.

6.6. Fungibility

From a clearing perspective, Securities traded in Turquoise are fungible only with those that belong to the same line. Any cross-border clearing arrangements are to be arranged separately.

6.7. Settlement Instructions

All trades executed by Turquoise are settled according to the default settlement practices of the Primary Exchange of the line that is being traded.

Non-standard settlement instructions are not supported.

6.8. Choice of Sending Trades to Clearing

Trades that are executed with the same Member Firm on both sides are by default sent to the relevant CCP.

A Member can optionally sign up for the service of not passing self matched trades to clearing.

This can be done on the basis of a group of Users within a Member. Where both sides of the trade belong to a User within the specified group, with the same trading capacity, the trade will not be sent to Clearing.

6.9. Risk Management and Exposure Monitoring

Trading Members' exposure is monitored by the CCP or GCM.

Turquoise has a mechanism to suspend order entry for a Trading Member should this be required by any CCP, GCM or regulator, or required by Turquoise to preserve the orderliness of its marketplace.

6.10. Hosting and Network Connectivity

Turquoise Hosting is available at the London Stock Exchange Primary Data Centre. Details of the Hosting service and Network Connectivity options can be found on the London Stock Exchange website at

www.londonstockexchange.com/products-and-services/connectivity/hosting

Please also refer to the Turquoise Guide to Connectivity found on the Turquoise website at

http://www.tradeturquoise.com/doclibrary/TQ102_Connectivity_Guide.pdf

Should a Firm only wish to connect to Turquoise but not connect to other LSEG Markets, then alternative arrangements can be made.

Please contact products@tradeturquoise.com for more information.

7. Reference Prices

Turquoise relies on a number of reference prices to control market behaviour and determining execution prices. These reference prices are derived from external and Turquoise Best Bid and Offer prices, the previous day's Primary-market Closing Price, Turquoise Last Traded Price etc.

7.1. Turquoise Last Trade Price (TLTP)

The TLTP is defined as the price of the last trade on the Turquoise market. This is set by any trade that occurs during continuous trading. Prior to the first trade of a trading day, the Last Trade Price is deemed to be undefined.

7.2. Primary-market Close Price (PCP)

The PCP is set at the end of the Turquoise trading day and is defined as being equal to the Close Price published by the Primary-markets.

Where there is no Primary-market Close Price, the PCP is set from the Turquoise Reference Price which always has a value.

Turquoise are able to modify the official closing price, via Market Operations, should that be required.

The PCP is not disseminated.

7.3. Primary-market Close Price Adjusted (PCPA)

The PCPA is defined as the PCP adjusted for Corporate Actions.

Example: closing price = 10. Stock Split 2:1, so next day's PCPA is 5.

Turquoise has a daily feed of Corporate Action data into the Surveillance System and Market Operations can amend the opening prices as appropriate.

7.4. Turquoise Reference Price (TRP)

The Turquoise Reference Price is defined as the adjusted Primary-market Close Price (PCPA) at start of Day. During trading hours the TRP will be updated to be the TLTP. Where there is no TLTP it remains at PCPA. Turquoise Market Operations can override the PCPA if appropriate.

7.5. Primary-market Best Bid and Offer (PBBO)

The PBBO is defined as the Best Bid and Offer prices as represented by visible orders in the Primary-market Order Book when that market is in Continuous Trading.

If there are no orders in the relevant Primary-market Order Book, or if the Primary-market is not in continuous trading the PBBO is deemed to be undefined.

7.6. Primary-market Midpoint Price (PMP)

The PMP is defined as the average of the two PBBO prices. When the Primary-market is locked/crossed the PMP is undefined.

The PMP can have values with half-tick increments where there are an odd number of ticks between the PBBO prices. When the PBBO is undefined the PMP is also deemed to be undefined.

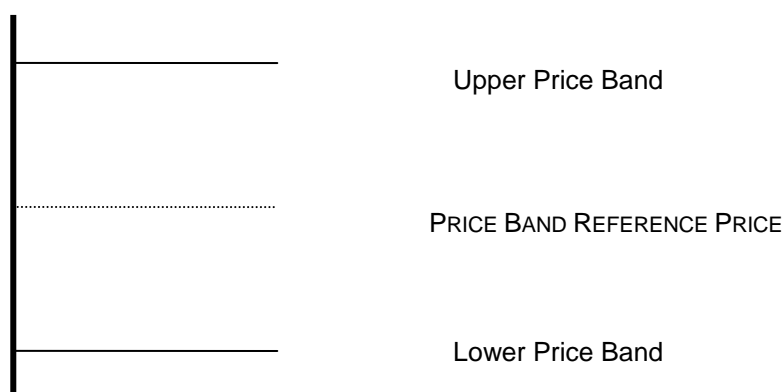
8. Price, Value and Market Checks

8.1. Price Band Validation for Limit Orders

Price Band Validation prevents orders with an overly aggressive limit price from entering the Integrated order book and trading. This also helps to protect the trader from executing at an unexpected price due to a 'fat finger' error.

Turquoise has defined 2 price band limits (for wider and tighter controls as required) set for each instrument group, defined as a percentage offset, which are computed against the reference price of the last traded price (TLTP) or the previous day's closing price in the case of no last traded price for the current trading day. Turquoise will use the wider price band until a last traded price is established, after which it will use the tighter price band.

Limit Orders with a price to buy greater than the upper price band limit, and Limit Orders with a price to sell less than the lower price band limit, will be rejected.



8.2. Maximum Order Value (for Market and Limit Orders)

A 'Maximum Order Value' will be specified by Turquoise to ensure that a trader does not commit to an excessively large execution erroneously. Orders in excess of the specified Maximum Order Value will be rejected.

8.3. Market Order Execution Limit (MOEL)

An 'Execution Limit' is applied to ensure that the Market Orders entering the Integrated Order Book do not execute beyond a certain price point.

MOEL is specified as a percentage offset from a reference price ascertained in the following manner

- If a Bid and Offer exists in the Book at the time the Market Order is entered, the reference price would be the midpoint of the Book.
- If only Offers exist, the reference price would be the Turquoise Best Offer.
- If only Bids exist, the reference price would be the Turquoise Best Bid.

If persistent orders exist on the sell side, a Buy Market Order will only execute up to the price equal to:

- $\text{Reference Price} + (\text{Reference Price} * \text{MOEL}\%)$, with the unexecuted balance of the order being cancelled

If persistent orders exist on the buy side, a Sell Market Order will only execute down to a price equal to:

- Reference Price – (Reference Price * MOEL%), with the unexecuted balance of the order being cancelled

8.4. Well Formed Market Checks

The Turquoise platform will carry out Well Formed Market Check (WFMC) validation upon receipt of PBBO updates and Primary-market status updates to determine if the PMP is valid.

If the WFMC fails for a particular Security, the market for that Security is deemed not well formed, resulting in matches in the Dark Midpoint Order Book not being permitted.

The WFMC will fail if:

- The Market Feed for the Primary-market data is flagged as 'stale'
- If the Primary-market data is not available
- The Primary-market symbol does not have a valid PBBO spread; i.e.
 - If either or both the Primary-market Bid and/or Offer don't exist, or
 - Either or both the Primary-market Bid and/or Offer is equal to 0
- The PBBO spread is greater than a defined Maximum Spread threshold or lesser than the Minimum Spread threshold for the specific instrument as defined by Turquoise Operations
- For liquid instruments, if the Primary-market symbol of the instrument has not published High trade and Low trade (i.e. the instrument has not executed at least once on the Primary-market)
- For liquid instruments, if the midpoint price at which executions may occur is greater than the high trade or lesser than the low trade published for the Primary-market symbol

9. Turquoise Order Types

This section defines the various types of orders (including Market, Limit and Midpoint Pegged) that are supported by Turquoise in terms of the key attributes that determines their behaviour and handling:

- Target Book
- Display Quantity
- Duration (Time in Force)
- Price
- Size (including minimum quantity)
- Execution Instruction

9.1. Target Book

On order entry a trader can specify the Target Book, indicating whether the order should be routed to the Integrated Order Book, or the Dark Midpoint Order Book. This is mandatory for orders submitted via the Native Gateway but is optional for orders submitted via FIX.

If the Target Book is not specified, the order will be routed based on the logic defined in Appendix 1 and summarised below.

Where an Order Book is not explicitly specified, the following orders will be routed to the Integrated Order Book:

- All visible Limit Orders (with Display Quantity > 0 or not specified);
- All Iceberg (partially visible) Limit Orders.
- All Dark Limit Orders that meet the MiFID Large in Scale (LIS) criteria and for which minimum quantity is not specified or is specified as 0.
- All IOC/FAK, FOK and Market Orders where Display Quantity <> 0;

Where an Order Book is not explicitly specified, the following orders will be routed to the Dark Midpoint Order Book:

- All orders with a valid Midpoint Peg instruction
- All Limit or Peg orders with Display Quantity = 0 (with the exception of above LIS Limit Orders with no minimum quantity);
- All IOC/FAK, FOK and Market Orders with Display Quantity = 0.

9.2. Display Quantity

Orders can either be Displayed or Dark (also referred to as Hidden), qualified by Displayed Quantity (0=Dark). A Display Quantity greater than zero but less than the total Order Quantity implies an Iceberg Order.

Where a target Order Book is not explicitly specified, Display Quantity is one factor that determines the Order Book that orders are routed to, as defined in Appendix 1.

9.3. Duration (Time in Force)

Below is a list of the durations that Turquoise supports based on their maximum life expectancy in the Order Book (from shorter to longer):

Fill or Kill (FoK)	Must either be executed <i>immediately and in full</i> against one or more eligible (in price and size) persistent, opposite side orders, or cancelled.
IOC (Immediate or Cancel) / Fill and Kill (FaK)	Will be executed <i>immediately, either partially or in full</i> against one or more eligible (in price) persistent, opposite side orders, with any unexecuted balance immediately cancelled.
Good Till Time	Order submitted will be eligible for execution until the specified time.
Day	The order is valid until close of the normal trading day on the day on which it was entered. The close of the normal trading day is 16:30 UK Time 17:30 CET.
Good Till Cancel (GTC)	A GTC order will be treated as a Day order, expiring at the close of the normal trading day on the day on which it was entered.
Good Till Date (GTD)	A GTD order will be treated as a Day order, expiring at the close of the normal trading day on the day on which it was entered.

9.4. Price

Market	<p>The order does not have a specified price.</p> <p>All Market Orders are non-displayed (i.e. never pre-trade transparent), regardless of which Order Book they are routed to.</p> <p>In the Integrated Order Book, a Market Order will be executed according to the priority of contra-side orders up/down to the MOEL. An incoming Market Order can potentially trade through one or more price levels. Market Orders are non-persistent (unexecuted balances will be cancelled immediately).</p> <p>In the Dark Midpoint Order Book, a Market Order can be persistent or non-persistent, depending on the order duration qualifier (Day, GFD, GTT, GTC and GTD 'time in force' qualifiers will persist in the book, while IOC/FAK and FOK qualifiers will not). Market Orders are interpreted as Midpoint Pegged Orders without a Peg Cap.</p>
Limit	<p>The order will be executed against any order(s) in the opposite side of the book at a price that will never be worse than its Limit. Depending on the duration qualifier, a Limit order can be persistent or non-persistent.</p> <p>Limit Prices must be set in whole ticks for all orders.</p>
Pegged	<p>Turquoise only supports Pegged Orders that are pegged to the PMP, and these are routed to the Dark Order Book. Orders with other Peg instructions will be rejected.</p> <p>Pegged Orders may have a limit price (aka Peg Cap). Whilst the PMP is worse than the limit price, the order will be excluded from matching.</p>

9.5. Size

Dark LIS (Large In Scale)	<p>An order is Large in Scale (LIS) if it meets the requirements described in Section 5.8.1</p> <p>Orders that meet the LIS criteria can be Dark (Hidden) and accepted in the Integrated Order Book as persistent (passive) Limit Orders.</p> <p>Orders that meet the LIS criteria can also be routed to the Dark Midpoint Order Book by explicitly specifying the target book.</p>
Dark Non-LIS	<p>Dark persistent (passive) orders that are smaller than LIS will only be accepted into the Dark Midpoint Order Book.</p>
MAQ (Minimum Acceptable Quantity)	<p>Turquoise supports MAQ on non-persistent order types in the Integrated Order Book.</p> <p>An order with MAQ will only be matched subject to, at minimum, fulfilling its MAQ. The match quantity may be formed by multiple fills.</p>
MES (Minimum Execution Size)	<p>Turquoise supports MES on all order types in the Dark Midpoint Order Book.</p> <p>Each individual fill will be equal to or greater than the specified MES.</p> <p>Members can specify whether MES will apply to the first execution only (default for non-persistent orders) or to persist for the lifetime of the order (default for persistent orders).</p> <p>When a MES order is partially filled, if the remaining quantity is below the MES initially set then the MES value is set to the remaining order quantity.</p>
Iceberg	<p>Turquoise supports Iceberg Orders on the Integrated Order Book only.</p> <p>Iceberg Orders display only a portion of their total interest, with the remaining being hidden. The displayed quantity is replenished to its original size only when it is fully matched, at which point the time priority of the order is re-set.</p> <p>The display quantity is always defined as an explicit quantity.</p> <p>If the remaining quantity is less than the original display quantity, the new display quantity will be set to the remaining quantity.</p>

9.6. Execution Instruction

This attribute is relevant to the Dark Midpoint Order Book only.

The Execution Instruction of an order should be selected on order entry from one of the options below:

Execution Instruction	Description
Randomised Periodic Uncrossing Only	Persistent orders can be submitted at any time during Normal Trading but will only be open to matching against contra-side persistent orders in the Order Book during the Randomised Periodic Uncrossing events.
Continuous and Randomised Periodic Uncrossing (default if omitted)	Orders submitted will be open to immediate execution against contra persistent orders during Normal Trading and any unexecuted volume and will rest on the book, open to continuous matching and matching during the Randomised Periodic Uncrossing events.
Continuous only	Orders submitted as continuous only will only execute during continuous trading and will not match during Randomised Periodic Uncrossing events.

The Execution Instruction attribute is only applicable to Day, GTC, GTT and GTD orders. FoK and IOC orders will only ever execute against orders resting on the Order Book (persistent orders) during Continuous trading (i.e. persistent orders with Execution Instructions set to Continuous and Periodic Un-crossing).

10. Trading at Turquoise

10.1. Trading Calendar

Turquoise typically observes the domestic market practice for open business days. Therefore, where the Primary-market of a Security is closed on a business day, Turquoise will also be closed for that Market (for example, OMX Oslo is closed on the 24th December so Turquoise is also closed for the Norwegian Market).

Where there is cause for doubt a Market Notice is sent out to participants for clarification. The up-to-date Turquoise Trading Calendar can also found on the Turquoise website at www.tradeturquoise.com/tq_calendar.

10.2. Trading Sessions and Support

Each of the trading days within Turquoise is divided into the sessions shown in the following table and diagram.

Daily Trading Schedule

Time	Session Name	Order Book Type	Summary
04:31 – 07:59:59	System Start-up	Integrated and Midpoint	System connectivity allowed. No Order Entry allowed.
08:00-16:30	Normal Trading	Integrated and Midpoint	Order Entry allowed for all Securities. All order constraints enforced. Price and Value Checks enforced. Price Band Validation and Execution Limit Enforced. Continuous Matching in the Integrated Order Book. Continuous and Random Periodic Matching in the Dark Midpoint Order Book
Ad-Hoc	Trading Halt	Integrated and Midpoint	No Matching allowed. No Order Entry allowed. Cancellation of orders is permitted but amendments are not.
16:30	Close	Integrated and Midpoint	No order management. Persistent orders are cancelled. No matching.
17:00	End Of Day	Integrated and Midpoint	Capture of Closing Price. End Of Day Syncing with all CCPs.
17:05	System shutdown Start of end-of-day processes	Integrated and Midpoint	No access for market Members. The Closing Price will be calculated.

Support Schedule

Market Operations

Hours: 7:15 – 17:45

Number: +44 (0)20 7382 7676

Email: market.operations@tradeturquoise.com

Technical Account Management

Hours: 7:15 – 17:45

Number: +44 (0)20 7382 7699

Email: tam@tradeturquoise.com

10.3. Order Amendment and Cancellation during Trading Sessions

Amendments to orders are allowed at any time that the system accepts orders.

Not all fields are amendable by users, and some amendments may cause the time priority of an order to be re-set. As a general rule, if the amendment makes the order more executable the time priority will not be re-set. For example, reducing the minimum quantity of an order will not re-set the time priority.

Below is a summary of the main order attributes and their amendment capabilities.

Book	Buy/ Sell	Target Book	Symbol	(Price) Type	Price	Qty		Displayed Qty		MAQ/MES		Valid Til	Exec Inst	Client Ref
						+	-	+	-	+	-			
Integrated	x	x	x	↓	↓	↓	✓	✓	✓	✓	✓	✓	✓	✓
Midpoint	x	x	x	↓	↓	↑	↓	n/a	n/a	↓	↓	✓	✓	✓

✓ Change allowed without affecting Time (Integrated) or Size/Time (Dark) priority

↑ Change allowed, increases priority based on amended order quantity (Dark only)

↓ Change allowed, affecting time priority (Integrated) or Size/Time priority (Dark – where orders are of the same Size)

x Change not allowed, order must be cancelled and re-entered

Order Cancellations by clients can be made at any time, including during Trade Halts.

Additionally, orders are cancelled by the system in the following circumstances:

- An order has reached its expiration as set by the user.
- At market close (including Day, GTD and GTC order validities), specific to the Primary-market.
- A client disconnects from the trading gateway, if the Cancel-on-Disconnect feature is specified by the client or is mandatory as part of the interface being used.
- Eligible orders may execute partially up to the MOEL, with the remainder of the order being cancelled
- Turquoise Market Operations (MOPS) may in certain circumstances, including if requested by a client, intervene and cancel an order.
- If a User enters a Mass Cancellation, all orders within the same Trader Group are cancelled from a single FIX session (FIX specific).

11. Normal Trading

11.1. Execution Priority

The system determines execution priority based on the following hierarchy.

Integrated Order Book:

- i) **Price:** Orders that are priced more aggressively have priority
- ii) **Visibility:** Within a price point, Visible quantities of all orders, will have priority over Hidden quantities. Hidden quantities of Iceberg Orders have priority over Hidden LIS order quantities
- iii) **Time:** Within a price point and visibility category, earlier time priority has preference.

Time priority is assigned:

- when an order is received during Normal Trading
- when an order is modified (only for certain modification types)
- when an Iceberg Order's Visible display size is replenished after depletion.

Size constraints (MAQ): Applies only to orders with IOC, FOK time qualifiers and Market Orders with MAQ specified.

Dark Midpoint Order Book:

Orders with larger sizes will be given higher priority than orders of smaller sizes. Partial filling of an order will not result in an order losing its priority.

Where two orders share the same Size priority, Time priority will then apply. Time priority is assigned at the point of order entry and may be updated when the order is modified (only for certain modification types).

12. Trading Halts

Trading Halts are controlled by Turquoise Market Operations. A Trading Halt may be followed by resumption of the Normal Trading session if the market is not closed before Market Operations deems an instrument tradable.

12.1. Within Turquoise

In response to information within Turquoise, Market Operations can halt Securities immediately via an ad-hoc change to a Securities Trading Status.

12.2. Within Primary-markets

Turquoise will ascertain from a Primary-market's feed whether a Trading Suspension/Halt was based on regulatory reasons, a volatility break or a technical fault. However, Turquoise will halt the trading for a Security irrespective of the reason.

12.3. Impact of a Trading Halt

If a Trading Halt is enforced by Turquoise Market Operations, the trading on both the Integrated Order Book and the Dark Midpoint Order Book for the Security halted will be affected as follows:

- Existing orders will remain in the Order Book.
- New orders will be rejected, with appropriate error message.
- Members will be able to cancel their orders, but no order amendment will be permitted.
- No matching will occur (updates to the PMP affecting the set of orders available for matching in the Dark Midpoint Order Book will not result in any matches).

13. Test Securities

13.1. Within Production

Turquoise offers Pan-European and US test Securities for testing of Turquoise functionality. These Test Securities:

- Cover all the tradable currencies at Turquoise.
- Cover full functionality offered by Turquoise.
- Market Operations may arbitrarily suspend the Test Securities from time to time for the purpose of system stability and performance.
- Test Securities are not passed to clearing and are not included in Trade Statistics or sent to Surveillance.

14. Trading Tariff Model

14.1. Trading Tariff model

Turquoise uses a Passive/Aggressive (Maker/Taker) tariff model for its Integrated Order Book, and a flat tariff model for its Dark Midpoint Order Book. Pricing promotions including volume discounts are sometimes offered.

All tariff information is publically available. Please refer to the Tariff Schedule document located on the Turquoise website for up-to-date information: www.tradeturquoise.com/tq_tariff_download

14.2. Categorisation of Trades

14.2.1. Midpoint Order Book

All trades on midpoint book are considered as Dark for the purposes of billing.

14.2.2. Integrated Order Book

Executed orders will be categorised as Passive or Aggressive.

- Orders that 'rest' on the book prior to execution are Passive
- Orders (or portions of orders) that execute without resting are Aggressive.

Executed orders will additionally be categorised as Displayed or Hidden

- Executed visible Passive orders (including the visible portion of iceberg orders) disseminated in market data before execution are Displayed.
- LIS Hidden orders and the non-displayed portion of iceberg orders are Hidden
- Non-persistent orders and LIS Hidden will be designated as Hidden

14.3. Types of Trade for Billing

Turquoise currently charges differently for the following categories:

- Dark – including Midpoint Book executions and Hidden Passive executions on the Integrated Book
- Passive – Displayed Passive executions on the Integrated Book
- Aggressive – all Aggressive executions on the Integrated Book

15. Interfaces and Information Dissemination

Turquoise provides a gateway to enter orders into the trading system, receive market data, send trade reports, download own order and trade information.

15.1. Native Trading Gateway

The Native trading gateway provides a low latency trading interface which allows participants to send and manage orders on the trading system. The interface enables clients to perform the following activities:

- i) Submit an order
- ii) Cancel an order
- iii) Mass Cancel orders
- iv) Cancel/Replace an order

The entry of trade reports is not supported by the Native Trade Gateway.

The Native Trading Gateway uses a proprietary interface referred to as the Native interface. The Native interface consists of two channels. A Real-Time channel that provides the main order management functionality and a Recovery channel that allows clients to subscribe to missed messages due to a disconnection from the Real-Time channel.

15.2. FIX Trading Gateway

The FIX trading gateway allows participants to send and manage orders on the trading system. The interface enables clients to perform the activities outlined below.

- i) Submit an order
- ii) Cancel an order
- iii) Mass Cancel orders
- iv) Cancel/Replace an order

The entry of trade reports is not supported by the FIX Trading Gateway. The FIX Trading Gateway uses the FIX 5.0 SP2 protocol.

15.3. FIX Drop Copy Gateway

Turquoise provides a gateway to receive additional copies of Execution Reports generated by the trading system. This gateway may also be used by clients to download the current status of all their active orders in the event of a failure. The drop copy service cannot be used to submit orders or receive market data. The drop copy gateway uses the FIX 5.0 SP2 protocol.

15.4. FIX Post Trade Gateway

Turquoise provides a FIX post trade gateway that permits participants to perform the activities outlined below:

- i) Receive real-time updates on executed trades
- ii) Receive information on executed trades via a query-based service to facilitate a recovery after a failure.
- iii) Submit an off-book trade for registration
- iv) Request the cancellation of a confirmed off-book trade

The entry of quotes or orders is not supported by the post trade gateway. The post trade gateway uses the FIX 5.0 SP2 protocol.

15.5. Native Market Data Gateway

The Market Data gateway provides a stream of fixed width binary messages which provides the following real-time information:

- i) Order depth for the entire Integrated Order Book.
- ii) Price and volume for each executed on-book trade for both the Integrated Order Book and Dark Midpoint Order Book.
- iii) Price, volume, date and time of each confirmed off-book trade if those trades require reporting under FSA regulations.
- iv) Trading status of each instrument

The feed also includes a daily download of the instrument list of Turquoise (Symbol Directory). The Market Data gateway uses a proprietary interface based on the ITCH protocol via UDP multicast.

15.6. Detailed information regarding interfacing and information dissemination

For further information regarding interfacing with Turquoise please refer to the following documentation:

- TQ102 - Connectivity Guide
- TQ201 - Trading Gateway (FIX 5.0)
- TQ202 - Post Trade Gateway (FIX 5.0)
- TQ203 - Drop Copy Gateway (FIX 5.0)
- TQ301 - Trading Gateway (Native)
- TQ401 - Level-2 ITCH Market Data
- TQ501 - Guide to Reference Data Services
- TQ601 – Guide to Certification

All of the above documentation can be found at www.tradeturquoise.com/tq_resources under 'Turquoise Equities'.

16. Appendix 1

The below matrix describes the order routing logic if the Target Book (FIX tag RoutingInst (9303)) is not specified.

#	Time In Force	Order Type	Display Quantity	Price x Order Quantity)	MAQ	Destination book	
1	DAY, GTC, GTD, GTT	Limit	0	< LIS	> 0	Dark Midpoint	
2					0 or Null	Dark Midpoint	
3				>= LIS	> 0	Dark Midpoint	
4					0 or Null	Integrated, as Hidden Order	
5			> 0	< LIS	> 0	Integrated - Reject*	
6					0 or Null	Integrated	
7				>= LIS	> 0	Integrated - Reject *	
8					0 or Null	Integrated	
9			Null	< LIS	> 0	Integrated - Reject *	
10					0 or Null	Integrated	
11				>= LIS	> 0	Integrated - Reject *	
12					0 or Null	Integrated	
13		Market	0	< LIS	> 0	Dark Midpoint	
14					0 or Null	Dark Midpoint	
15				>= LIS	> 0	Dark Midpoint	
16					0 or Null	Dark Midpoint	
17			> 0	< LIS	> 0	Integrated	
18					0 or Null	Integrated	
19				>= LIS	> 0	Integrated	
20					0 or Null	Integrated	
21			Null	< LIS	> 0	Integrated	
22					0 or Null	Integrated	
23				>= LIS	> 0	Integrated	
24					0 or Null	Integrated	
26			Peg	0	< LIS	> 0	Dark Midpoint
27						0 or Null	Dark Midpoint
28					>= LIS	> 0	Dark Midpoint
29						0 or Null	Dark Midpoint

30			> 0	< LIS	> 0	Dark Midpoint - Reject**
31					0 or Null	Dark Midpoint - Reject**
32				>= LIS	> 0	Dark Midpoint - Reject**
33					0 or Null	Dark Midpoint - Reject**
34			Null	< LIS	> 0	Dark Midpoint
35					0 or Null	Dark Midpoint
36				>= LIS	> 0	Dark Midpoint
37					0 or Null	Dark Midpoint
38	IOC, FOK	Any (Limit, Market, Peg)	0	< LIS	> 0	Dark Midpoint
39					0 or Null	Dark Midpoint
40				>= LIS	> 0	Dark Midpoint
41					0 or Null	Dark Midpoint
42			> 0	< LIS	> 0	Integrated
43					0 or Null	Integrated
44				>= LIS	> 0	Integrated
45					0 or Null	Integrated
46			Null	< LIS	> 0	Integrated
47					0 or Null	Integrated
48				>= LIS	> 0	Integrated
49					0 or Null	Integrated

*Order will be routed to Integrated Order Book and will be rejected by matching engine since Integrated Order Book does not support MAQ on persistent orders.

**Order will be routed to the Dark Midpoint Order Book and will be rejected by matching engine since Dark Midpoint Order Book does not accept orders with disclosed quantity.