

T7 Release 5.0

FIX Gateway

An Introduction

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Abstract

This document provides first information for Xetra Participants regarding the Migration to T7. The purpose of this document is to provide an introduction of the T7 FIX Gateway to participants.

Keywords

Xetra, T7, FIX Gateway

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1 List of Abbreviations, Acronyms and Definitions

Please find a list of all the abbreviations used in the document. The first time an abbreviation is introduced in the document it is written in brackets after the phrase.

ETI	Enhanced Trading Interface
Xetra®	Cash Market Electronic Trading system of DBAG
Participant	The Xetra concept of a member will be represented by a “participant” within T7

2 Introduction

The T7 architecture is the industry-leading, multi-asset trading platform of the Deutsche Börse Group, its affiliates and partners.

The system has best-in-class performance and is scalable to support any sized market. It can be customized to support different types of markets.

The FIX Gateway, which already exists for the T7 trading architecture, will be enhanced to support also the Xetra system. The interface is intended for participants that require a standard FIX connection to the exchange. The T7 FIX Gateway supports version 4.2 and version 4.4 of the FIX protocol.

The interface is a point-to-point service based on the technology and industry standards TCP/IP, FIX and FIX Session

The FIX Gateway provides the following trading functions for Xetra on the trading architecture T7:

- Order management
- Execution notifications
- Cross request
- Quote request
- Risk control events¹

Additionally the FIX Gateway enables participants to subscribe to private trading data in broadcast form:

- Trade notifications at a business unit level
- Drop Copy for standard (not lean) orders at business unit level

Note: This document provides a general introduction to the FIX Gateway on T7 and describes some differences to the existing Xetra interface. A delta overview is provided in the appendix of this document.

For access to T7 via the FIX Gateway, new FIX sessions need to be ordered by the participant for its business units.

2.1 Purpose

The purpose of this document is to provide an overview of the FIX Gateway when connected to T7. The focus of the description is to capture Xetra relevant behaviour, highlight where it deviates from the recommended FIX Protocol standard and keep the amount of the FIX specification which needs to be included in this document to a minimum. For further detail the participant should refer to the FIX Gateway Manual (Preliminary Version), which will be published on the Xetra website in December 2016. Furthermore, the document "Interface Differences between Xetra Classic and T7" will be published in November 2016.

2.2 Readership

The main target group is technical staff within the Exchange's participants firms. Throughout this document the term "participant" stands for a Xetra member firm.

¹ e.g. when a breach on a certain level of risk limits occurs, the participant will be informed via the Risk Notification Message

3 Services Description

The FIX Gateway mainly supports:

- Order handling
- Cross request
- Trade notifications at a business unit level
- Quote request
- Risk control events

The FIX Gateway supports two types of sessions:

- **Trading sessions** that support order management, cross request, quote request and risk control events.
- **Back-office sessions** that receive trade confirmations for the business unit. Clearing business units receive trade confirmations from its trading business units and from its non-clearing members. Back-office sessions can be configured to receive additionally drop copy information for standard (not lean) orders as well as risk control events at the business unit level.

3.1 Party Identification

The **participant** is an entity accessing T7. The Xetra concept of a member remains in place, and will be represented by a “participant” within T7. When trades are sent to the clearing system, the participant will be replaced by its corresponding member-ID.

A participant may have several **business units** as independent entities taking part in trading at the exchange. Business units are identified by a business unit ID. A business unit belongs to a participant.

A **user** is a person, e.g. a trader or an exchange market supervisor that interacts with T7. Users are identified by a user ID. A user belongs to one business unit. A user is a trader or administrator that logs on to the system to enter commands on the trading system.

Users can be assigned to a specific **trader group**, along with the head trader and supervisor roles:

- A user with a user level of head trader may modify or cancel orders of any user belonging to the same trader group.
- A user with a user level of supervisor may modify or cancel orders of any user belonging to the same business unit.

All orders must carry the user ID of the trader that is legally responsible for the order.

Party	Description	Party Attributes
Participant	The participant is an entity accessing T7.	Participant Short Name
Business Unit	Indicates the name of a company or a part of a company that is set up as an independent entity taking part in trading at the exchange.	Business Unit ID
User	A business unit can have multiple users. A user can be a trading user and/or an administrator.	User ID
Owning User	User who owns the transaction.	Owning User ID Owning User Short Name

Party	Description	Party Attributes
Entering User	User who initiates/submits the order/quote transaction; could be the head trader or supervisor or a market supervision user.	Entering User ID
Entering Entity	Identifies the entity that entered the transaction; might be market supervision, the participant or the clearing member.	Entering Entity ID
Clearing firm	Counterparty: Settlement institute or clearing bank identification for trades and clearing house identification for CCP trades respectively.	Counterparty Settlement Institute
Settlement Account	Settlement Account Identification	Settlement location
Executing System	Executing system information.	Executing System ID

3.2 Market Identification

For identification of a tradable instrument on Xetra via the FIX Gateway, the market identifier (MIC Code) must be entered into field *ExDestination (100)* in all messages. It will be echoed on the *Execution Report (8)* in field *ExDestination (100)*.

Supported markets on Xetra include the following Marketing identifier codes:

Market Identifier Code	Description
XDUB	Irish Stock Exchange
XETR	Xetra
XVIE	Vienna Stock Exchange

3.3 Security Identification

For the T7 FIX interface the security identification of the instruments based on ISIN and the Instrument Identifier and will be supported by the entry, modification and deletion of orders. The instrument identifier uniquely identifies an instrument in the core system.

If SecurityIDSource (22) = 4 (ISIN) is set, the FIX Gateway will find the corresponding Security ID in the FIX Gateway database and set it in the ETI request.

For unsolicited messages the instrument identifier will be delivered in the generated FIX message. This applies for unsolicited messages via trading session and for all messages sent via back office session.

Instrument data will not be provided by FIX Gateway.

3.4 Order ID Policy

The standard FIX policy regarding usage of Client Order IDs is supported by the T7 FIX Gateway.

Order related messages must include a unique customer defined identifier, the Client Order ID, in the *CIOrdID (11)* field.

CIOrdIDs with 20 characters or less are accepted. Characters in ASCII range 32-126 are allowed.

A CIOrdID may only be used once per business day and trading session. Additionally the FIX Gateway enforces the uniqueness of CIOrdID values among currently live orders.

The Client Order ID needs to change on every modification and cancellation request; the original scope is specified by the *OrigClOrdID (41)*. In this way the customer is able to find and track individual requests by their Client Order ID. This FIX concept is called message chaining and intended for order handling through a single interface and session.

Orders entered through the FIX Gateway can be modified through sessions of other interfaces, i.e. T7 Enhanced Trading Interface (ETI). ETI supports message chaining but does not enforce it. It is recommended to avoid using message chaining in both the FIX Gateway and ETI in order to receive order updates conducted through ETI also on the FIX Gateway. This can be done by setting *ClOrdID (11) = OrigClOrdID (41)* in ETI which is not permitted in the FIX Gateway.

Note: The FIX Gateway will ignore trailing spaces in the field ClOrdID when a client order ID is checked for uniqueness among currently live orders. A newly entered ClOrdID is considered duplicate by the FIX Gateway, if it only differs in the number of trailing spaces from the ClOrdID of a live order. In this case the FIX Gateway will send a Business Message Reject (j) message denoted by *BusinessRejectReason (380) = 0 (Other)* and *Text (58) = "ClOrdID is not unique."*

Example: If a live order exists with the *ClOrdID (11) = "Test"*, any request with *ClOrdID (11) = "Test_"* will be rejected. Note that this has no impact on the *OrigClOrdID*, which still must provide the correct number of trailing spaces to identify the corresponding order.

3.5 Order Management

A FIX session can only modify or cancel own orders (i.e. orders previously submitted successfully on the same FIX session. This also applies to Mass delete requests).

3.5.1 Order Types and Restrictions

The following Xetra order types and trading-/validity-/execution-restrictions are supported via the FIX Gateway:

Order Types and Restrictions	Description
Market	Market orders are visible in the order book for any market participant and have no specific price limit, but are matched to the best available contra-side bid or offer.
Limit	Limit order include a specific price limit, and may not be executed at a price worse than that limit.
Stop (Market)	Stop market order create market orders when the specified trigger price is reached. Similar to market orders, stop orders are visible in the order book for any market participant.
Stop (Limit)	Stop limit orders create limit orders when the specified trigger price is reached. Similar to market orders, stop orders are not visible in the order book for any market participant.
Iceberg Order	Limit Order that contains a peak quantity and an overall quantity. The peak quantity can be determined absolutely or randomly. Once the displayed quantity has been completely executed, a new peak is entered into the book. In auction trading, iceberg orders contribute with their overall volume.
Immediate or Cancel (IOC)	An IOC order is to be filled immediately, either completely or to the extent possible; the portion that cannot be filled immediately is cancelled.
Fill or Kill	A Market or Limit order, which is executed immediately and fully or not at all. If immediate and full execution is not possible, the order is rejected without entry in the order book.
Book or Cancel	An order, which is placed as resting liquidity in the order book to ensure passive execution. If immediate (and hence aggressive) execution is possible, the order is rejected without entry into the order book.
Trailing Stop	A Trailing Stop order is a Stop order whose stop limit is adjusted in accordance with the development of the reference price. Because of the dynamic adjustment of the stop limit the investor does not need to permanently watch the market in order to optimise his stop limit.
One-cancels-the-other	An order that combines the functionality of a limit order and a stop (market) order, expressed as a single order. Traders will specify a limit price and a trigger price as part of one order.
Opening auction only	Order only valid in opening auctions.
Closing auction only	Closing auction only orders may be entered during the entire trading day, but are only active during the closing auction phase.
Auction only	Order only valid in auctions.
Good-for-day (Day)	Day orders are deleted automatically in the next end-of-day processing.
Good-till-date (GTD)	Order carries a specified date on which the order is automatically

Order Types and Restrictions	Description
Good-till-cancelled (GTC)	Order remains valid until the last trading day is reached..
Persistent	A persistent order is an order that is reinstated at the beginning of the Business Day (if valid for that Business Day) or after a Market Reset.
Non-persistent	Non-persistent orders are automatically cancelled at the end of the Business Day or after a Market reset. They are also cancelled in case of some system events and session connection problems.

3.5.2 Cancellation

The FIX session may only cancel orders that have been entered previously via the same session. Cancelling an order will remove the remainder of a live order from the Xetra trading system's order book. The participant must use the *OrigClOrdID (41)* to identify the order to cancel. The FIX Gateway will respond with an *ExecutionReport (8)* or *OrderCancelReject (9)* message for confirmation or rejection respectively.

Participants can also submit Order Mass Action Request in order to delete all active orders for the respective session in a given instrument. The Order Mass Action Request can be further restricted to a defined trader and/or a defined instrument.

3.5.3 Modification

The FIX session may only modify orders that have been entered previously via the same session. The participant must use the *OrigClOrdID (41)* to identify the order to modify.

The FIX Gateway will respond with an *ExecutionReport (8)* or *OrderCancelReject (9)* message for confirmation or rejection respectively.

The *ExecutionReport (8)* will contain *ExecRestatementReason (378) = 181* (ownership changed) if the order ownership was changed. This will be the case if the submitter (Entering Trader) of the modify request is different from the original owner of the order.

Orders that have been completely filled may not be modified anymore.

Note: Modifications of the total order quantity to a quantity less than or equal to the cumulated executed order quantity will be interpreted as a cancel request.

3.5.4 Account Structure

The mandatory field *TradingCapacity (1815)* specifies the relationship between the market participant and the order.

Business Type	Description
Agency	Market Participant is trading on behalf of its customer.
Proprietary	Market Participant is trading for its own account.
Market Making	Market Participant is acting as a Market Maker.

The entry of a Xetra account type and number is supported via the *Account (1)* field designating the account type to be used for the order when submitted to clearing. There are different types of accounts:

- A1 = Agent
- M1 = Designated Sponsor
- P1 = Proprietary

Every order entered into the Xetra trading system must be associated with one account type.

Note: T7 will not evaluate the consistency between *TradingCapacity (1815)* and *Account (1)* for an order. In case an invalid *Account (1)* is entered for an order, a default value will be applied for clearing purposes; the *Execution Report (8)* will only echo the entered value in *Account (1)*.

3.5.5 Order Book Restatement

During the start-of-day phase and after a market reset event (an exchange system failure), all active orders of a session will be transmitted to the market participant via the respective session.

During Order Book Restatement *ExecutionReport (8)* messages for each restated order of the corresponding session are provided and finally a *TradingSessionStatus (h)* message indicates the end of the restatement per instrument; see chapter 3.5.7 Trading Session Events.

The reason for the restatement is communicated in field *ExecRestatementReason (378)* in message *ExecutionReport (8)*.

Each end of restatement message initiates the start of trading for an instrument.

ExecRestatementReason (378) will have the value "001 = Order Book Restatement".

3.5.6 Mass Cancellation Notification

Mass cancellation notification is not provided on a single order level. The owning session will be informed about the scope of the cancellation by a summary record. The summary record will also provide the entering parties involved and the reason for the mass cancellation.

Unsolicited order mass cancellation is communicated by the FIX Gateway via the *OrderMassActionReport (UBZ)* message.

Orders that couldn't be cancelled due to an incompatible instrument state are provided with their Exchange Order ID (*NotAffectedOrderID (1371)* in the <NotAffectedOrdersGrp>).

The reason for the mass cancellation event is communicated in field *MassActionReason (28734)* in message *OrderMassActionReport (UBZ)*.

3.5.7 Trading Session Events

The *Trading Session Status (h)* message is used by the FIX Gateway for all session related events.

Trading session events might imply mass cancellation events, where no explicit mass cancellation notifications are provided; for details see the following table:

Event	TradSesEvent (1368)	Persistent Orders	Non-persistent Orders
Market Reset	Market reset (102)	No	Yes
End of Restatement	End of restatement (103)	No	Yes
Service Resumed	Service resumed (105)	No	Yes

Event	TradSesEvent (1368)	Persistent Orders	Non-persistent Orders
End of Service	No more messages (200)	No	Yes
Session Disconnect	Message processing suspended (202)	No	Yes

The “Market Reset” event informs the participant that the matching engine has been restarted.

The “End of Restatement” event implies that all non-persistent orders of the session in a product² have been cancelled; in this case no individual cancellation notifications are provided on individual order level.

The “Service Resumed” event informs the participant that the matcher has started accepting transactions after a slow partition event. All non-persistent orders of the session in a product have been cancelled.

The “End of Service” event informs the participant about the end of message transmission.

The “Session Disconnect” event informs the participant about the disconnection of the ETI session.

3.6 Trade Notifications

Customers will use drop copy sessions for receipt of trade confirmations for the business unit.

The scope for all *TradeCaptureReport (UAE/AE)* messages will be the business unit; all trade information the business unit is authorized to see will be provided within one stream; for clearing business units this feature includes the provision of all trade information for all of its non-clearing business units.

After a back-office FIX session logon, the transmission of all trades of the current business day is triggered.

Newly generated trades and trade reversals on T7 will automatically be transmitted via the Back-office FIX session.

If a trade should be cancelled, additional *Trade Capture Report (UAE/AE)* messages will be received with *TradeReportType (856)* equals “6” (Trade Report Cancel). *TradeCaptureReports (UAE/AE)* are only sent for on-exchange trades.

Note: All order response information in the FIX Gateway is preliminary; this includes *ExecutionReports (8)* sent out for persistent and non-persistent orders.

For these reasons, a participant application always needs to confirm the preliminary execution information with the corresponding legally binding *TradeCaptureReport (UAE/AE)*.

3.7 Cross Request

A cross trade is a trade where a participant trades against an own order in the order book. In a pre-arranged trade, orders from at least two participants are executed against each other as previously negotiated. Cross and pre-arranged trades may not knowingly be entered into T7 by a participant, unless the participant precedes the cross or pre-arranged trade with a cross request.

A trader sends the FIX Gateway message *CrossRequest (U100)* which is published via Market Data Interface to all other participants, to alert them of the intention to trade with an own order or pre-arranged trade.

The cross request contains the security identification and the *OrderQty (38)*, which is mandatory for regulatory reasons. Optionally the *Side (54)* can be specified by the entering user. In case no side is specified, the quantity is valid for both sides by default.

² A product is equal to an instrument for the cash market in general. ETFs & ETPs can be grouped as one product.

3.8 Self Match Prevention

The Self Match Prevention (SMP) functionality allows participants to prevent an execution of an incoming order against a book order or quote side from the same business unit in the same instrument (crossing). Participants can specify an individual Self Match Prevention ID in the field *MatchInstCrossID* (28744) which is contained in the component <MtchgInst> (Matching Instructions).

The *ExecutionReport* (8) will contain the field *Crossed* (28745) with the valid value 1 (*Cross rejected*) if the order was deleted or modified due to SMP.

3.9 Request for Quote

The request for quote functionality is used by a trader for asking market makers to enter a quote in a specified instrument. This functionality is supported in the FIX Gateway by the standard FIX message *Quote Request* (R). All requests for quote are published via the market data interface to all other participants. Every *Quote Request* (R) message contains the security identification.

A *Quote Request* (R) message might be rejected with an error message indicating a previous request for quote has already recently been sent.

Note: A *Quote Request* (R) message is validated against the available quantities at the best price and the corresponding bid/ask spread in the market. A *Mass Quote Acknowledgement* (b) message confirms the quote request or might indicate that the quote has been rejected.

3.10 Risk Control Event Notifications

The FIX Gateway supports the dissemination of Risk control event notifications on both the Trading and Back-office sessions. Available notifications will be provided in the FIX Gateway Manual at a later point of time.

3.11 Mass Deletion Request

The *Mass Deletion Request* (UCA) will allow deletion of multiple orders. Orders may be filtered by Product identifier (Symbol) or Product identifier (Symbol) and Security identifier (SecurityID).

The user may delete orders owned by a different trader. In this case the owning trader must be provided by the appropriate target occurrence/field TargetPartyRole "executing trader"

The user may delete only part of their orders for one instrument by entering the additional filter criteria side and price. For the buy side the orders will be deleted starting from the highest price until the price specified in the filter, for the sell side starting from the lowest price.

The request will be answered by a *User Order Mass Action Response* (UCAR) message having MassActionResponse set to "Completed" , if successful. The message then has two different layouts depending on whether any orders were affected or not ("No hits message"). A rejected request will be answered by a *User Order Mass Action Response* (UCAR) message having MassActionResponse set to "Rejected" and providing an error code/explaining text in ReturnCode/ReturnCodeText respectively.

3.12 Drop Copy for Order Information (Business Unit Level)

Drop copy functionality for standard (not lean) orders of a business unit of the current business day is provided as an optional feature of the Back-office FIX session.

When the client chooses the drop copy feature for a Back-office FIX session in the Xetra Member Section, the order-information of the current business day for all standard (not lean) orders of the member is provided on a stream basis:

- After a Back-office session logon, the transmission of all active orders for the current business day can be requested *via ResendRequest (2)*.
- Newly generated messages for standard (not lean) orders on the back end will automatically be transmitted via the Back-office FIX session.
- All drop copy information for standard (not lean) orders will be sent via FIX messages (*ExecutionReport (8)*, *UserOrderMassActionReport (UBZ)*).

4 Connectivity and Session Parameters

4.1 Session Concept

As per the FIX Protocol standard, a FIX session is defined as a bi-directional stream of ordered messages between two parties within a continuous sequence number.

A participant may have multiple FIX sessions. A FIX session will be initiated by the participant, and maintained between the participant and the FIX Gateway over the course of a trading day.

The FIX Gateway will support two types of FIX sessions; Trading and Back-Office FIX Sessions.

Trading FIX Sessions are used for order management. Each session will receive information for all of its own orders. Several traders may share a single session, but every session can only be instantiated once.

Back-office FIX sessions are used for receipt of trade confirmations at a business unit level. Clearing business units receive trade confirmations from its trading business units and from its non-clearing members.

Every Back-office session may only be instantiated once.

4.2 Session Identification and Authentication

For each FIX session, a unique identifier, the *SenderCompID* (49) and a *Password* (554) is assigned by Xetra on registration. A participant may have multiple FIX sessions (connections to the FIX Gateway). For each business unit a separate FIX session is required.

For security reasons, a *Password* (554) must be specified on the Logon (A) message. The initial password assigned by Xetra for each FIX session should be changed during the first logon by specifying *NewPassword* (925) in the Logon (A) message.

When changing the password, the following password validation rules have to be applied:

- Minimum password length 8
- Minimum required alphanumeric characters 1
- Minimum required uppercase characters 1
- Minimum required lowercase characters 1
- Minimum required special characters 1

In exceptional circumstances, a password may need to be reset. Participants are able to perform a password reset via the Xetra Member Section.

All messages sent to the FIX Gateway should contain the assigned unique identifier of the FIX session in the *SenderCompID* (49) field and "XETRA" in the *TargetCompID* (56) field.

The FIX Gateway has a two-step logon procedure, with a *Logon* (A) message (Session Logon) followed by one or multiple *User Request* (UBE/BE) messages (Trader Logons) at an application-level.

4.2.1 Network Authentication

The FIX Gateway will validate the subnet from where the FIX session is initiated during session logon. The FIX session logon (*Logon* (A) message) will be rejected by the FIX Gateway if the subnet cannot be authenticated. Participants are allowed to initiate/resume their FIX sessions from alternate locations, e.g., a backup site or disaster recovery location, T7 permits the setup of up to four IP subnet addresses for FIX session IDs via the Xetra Member Section.

4.2.2 Session Logon

The *Logon (A)* message authenticates a FIX session and establishes a connection to the FIX Gateway. This message must be the first one sent by the participant. The FIX Gateway will validate the *SenderCompID (49)* and *Password (554)*. A successful logon will initiate a FIX session.

The FIX Gateway does not support encryption. *EncryptMethod (98)* must therefore be set to "0".

As an additional safeguard measure, the *TestMessageIndicator (464)* is used to indicate whether a FIX session to be initiated will be used for Test (Simulation, Advanced Simulation) or Production purposes. The FIX Gateway will reject a *Logon (A)* message in the event that the *TestMessageIndicator (464)* value does not match the target environment.

In order to enhance operational support and error analysis on both the session and application level, information about the participant's FIX engine (*FIXEngineName (1600)*, *FIXEngineVersion(1601)*, *FIXEngineVendor(1602)* as well as the used FIX application (*ApplicationSystemName(1603)*, *ApplicationSystemVersion (1604)*) *ApplicationSystemVendor (1605)*) must be provided by the participant in the *Logon (A)* message. For more details, please refer to the detailed description of the *Logon (A)* message in chapter 5.1 Logon.

Note: The *Logon (A)* message is not used to log on and authenticate a trader on the Xetra trading system.

4.2.3 Trader Logon

The *User Request (UBE/BE)* message identifies and authenticates a qualified trader establishing access to the Xetra trading system. FIX sessions may be shared by several traders, with the exception of Back-Office FIX sessions. Back-Office FIX sessions do not require a trader logon.

The participant must provide the corresponding Xetra User ID of the trader in the *Username (553)* field, and the corresponding password in the *Password (554)* field.

A successful trader logon will grant the trader access to the Xetra trading system

Note: A trader logon requires an active connection to the Xetra trading system (indicated by a *TradingSessionStatus (h)* message with *Trading TradSesEvent (1368) = 203* "Message processing resumed" sent previously by the FIX Gateway). Order related messages will only be accepted by the trading system if a trader is logged on successfully. Otherwise these messages will be rejected (e.g. "User not logged in") and have to be sent again by the customer using a new *MsgSeqNum (34)* and a new *ClOrdID (11)*. It is strongly recommended that order related messages should only be sent if a previous trader logon was positively confirmed.

4.2.4 IP Addresses and Ports

The FIX connection between a Xetra participant's infrastructure and the FIX Gateway service on T7 is established via a TCP/IP connection. The service comprises of primary and secondary gateways, operated in the Xetra Simulation and Production environments. The respective gateways will use distinct target IP addresses and port numbers.

For each FIX session, two individual IP addresses and port numbers are assigned and communicated by Xetra. Primary IP address and port is for default usage. Secondary combination is reserved for emergency cases (e.g. line outage).

The participant is free to define its own source addresses.

4.3 Failover

The FIX Gateway service features a redundant setup of all components to provide a high level of availability and fault tolerance, and to facilitate a client's implementation of failover in network- and application level failure scenarios. Its setup offers connectivity to both FIX Gateways and thus provides a client's application with the possibility to select which FIX Gateway it will connect to.

A FIX session may be initiated via all available connections, but every session may only be instantiated once. Each TCP/IP connection may only support one session instance.

Both participant ports on the primary and on the secondary FIX Gateway are open. Every FIX session may only be logged in once via one of the connections. Per default only the primary FIX Gateway is connected to the market back end. Therefore the first FIX session logon to the secondary FIX Gateway may take some seconds.

4.3.1 Network Failover

The minimal network configuration that enables a network failover comprises two connections via dedicated leased line and/or via the Internet. Each line is unchangeably assigned to one FIX Gateway, one to the primary, the other to the backup gateway.

After a successful FIX logon to the secondary FIX Gateway, the port of the primary FIX Gateway connection will remain open, but any further logon attempts to the primary FIX Gateway will lead to a disconnect of this session.

4.3.2 Application Failover

In the event of a FIX Gateway failure, active FIX sessions connected to this gateway will be disconnected and the corresponding port will be closed. There will be no automatic FIX session failover in case of a FIX Gateway failure.

4.3.3 Best Practice

In all failover scenarios described above, participants may resume a FIX session for the same *SenderCompID* (49) via connection to the secondary FIX Gateway. Participants should therefore implement a failover mechanism in their application, in order to be able to establish a FIX session over the alternative connection.

If a connection or a session logon fails or is not responded to immediately, a second attempt should only be made after a few seconds (30 seconds recommended).

Note: A failover will not cause a reset of sequence numbers on the FIX Gateway side, neither is a reset of sequence numbers required in the participant's application. After re-establishment of the FIX session via the alternative connection, the regular retransmission process of missed messages starts.

4.4 Message Throttling and Queuing

All messages will be sent by the FIX engine on the exchange side. Nevertheless participants should not send more than 50 application messages (production environment) per second, trading market and FIX session in order to prevent the FIX Gateway from queuing. In case a rate is exceeding 50 messages per second, the FIX Gateway may queue the affected messages internally and forward them subsequently to the backend, maintaining the maximum back end throttle rate.

The general session parameter *MaxOrderRequestQueueTimeout* allows a participant to define the maximum time period in milliseconds a single FIX message should be held in the FIX Gateway's intermediate buffer in case the throttle limit is exceeded, before it is rejected.

Default is a maximum value, which means that all requests will be queued until they can be routed to the trading system.

Session parameters can be maintained within the Xetra Member Section.

4.5 Mass Cancellation on Disconnect

The FIX Gateway does not cancel orders in the event of a FIX session disconnection.

5 Session Layer

The FIX Gateway uses session level messages and Xetra specific extensions as described in this document. The FIX Gateway ignores the *OrigSendingTime (122)* in all message types.

5.1 Logon

The *Logon (A)* message is the first message the participant needs to send after the TCP connection has been established. No encryption is supported by the FIX Gateway.

As the first message for the day the participant should send a *Logon (A)* message at sequence number 1. A FIX session is identified by the *SenderCompID (49)* and *TargetCompID (56)* fields in the message header.

SenderCompID (49), *Password (554)* and *BeginString (8)* are validated during the session logon. If validation fails, the FIX Gateway will send a *Logout (5)* message specifying the reason for the rejection, followed by the termination of the TCP connection.

Note: If validation during session logon has failed, the sequence number will not be reset.

In the event of an intra-day restart the *Logon (A)* response message may provide a sequence number higher than expected by the participant. This would indicate that messages were missed. The participant should send a *Resend Request (2)* message to trigger retransmission of the missed messages.

Logon Requests with *ResetSeqNumFlag (141)* set to "Y" will trigger a reset of sequence numbers at the participant side only. The FIX Gateway's sequence numbering will remain unchanged. Thus the customer is able to access all messages disseminated by the FIX Gateway including the transmission of all active orders at start of the business day.

Note: if a FIX session is successfully logged on subsequent *Logon (A)* messages will be discarded.

5.2 Sequence Number

All FIX messages are identified by a unique sequence number. The FIX Gateway will process messages in sequence per tradable instrument.

Sequence numbers are initialized by the FIX Gateway for the new business day. The same behavior is expected for the FIX engine on the participant side.

Sequence numbers sent by the participant which are behind sequence expected will trigger a logout and TCP connection drop by the FIX Gateway.

Sequence numbers ahead of sequence will trigger a message recovery by the FIX Gateway via the *Resend Request (2)* message.

5.3 Heartbeat

The *HeartBtInt (108)* has to be specified by the participant during the FIX session logon.

A *Heartbeat (0)* message should be sent by the participant if no other message has been sent during the defined *HeartBtInt (108)* interval.

5.4 Test Request

A *Test Request (1)* message should be sent, if no in-sequence message has been received for more than the heartbeat interval. If no in-sequence message is received after that for more than the heartbeat interval, the TCP connection should be dropped.

5.5 Resend Request

A *Resend Request (2)* message initiates the retransmission of missed messages and can be used if a sequence number gap has been detected. A *Resend Request (2)* message needs to be sent, even if it is ahead of sequence.

The *PossDupFlag (43)* field set to "Y" in the Message Header indicates that a FIX engine is repeating transmission of already sent content (including *MsgSeqNum*).

The FIX Gateway supports open or closed sequence ranges in a *Resend Request (2)* message (an open range is indicated by sequence number zero as the *EndSeqNo (16)*).

Note: No Gap Fill messages should be sent by the participant during the resend series for application messages. Application messages should always be re-transmitted, since the FIX Gateway requires all missed application messages for the purpose of reconciliation with the Xetra trading system.

5.6 Reject

Session level rejects are used by the FIX Gateway to indicate violations of the session protocol, missing fields or invalid values.

5.7 Sequence Reset

Two types of *Sequence Reset (4)* messages are supported: Gap Fill Mode and Reset Mode.

5.7.1 Gap Fill Mode

This type of *Sequence Reset (4)* message is the response to a *Resend Request (2)* message.

Gap Fill Mode is indicated by *GapFillFlag (123)* field = "Y".

All gap fill messages should have *PossDupFlag (43)* = "Y" in the Message Header.

Note: The FIX Gateway will not disseminate Gap Fill messages. Gap Fill Mode should only be used by the participant for administrative Messages; see chapter 5.5 Resend Request.

5.7.2 Reset Mode

The Reset Mode of the *Sequence Reset (4)* message may be used by the participant in emergency scenarios where all means of automatic recovery are lost (e.g. in case of an unrecoverable application failure).

Reset Mode is indicated if *GapFillFlag (123)* = "N" or if the field is omitted.

After the Reset Mode has been triggered, the *Test Request (1)* message should be used by the participant to verify that the requested reset has been accepted by the FIX Gateway.

5.8 Logout

The *Logout (5)* message is used by the participant to gracefully close the FIX session. Messages need to be sent normally by the participant until the FIX Gateway sends the logout confirmation.

The FIX Gateway will send a *TradingSessionStatus (h)* message when all messages for a FIX session have been sent. The FIX Gateway will subsequently log out the FIX session.

Note: The FIX Gateway will also send a *Logout (5)* message if validation fails for a FIX session logon. The reason for the rejection is specified in *SessionStatus (1409)*. The *Logout (5)* message is followed by a drop of the TCP connection.

5.9 Recovery

When a participant reconnects after a FIX session disconnection during the same business day, two different scenarios can be identified as a reason for the outage: namely, outage on the participant side and outage on FIX Gateway side.

5.9.1 Outage on the Client Side

- After resuming the FIX session, the participant may have missed some messages from the FIX Gateway. In this case, the sequence number of the next message received from the FIX Gateway will be ahead of the last *MsgSeqNum (34)* stored on the participant side.
- The participant should send a *Resend Request (2)* message in order to trigger the retransmission of all missed messages during the outage.
- The FIX Gateway will return all potentially missed messages with *PossDupFlag (43) = "Y"*, to indicate that a message may have been previously transmitted with the same *MsgSeqNum (34)*.

Note: Mass Cancellation service on disconnect is not supported by the FIX Gateway. All open orders remain in the order book during an outage, including non-persistent orders.

5.9.2 Outage on FIX Gateway Side

In the unlikely event that the disconnection was due to an outage on the Xetra side, the participant should consider the following recovery mechanisms:

- After reconnection of the FIX session, the FIX Gateway may receive a sequence number higher than the one expected and sends a *Resend Request (2)* message to the participant.
- The participant should resend all potentially missed messages with *PossDupFlag (43) = "Y"*, to indicate that a message may have been previously transmitted with the same *MsgSeqNum (34)*. The FIX Gateway will send responses to already processed messages with *possResend (97) = "Y"*. After a forced failover pending order messages might be rejected. These messages can be submitted again by the participant using a new *MsgSeqNum (34)* and a new *ClOrdID (11)*.

Note: No Gap Fill messages should be sent by the participant during the resend series for application messages. Application messages should always be re-transmitted, since the FIX Gateway requires all missed application messages for the purpose of reconciliation with the Xetra trading system.

If a participant sends Gap Fills messages during the resend series for application messages the related orders might not be accessible any more via the FIX Gateway and related order specific information will not be forwarded to the FIX session. This also holds true in cases of *Logon (A)* message with *ResetSeqNumFlag (141) = "Y"*.

6 Overview of Supported Message Types

Message	Type	Description
Administrative Messages		
Heartbeat	0	The Heartbeat message may be used by the client and the FIX Gateway to monitor the status of the communication link during periods of inactivity.
Test Request	1	The Test Request message is used to trigger a heartbeat message from the opposing application.
Resend Request	2	The Resend Request message is used by the client and the FIX Gateway to initiate the retransmission of messages in a recovery scenario.
Reject	3	The Reject message is used by the FIX Gateway when a message is received but cannot be properly processed due to a session-level rule violation.
Sequence Reset	4	The Sequence Reset message has two modes: Gap Fill mode is used in response to a Resend Request message when one or more messages must be skipped over. Reset mode specifies an arbitrarily higher new sequence number.
Logout	5	The Logout message initiates or confirms the termination of a FIX session. It is also used by the FIX Gateway to reject the FIX session logon.
Logon	A	The Logon message allows the client to connect to the FIX Gateway. It is also used by the FIX Gateway to confirm the logon.
Business Message Reject	j	The Business Message Reject message indicates that an application message has been rejected.
Application Messages: Order Management		
New Order Single	D	The New Order Single message is used by the client to submit an order.
Order Cancel Request	F	The Order Cancel Request is used to delete an existing order.
Order Cancel Replace Request	G	The Order Cancel/Replace Request is used to modify an existing order.
Execution Report	8	The Execution Report message is used to: <ul style="list-style-type: none"> - confirm the receipt of an order - confirm changes to an existing order - transmit all active orders - relay fill information - reject orders
Order Cancel Reject	9	The Order Cancel Reject message indicates that an Order Cancel Request or Order Cancel Replace Request has been rejected.
Order Mass Action Request (User-defined)	UCA	User order mass action request. (New for Xetra)
Order Mass Action Response (User-defined)	UCAR	User order mass action response. (New for Xetra)
Order Mass Action Report (User-defined)	UBZ	This message informs about unsolicited mass cancellation events. (New for Xetra)
Application Messages: Cross Request and Quote Request		

Message	Type	Description
Cross Request	U100	The Cross Request message is used by a trader to announce a Cross Trade to the market. The request is used, if a trader intends to trade with himself via order-book by sending a buy and a sell order for the same instrument. It is also used for prearranged trades between two traders, where the trade should be reproduced via matching the orders in the order-book.
Cross Request Acknowledgement	U101	Cross Request Acknowledgement is used as the application level response to a Cross Request.
Quote Request	R	The Quote Request message is used to request quotes from market makers. This message is commonly referred to as a Request For Quote (RFQ).
Mass Quote Acknowledgement	b	Mass Quote Acknowledgement is used as the application level response to a Quote Request.
Application Messages: Trade Capture Resport		
Trade Capture Report	UAE/ AE	The Trade Capture Report message is used to report trades and trade reversals.
Application Messages: Others		
User Request	UBE/ BE	Each trader needs to logon/logoff to/from T7 system via the User Request message.
User Response	UBF/ BF	The User Response message is used to confirm or reject the trader logon/logoff.
User Notification	UCB	The User Notification message is used to: <ul style="list-style-type: none"> - send information of an unsolicited trader logoff - send information of legal notifications (New for Xetra. Previously: UTS)
Trading Session Status	h	The Trading Session Status message informs about session related events. (New for Xetra. Previously: USE)
Party Action Report (User-defined)	UDI	User Party Action Report. This message communicates risk control events of type halt-trading and re-instate. Events will be entered via the T7 Admin GUI.

7 Appendix – T7 FIX Gateway delta

The following table provides an overview of the major differences between the current Xetra FIX Gateway and the T7 FIX Gateway.

Category	Current Xetra FIX Gateway	FIX Gateway on T7
FIX Message flows and message formats	No changes in the existing functionality.	Message flows similar to the FIX-Gateway. Message formats adapted to the ETI and the T7 functionality.
Instrument Identification	ISIN, Isix	ISIN, SecurityID
Back Office Session functionality	Functionality on Member Level <ul style="list-style-type: none"> Trade Confirmations Drop-copy for persistent orders (optional activation via Xetra Member Section) 	Functionality on Business Unit Level <ul style="list-style-type: none"> Trade Confirmations Drop-copy for standard orders (optional activation via Xetra Member Section)
Trading Session functionality	<ul style="list-style-type: none"> Order Handling Quote Request OTC Trading functionality (Xetra Trade Entry) Trade Reporting 	<ul style="list-style-type: none"> Order Handling Quote Request Cross Request Risk Control Events
Initial order transfer/order book replay	Optional Can be deactivated via Xetra Member Section.	Mandatory. Cannot be deactivated.
Supported Order Attributes	Persistent, Non-persistent	Only Standard order (no support of lean orders) Persistent, Non-persistent.

8 Change log

The document contains the following changes compared to the previous versions.

No	Chapter, page	Date	Change
1	General	30.09.2016	Initial version