TURQUOISE

Technical Specification
FIX Certification Service Overview

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1. Overview

The purpose of this document is to provide a summary of the activities required to undertake certification tests on the Turquoise Trading System. The Certification Tests are intended to cover a range of functional elements in order to demonstrate that a participant can successfully interact and perform as specified with the core Turquoise architecture. This mandatory testing is designed to ensure that a robust platform is in operation between participants and Turquoise to ensure a stable, productive and performant service.

Certification testing is categorised in five sections: Session Management, Information Certification, Trading Certification, Quoting Certification and Drop Copy. An additional and optional section for use with the TQ-LENS service is also provided. A more detailed specification of the test cycles will be adhered to during the certification testing.

Session Management defines the initial interaction between a member firm's application and the Turquoise Trading System. The objectivity of this test is to establish that the connectivity and logon requirements have been implemented correctly.

On completion of the Session Management testing, certification testing can commence for Information Certification and Trading Certification.

The Information Certification and Trading Certification procedures consist of a set of test cycles designed to create a series of technical events oriented to assess a participant's ability to process specific trading and information messages defined by the FIX interface.

The Certification process allows for participants to be tested for the functionality to be used in Live service. Therefore it is important to review the cycles thoroughly and agree the scope of the certification with Technical Account Management in advance of the date of the certification test.

2. Testing Arrangements

Prior to undertaking certification, all participants are required to have completed a Connectivity Agreement and have confirmed connectivity to the Customer Testing Platform environment either via private network or VPN. Participants requiring exemptions from cycles of the test should have confirmed these with Technical Account Management at least one full working day prior to the day of the test. In certain circumstances additional test steps may be requested due to the exemptions requested.

Certification testing is arranged between a participant and Technical Account Management. Whilst participants should provide three working days notice for a test, short notice bookings may be available at the discretion of Technical Account Management.

Full certification testing is expected to elapse approximately 2 hours. The testing session may need to be extended where there is a requirement to re-run test cycles. Testing will be available between 8:00AM and 16:30PM Monday to Friday.

3. Session Management

The Session Management test assesses the ability to establish a connection, and login. This forms the initial phase of the Trading Certification tests. Connection to the system must be maintained throughout the full testing schedule. A failure to maintain a connection at any point during the Session Management or Information or Trading phases will constitute a failure of the certification test.

Please note that if at any point a `heartbeat` message is not received after the `heartbeatInterval` periods have elapsed, the Customer Testing Platform will logoff the user and disconnect the session. This will also constitute a failure of the certification test.

Section Number	Activity	Participant Input	Turquoise Output	Mandatory/ Optional
1	A logon message (35=A) should be sent to Turquoise to establish a connection and agree on session parameters such as heartbeat intervals and sequence numbers.	Logon (Message Type = A)	Logon (Message Type = A)	M
2	After a logon has been successfully established, Turquoise and the application will send heartbeats at the times of the intervals set (35=0).	Heartbeat (Message Type = 0)	Heartbeat (Message Type = 0)	O
3	The user at any time can query the sequence numbers and communication line status by sending a heartbeat as a result of a test request message (35=1). The response will also be a heartbeat message with a test request ID.	Test Request (Message Type = 1)	Test Request (Message Type = 1)	O
4	A request to resend messages from Turquoise (35=2) by specifying the beginning and end sequence numbers for events.	Resend Request (Message Type = 2)	Resend Request (Message Type = 2)	O
5	A request to resend a single message by specifying the beginning and end sequence numbers to be the same.	Resend Request (Message Type = 2)	Resend Request (Message Type = 2)	O
6	Sequence Reset sent to Turquoise, specifying the new sequence number.	Sequence Reset (Message Type = 4)	Sequence Reset (Message Type = 4)	O
7	A logout message should be sent to Turquoise (35=5) to successfully terminate the connection to the TTS.	Logout (Message Type = 5)	Logout (Message Type = 5)	M

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4. Information Certification

During the Information Certification test the full range of messages that can be generated during a daily life cycle of the Turquoise Trading System are disseminated.

Section Number	Activity	Participant Input	Turquoise Output	FIX Version	Mandatory/ Optional
1	A Security List request can be made to receive the list of tradable instruments on Turquoise. (35=x)	Security List Request (Message Type = x)	Security List (Message Type = y)	4.4	O
2	A Security Definition request can be made to receive the list of tradable instruments on Turquoise. (35=d)	Security Definition Request (Message Type = c)	Security Definition (Message Type = d)	4.2/4.4	O
3	Upon request unsolicited news messages will be sent outbound to the customer.	Unsolicited	News Message (Message Type = B)	4.2/4.4	O

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5. Trading Certification

The table below illustrates test cases for the FIX Trading Certification process. During the test we will ask a participant to enter credentials from our own test cases relevant to the supported functionality.

Section Number	Activity	Participant Input	Turquoise Output
	CLOSED		
1	The user enters a supported order	New Order Single (Message Type = D)	Execution Report (Message Type = 8)
	AUCTION PERIOD – The Orderbook enters an auction call.		
2	An order is entered Pegged to the TBBO bid	New Order Single (Message Type = D)	Execution Report (Message Type = 8)
3	A Dark Limit order is entered with a valid minimum acceptable volume.	New Order Single (Message Type = D)	Execution Report (Message Type = 8)
4	A limit order is entered with a valid Discretionary price with includes a fractional tick.	New Order Single (Message Type = D)	Execution Report (Message Type = 8)
5	A limit order is entered which is only valid for the auction	New Order Single (Message Type = D)	Execution Report (Message Type = 8)
6	A limit order is entered which is only valid for continuous trading.	New Order Single (Message Type = D)	Execution Report (Message Type = 8)
	OPEN – The auction uncrosses		
7	An order is entered Pegged to the TBBO bid without TBBO being available.	New Order Single (Message Type = D)	Execution Report (Message Type = 8)
8	A limit order is entered which is valid for the session.	New Order Single (Message Type = D)	Execution Report (Message Type = 8)
9	A Dark order is entered Pegged to the TBBO midpoint	New Order Single (Message Type = D)	Execution Report (Message Type = 8)
10	The price for order 8 is modified	New Cancel Replace Request (Message Type = G)	Execution Report (Message Type = 8)
11	A Dark limit order is entered	New Order Single (Message Type = D)	Execution Report (Message Type = 8)
12	A Dark limit order is entered by Turquoise	New Order Single (Message Type = D)	Execution Report (Message Type = 8)
14	A Dark market order is entered with a valid Minimum acceptable quantity.	New Order Single (Message Type = D)	Execution Report (Message Type = 8)
15	A Dark market order is entered with a valid Minimum acceptable quantity and set to Fill and Kill.	New Order Single (Message Type = D)	Execution Report (Message Type = 8)
17	An iceberg limit order is entered with a valid from set to two minutes in the future.	New Order Single (Message Type = D)	Execution Report (Message Type = 8)
18	A Dark order is entered with Valid Till set to 1 minute in the future.	New Order Single (Message Type = D)	Execution Report (Message Type = 8)
19	A limit order is entered with Valid From set to 3 minutes in the future and valid till set to 4 minutes in the future.	New Order Single (Message Type = D)	Execution Report (Message Type = 8)
20	Orders expire and execute.	New Order Single (Message Type = D)	Execution Report (Message Type = 8)
21	Fill and Kill Limit order is entered	New Order Single (Message Type = D)	Execution Report (Message Type = 8)
22	An Iceberg order is entered	New Order Single (Message Type = D)	Execution Report (Message Type = 8)
23	Fill or Kill Limit order is entered	New Order Single (Message Type = D)	Execution Report (Message Type = 8)
24	Fill and Kill Market order is entered	New Order Single (Message Type = D)	Execution Report (Message Type = 8)
25	Fill or Kill Market order is entered	New Order Single	Execution Report

		(Message Type = D)	(Message Type = 8)
26	An order is entered pegged to the TBBO bid.	New Order Single (Message Type = D)	Execution Report (Message Type = 8)
27	An order is entered pegged to the TBBO offer.	New Order Single (Message Type = D)	Execution Report (Message Type = 8)
28	An order is entered pegged to the TBBO bid with a 2 tick offset.	New Order Single (Message Type = D)	Execution Report (Message Type = 8)
29	An order is entered pegged to the TBBO offer with offset.	New Order Single (Message Type = D)	Execution Report (Message Type = 8)
30	An order is entered pegged to the EBBO bid.	New Order Single (Message Type = D)	Execution Report (Message Type = 8)
31	An order is entered pegged to the EBBO offer.	New Order Single (Message Type = D)	Execution Report (Message Type = 8)
32	An iceberg order is entered pegged to the EBBO offer.	New Order Single (Message Type = D)	Execution Report (Message Type = 8)
33	A dark order is entered pegged to the TBBO midpoint.	New Order Single (Message Type = D)	Execution Report (Message Type = 8)
34	A dark order is entered pegged to the TBBO bid.	New Order Single (Message Type = D)	Execution Report (Message Type = 8)
35	A dark order is entered pegged to the TBBO offer.	New Order Single (Message Type = D)	Execution Report (Message Type = 8)
36	A Dark order is entered pegged to the TBBO bid with offset.	New Order Single (Message Type = D)	Execution Report (Message Type = 8)
37	A Dark Order is entered pegged to the TBBO offer with offset.	New Order Single (Message Type = D)	Execution Report (Message Type = 8)
38	A dark order is entered pegged to the EBBO bid.	New Order Single (Message Type = D)	Execution Report (Message Type = 8)
39	A Dark order is entered pegged to the EBBO offer.	New Order Single (Message Type = D)	Execution Report (Message Type = 8)
40	Order 39 is cancelled	Order Cancel Request (Message Type= F)	Execution Report (Message Type = 8)
41	A limit order is entered and fully filled.	New Order Single (Message Type = D)	Execution Report (Message Type = 8)
42	Order 41 is Cancelled	Order Cancel Request (Message Type= F)	Order Cancel Reject (Message Type = 9)
43	A mass status request is sent to the system (FIX 4.4 only)	Order Mass Status Request (Message Type = AF)	Order Mass Status Request (Message Type = AF)
44	A Mass update is entered to cancel all remaining orders (FIX 4.4 only)	Order Mass Cancel Request (Message Type = q)	Order Mass Cancel Report (Message Type = r)

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6. Quoting Certification

The table below illustrates test cases for the FIX Quoting Certification process.

Section Number	Activity	Participant Input	Turquoise Output
1	A mass quote message is sent to Turquoise	Mass Quote (Message Type = i)	Quote Acknowledgement (Message Type = b)
2	A mass quote message is amended for one instrument.	Mass Quote (Message Type = i)	Quote Acknowledgement (Message Type = b)
3	A mass quote message is cancelled for one instrument.	Quote Cancel (Message Type = Z)	Quote Acknowledgement (Message Type = b)
4	A mass quote message is cancelled for all instruments.	Quote Cancel (Message Type = Z)	Quote Acknowledgement (Message Type = b)

7. Drop Copy

Should a participant specify to utilise the drop copy functionality within the FIX environment, Turquoise will request the user to logon to the Drop Copy FIX session and ensure they are receiving trades from executed orders. Further information on this can be provided by Technical Account Management.

Section Number	Activity	Participant Input	Turquoise Output
1	Execution Reports are sent outbound from Turquoise.	Unsolicited	Execution Report (Message Type = 8)

8. TQ-LENS

The TQ-LENS liquidity aggregation service is optionally available to FIX 4.2 and FIX 4.4 participants.

Section Number	Activity	Participant Input	Turquoise Output
1	A Block order is entered. ISIN: IT0000064854	New Order Single (Message Type = D) Tag TQLExecMethod(9012)=200	Execution Report (Message Type = 8) • Trade Order is considered Block due to tag TQLExecMethod(9012) value, order quantity meets minimum order size requirement for Block orders.
2	A Flow order is entered. ISIN: IT0000064854	New Order Single (Message Type = D) Tag TQLExecMethod(9012)=100	Execution Report (Message Type = 8) • Trade Order is considered Flow due to tag TQLExecMethod(9012) value.
3	Invalid fee condition: A Block order is entered with a quantity below the minimum size requirement. ISIN: FI0009000681	New Order Single (Message Type = D)	Execution Report (Message Type = 8) • Rejection.
4	A Block order is entered without specifying a strategy. ISIN: IT0000064854	New Order Single (Message Type = D) Tag TQLStrategy(9007) omitted.	Execution Report (Message Type = 8) • Execution. Default strategy invoked: TQLStrategy(9007)=2
5	An existing order is cancelled. ISIN: DE0005190003	Order Cancel Request (Message Type = F)	Execution Report (Message Type = 8) • Trade • Pending Cancel • Cancel
6	A Flow/Block order is entered specifying the maximum amount to route to each liquidity venue. ISIN: GB0031348658	New Order Single (Message Type = D) Tag TQLStrategy(9007)=3 DPMaxQty(9014) is specified.	Execution Report (Message Type = 8) • Trade
7	A strategy 2 order (IOC to TQ-MTF first then seek non-displayed liquidity) entered. No executions occur at the TQ-MTF; the order is then distributed to all liquidity venues according to strategy 3. ISIN: FR0000133308	New Order Single (Message Type = D) Tag TQLStrategy(9007)=2 denoting: IOC to Turquoise first then seek non-displayed liquidity.	Execution Report (Message Type = 8) • Trade
8	Enter a strategy 3 order with a Good Till Time of 2 minutes. ISIN: AT0000606306	New Order Single (Message Type = D) Tag TQLStrategy(9007)=3 Good Till Time specified as less than 4 minutes then the send time using than ExpireTime(126).	Execution Report (Message Type = 8) • Trade Execution Report (Message Type = 8) • Pending Cancel • Cancel
9	Enter a Cancel/Replace Request for an existing Block order. ISIN: DE000PAH0038	New Order Single (Message Type = D) Cancel/Replace Request (Message Type = G) Tag TQLStrategy(9007)=3	Execution Report (Message Type = 8) • Pending Replace • Replace

10	Strategy 1 order is entered with a TQLTimestamp set to expire 2 minutes into the future. ISIN: IT0000072733	New Order Single (Message Type = D) Tag TQLStrategy(9007)=1 TQLTimestamp(9008) set to 120 seconds into the future.	Execution Report (Message Type = 8) • Trade
11	A Block of Flow order is entered specifying exclude-self. ISIN: IT0000064854	New Order Single (Message Type = D) ExecInst(18)=2 X	Execution Report (Message Type = 8) • Trade