

# T7 – Release 9.0

DFS9025

Trade at Close

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2 <sup>nd</sup> Level WP:	Detailed Functional Specification

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**Abstract**

This document describes the basic concepts of a trade at close facility on the T7 trading platform. The enhancements, although requested for cash market, apply to any market where a closing auction is part of the trading day.

**Keywords**

Trade at close, closing auction, closing price, opt-in

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**Table of Contents**

<b>1</b>	<b>Introduction</b>	<b>5</b>
<b>1.1</b>	<b>High Level Requirements</b>	<b>5</b>
<b>1.2</b>	<b>Current Situation</b>	<b>5</b>
<b>1.3</b>	<b>Future Situation</b>	<b>5</b>
<b>1.4</b>	<b>Affected Markets</b>	<b>5</b>
<b>1.5</b>	<b>Assumptions</b>	<b>6</b>
<b>1.6</b>	<b>Out of Scope</b>	<b>6</b>
<b>1.7</b>	<b>Related Documents and Inputs</b>	<b>6</b>
<b>1.8</b>	<b>Abbreviations and Important Terms</b>	<b>7</b>
<b>1.9</b>	<b>Open Issues and related Assumptions</b>	<b>7</b>
<b>2</b>	<b>Introduction of Changes to System Components</b>	<b>8</b>
<b>3</b>	<b>Reference Data System and related RDA Views</b>	<b>9</b>
<b>3.1</b>	<b>RDS</b>	<b>9</b>
3.1.1	User Entity	9
3.1.2	MarketModel Entity	9
3.1.3	ProductState Datatype	10
3.1.4	ProductStateChangeEvent Type Entity	10
<b>3.2</b>	<b>RDA Views</b>	<b>10</b>
3.2.1	View RdaUser	10
3.2.2	View RdaMarketModel	10
3.2.3	View RdaEventTypes	10
<b>4</b>	<b>Matching Engine</b>	<b>11</b>
<b>4.1</b>	<b>Instrument and Product States for TaC</b>	<b>11</b>
4.1.1	Instrument State Trade_at_Close	11
4.1.2	Product State Closing_with_TaC	11
<b>4.2</b>	<b>Orders and Quotes</b>	<b>12</b>
4.2.1	Opt-In Flag and Order Validations	13
4.2.2	Transition into Trade_at_Close Phase	13
<b>4.3</b>	<b>Matching and Allocation Method</b>	<b>13</b>
<b>4.4</b>	<b>Match Reporting and Audit Trail</b>	<b>13</b>
<b>4.5</b>	<b>Failover and Recovery</b>	<b>14</b>
<b>5</b>	<b>Trading Interfaces (ETI and FIX GW)</b>	<b>15</b>
<b>6</b>	<b>Market Data and Reference Data Interfaces</b>	<b>16</b>
<b>6.1</b>	<b>Reference Data</b>	<b>16</b>
<b>6.2</b>	<b>Market Data – Product/Instrument States</b>	<b>16</b>
<b>6.3</b>	<b>Market Data – Pre-trade Transparency</b>	<b>16</b>
<b>6.4</b>	<b>Market Data – Post-trade Transparency</b>	<b>17</b>
<b>7</b>	<b>GUIs</b>	<b>18</b>
<b>7.1</b>	<b>Trader GUI</b>	<b>18</b>
7.1.1	Order Entry	18
7.1.2	Order History	18

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7.1.3	Trades	18
<b>7.2</b>	<b>Admin GUI</b>	<b>18</b>
7.2.1	User Maintenance Wizard	18
<b>7.3</b>	<b>Controller GUI</b>	<b>18</b>
7.3.1	Order Entry	18
7.3.2	Order History	18
7.3.3	Trades/Trade Summary	18
7.3.4	Time and Sales	19
<b>8</b>	<b>OFI</b>	<b>20</b>
<b>9</b>	<b>Trade Feed Handler</b>	<b>21</b>
<b>10</b>	<b>Downstream Systems</b>	<b>22</b>
<b>10.1</b>	<b>StatistiX</b>	<b>22</b>
<b>10.2</b>	<b>PND</b>	<b>22</b>
<b>10.3</b>	<b>Billing</b>	<b>22</b>
<b>10.4</b>	<b>CCP</b>	<b>22</b>
<b>10.5</b>	<b>CEF</b>	<b>22</b>
<b>10.6</b>	<b>Scila</b>	<b>22</b>
<b>10.7</b>	<b>WSS</b>	<b>22</b>
<b>10.8</b>	<b>Other Areas</b>	<b>22</b>
<b>11</b>	<b>Introduction Strategy</b>	<b>23</b>
<b>11.1</b>	<b>Conversions</b>	<b>23</b>
<b>11.2</b>	<b>Example Setup of Scheduler for TaC in DAX Products/Instruments</b>	<b>23</b>

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## **1 Introduction**

The present document describes the functional specifications of Trade-at-Close on the T7 trading venue.

### **1.1 High Level Requirements**

Trade at Close (TaC) is a prolonged closing phase of an instrument during which trading participants will have the possibility to enter orders/trade at the fixed closing auction price, if available. Executions take place continuously, no price discovery is necessary.

The TaC phase only allows for orders which have opted in to be executed at the fixed closing auction price and does not incur any price formation process. It is a transparent phase with both pre trade transparency and post trade transparency compliant with MiFID II/MiFIR requirements (best bid/offer is visible, trades are immediately reported).

This phase will not be available in the trading model continuous auction with market maker nor specialist. It is only possible after the end of a configured closing auction with a closing auction price.

### **1.2 Current Situation**

Trade at Close, i.e. a prolonged execution at the closing auction price is not available on T7. It is offered by a few trading venues with rising attention.

### **1.3 Future Situation**

T7 is enhanced to allow a 'continuous-like' trading phase for regular orders where executions take place at the closing auction price, if it exists. Orders must be flagged to participate in a potential trade at close phase following the closing auction. TaC can be configured per existing market model, but only makes sense for products where a closing phase is scheduled, and a closing auction is executed.

### **1.4 Affected Markets**

This functionality described in this document can be used by following markets:

Cash Markets				
Market	Functionality will be used	Functionality can be used, but not planned	Functionality cannot be used	ETI Visibility
XETR	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
XFRA	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
XVIE	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
XBUD	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
XLJU	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
XPRA	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
XZAG	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
XBUL	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
XMAL	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
360T	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Derivatives Markets				
Market	Functionality will be used	Functionality can be used, but not planned	Functionality cannot be used	ETI Visibility
XEUR	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
XEEE	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
FX	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Nodal	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

**Note:** For derivatives market the opt-in flag to participate in the TaC phase will not be part of ETI, although the functionality is fully available in T7 core.

## 1.5 Assumptions

The specification gives a generic description of how a trade at close phase can be implemented on T7. Therefore, any reference to 'Xetra' is avoided in the document as well as having any constraint to a specific instrument characteristic, e.g. cash or derivatives.

Since this requirement is generically applied to all markets, all risk evaluation features, like pre-trade risk functionality of Eurex, also apply in the TaC phase for orders entered and executed during this phase.

Self Match Prevention works as usual in the TaC phase.

Trade statistics is not extended to maintain a separate 'total TaC volume'.

TaC is only available for simple instruments with direct matching.

## 1.6 Out of Scope

## 1.7 Related Documents and Inputs

This requirement relates to the following documents:

- BRA9025 – Trade-at-Close

## 1.8 Abbreviations and Important Terms

Abbreviation / Term	Description
TaC	Trade at Close
EOBI	Enhanced Order Book Interface
EMDI	Enhance Market Data Interface
RDS	Reference Data System
MS	Market Supervision

## 1.9 Open Issues and related Assumptions

Priority for market orders that were in the order book already before the end of the closing auction: currently, they may have a lower priority in TaC matching than older limit orders. Is this acceptable?  
Assumption: yes.

## **2 Introduction of Changes to System Components**

The affected system components and related interfaces are listed below:

- Reference Data (RDS and RDA views)
- Matching Engine
- Trading Interfaces (ETI and FIX-GW)
- Market Data
- GUIs
- OFI
- Downstream Systems



### 3 Reference Data System and related RDA Views

This chapter specifies the reference data related enhancements for this requirement. Names of new attributes and entities are finally defined by the RDS team.

#### 3.1 RDS

New reference parameters for the configuration Trade at Close facility are added to the entity *ProductStateChangeEvent*. This can then be used in the context of scheduled events to setup a TaC phase for each product individually.

On user level a flag can be set, so that all regular orders are participating in the TaC. Each order must hereby fulfil the TaC conditions described in section 5.2.

##### 3.1.1 User Entity

Add a new attribute '*optInRegularOrdersTaC*' that defines if for a user all regular orders that fulfil the opt-in constraints are flagged as 'opt-in for TaC'. This defines the default for the opt-in flag if the individual flag per order is left empty.

Data Type	Boolean (True/False)
Optionality	Mandatory
Intraday Update Allowed	N
Initial Conversion Value	False

##### 3.1.2 MarketModel Entity

Add a new attribute '*hasTaC*' that defines if a TaC phase extends the actual closing phase or not.

Data Type	Boolean (True/False)
Optionality	Mandatory
Intraday Update Allowed	N
Initial Conversion Value	False

It must not to be set to True for trading model continuous auction with market maker and specialist.

Add a new attribute '*standardClosingWithTaCState*' that defines the standard state of the new product state.

Data Type	InstrumentStateNonTrading
Optionality	D
Intraday Update Allowed	N
Initial Conversion Value	3 = BOOK

### 3.1.3 ProductState Datatype

Add a new valid value

CLOSING\_WITH\_TAC 10 Closing with trade-at-close

### 3.1.4 ProductStateChangeEventEntity Entity

Add a new event as follows

Attribute	Value
ID	nn
Name	MOVE PRODUCT TO CLOSING_WITH_TAC
Description	Product State Change to Closing with TaC
CreateNonStandardEvent	0
ProductActionType	1
ProductState	10

## 3.2 RDA Views

Changes to the RDA views are directly derived from the RDS changes described in the previous section.

### 3.2.1 View RdaUser

New flag to specify opt-in for all regular order submitted by the given user.

### 3.2.2 View RdaMarketModel

New flag that enables TaC on market model level, new field that defines the standard instrument state for the new product state.

### 3.2.3 View RdaEventTypes

New product state change event type to setup a CLOSING\_WITH\_TAC phase.

## 4 Matching Engine

### 4.1 Instrument and Product States for TaC

The instrument state indicates the trading state of a given instrument. It determines how transactions are processed by the Matching Engine. For requests that can be attributed to a specific instrument, the instrument state also determines whether the request is accepted or rejected. Product states give a framework that allows to structure a trading day and to control product-wide transitions of instrument states.

For the TaC phase a new instrument state *Trade\_at\_Close* together with a new product state *Closing\_with\_TaC* is introduced.

#### 4.1.1 Instrument State *Trade\_at\_Close*

The instrument state *Trade\_at\_Close* indicates that a continuous matching of placed orders at the closing auction price is occurring for the instrument. It is only reachable when the product state is *Closing\_with\_TaC* (see next paragraph) and necessarily happens after an order book uncrossing, i.e. a closing auction with price determination **and** turnover. The *Trade\_at\_Close* immediately follows the Auction/Closing phase and is **only** triggered by the commit transition.

During the *Trade\_at\_Close* state:

- All requests except quotes are accepted
- The Matching Engine performs 'continuous matching' of placed orders at the closing price, **no** stop order triggering takes place
- Publication of Top of Book market data by MDD.

#### 4.1.2 Product State *Closing\_with\_TaC*

This intermediate state is used to close the trading period. It covers the time to finish all auctions normally and to allow for a trade-at-close phase after a closing auction with price determination and turnover.

*Trade-at-Close* is intended to stop at a fixed time limit, so a transition to the product state *Closing* is mandatory to keep extended auctions running. With this transition also the automatic change to *Post Trading* is in place/guaranteed.

During the product state *Closing\_with\_TaC*, no request is rejected because of the product state, but some requests may be rejected depending on the relevant instrument state.

During a product state change to *Closing\_with\_TaC* the following is done for all instruments:

- If the market model parameter *hasTaC* is set to False, reject the product state change request. If it was a scheduled one, a MS alert is generated.
- Else, if the market model parameter *AutomaticClosingAuction* is set to True, and if there had not been a Closing auction committed yet on that day for that instrument (*ClosingAuctionDone* instrument flag still False), then change the instrument state to Auction with the instrument state qualifier Closing. Note that this rule is also true when the previous instrument state was already Auction or Freeze.
- Else, if the previous instrument state was Auction or Freeze and the above conditions for a Closing auction are not true, then leave the instrument state in Auction or Freeze with the same instrument state qualifier.

- Else, set the instrument state to the standard instrument state defined in the market model parameter *ClosingTaCStandardIS*.

It is foreseen that for all products, the standard instrument state of *Closing\_with\_TaC* is *Book*.

During the product state transition to *Closing\_with\_TaC* when the market model parameter *AutomaticClosingAuction* is set to True, for all instruments which have not yet successfully committed a closing auction, a closing auction is automatically started.

**Persistency:**

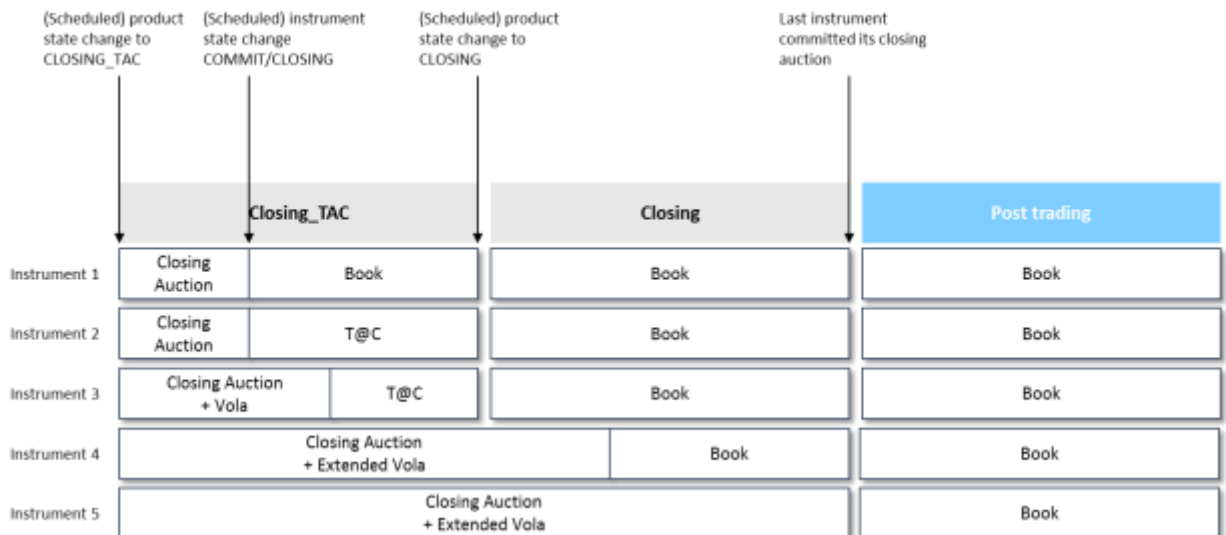
Once a closing auction has been committed, the *ClosingAuctionDone* flag is set to True and the closing auction price is persisted, if the executed quantity is greater than zero, i.e. there is a turnover.

**Product State Recovery Rule:**

The determination of the product state during the Recovery Start Up processing is as follows

Persisted Product State	Target Product State Upon Recovery
Closing_with_TaC	set the product state into <i>Halt</i>

The following figure illustrates the interaction of the new product/instrument state in the context of the closing period. A detailed T7 schedule to drive TaC can be found in 11.2.



**4.2 Orders and Quotes**

An additional order attribute *tacEligible* is introduced to qualify/opt in an order for participation in the *Trade\_at\_Close* phase. Quotes are not considered here; they cannot participate in TaC.

### 4.2.1 Opt-In Flag and Order Validations

The *tacEligible* is a new optional order attribute. It can be set for each order individually or is derived from the setting of the user flag *optInRegularOrdersTaC* (cf. 3.1.1) whereby the user setting is only applied if the *tacEligible* flag is not set on the received order.

The user setting is not considered for orders where the *tacEligible* flag is already set. In this case the user setting is simply overruled.

The following combination of order attributes are allowed to have *tacEligible* field set (True/False):

- Order Type:  
Only order type 'regular' is allowed
- Price Condition:  
Limit and market price condition is allowed
- Execution Constraint:  
IOC, FOK, BOC execution condition is allowed
- Validity:  
Any validity is allowed

Any other combination of order attributes with the *tacEligible* flag being set (True/False) is rejected.

An attempt to modify the *tacEligible* field of an order is rejected.

### 4.2.2 Transition into Trade\_at\_Close Phase

Once the closing auction is committed and there is a closing price with turnover the *Trade\_at\_Close* phase is started for an instrument. After uncrossing the order book, an order having the *tacEligible* flag set to 'True' remains active if the limit is better or equal to the closing auction price. This obviously includes market orders. All other orders are inactive.

The overall quantity which gets transferred is less than or equal to the auction imbalance quantity at the end of the closing auction phase. The order book for *Trade\_at\_Close* is always one-sided, i.e. quantity is only available either on the buy or on the sell side.

## 4.3 Matching and Allocation Method

An allocation method describes how a tradable quantity is shared amongst a group of eligible orders. In T7, up to now, strict price priority is always observed, i.e., an eligible limit order receives a share only, if all market orders and all limit orders with a better limit price have already been fully matched.

With the introduction of TaC a strict time based allocation method is introduced. Orders which are better or equal than the closing auction price are sequenced by their order entry time with lowest first (price is irrelevant). The orders are then fully allocated one after the other, until the available tradable quantity is exhausted.

## 4.4 Match Reporting and Audit Trail

Match reporting comprises the reporting of match events in the audit trail. To identify match events resulting from TaC a new match event subtype is used.

Audit trailing of orders is enhanced to include the new opt-in flag which is attached to the order layout.

---

## 4.5 Failover and Recovery

Intraday recovery of the product/instrument state is required for the following technical scenarios:

- a) Both instances fail – recovery of the persistent data, non-persistent data is lost.
- b) Only the master instance fails – recovery of the persistent data is required; non-persistent data is lost.
- c) Only a slave instance fails – No recovery of any data is required. The failover is transparent to the users, no data is lost.

Since the *Closing\_with\_TaC* product state is reset to *Halt* (a & b), running TaC phases are potentially aborted. A product state change back to *Closing\_with\_TaC* does **not** start an additional TaC phase even if the closing auction was committed before and there is a closing auction price with turnover.

### Background:

Functionally a crossed book would be possible if a TaC phase is started a second time without having an uncross before, i.e. a closing auction commit (cf. 4.1.1). This is therefore prevented.

(Switching back to from *Halt* to *Closing\_with\_TaC* includes a transition via *Pretr*. Here order maintenance can be done and orders at the closing auction price could be entered on both sides of the book. If again a TaC phase would be started a crossed book situation would exist since there is no second closing auction in that case which ensures an uncrossed book at the beginning of the TaC phase. Such a workflow is therefore not supported.)

## 5 Trading Interfaces (ETI and FIX GW)

This chapter describes the changes in the context of the ETI interface. The FIX GW is enhanced accordingly. Interface details will be defined by the interface team.

The ETI enhancements are as follows:

**NewOrderSingle/ReplaceOrderSingle** Message:

A flag is provided to allow an order for participation in the TaC phase (opt-in flag).

A new tradeType (TradeAtClose) has to be supported.

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## 6 Market Data and Reference Data Interfaces

This chapter refers to market data and reference data interfaces for T7 participants.

### 6.1 Reference Data

A TaC session starts with a normal closing auction and price determination which is then followed by the real trade-at-close execution phase. It is purely controlled by a new/separate product/instrument state and requires therefore a new schedule to be published.

In order to reduce the data sent via RDI and the size of the files on the CRE and on DBAG websites, the trading schedules are only be provided via static csv-files on these channels. This is already in place and as soon as a TaC schedule is setup and assigned to a product, it gets published.

RDI/RDF are not affected by this requirement.

### 6.2 Market Data – Product/Instrument States

The new instrument state TRADE\_AT\_CLOSE is reflected in EMDI/MDI/EOBI. The following fields are enriched with A new valid value:

<i>SecurityTradingStatus</i> (326)	TradeAtClose
<i>SecurityMassTradingStatus</i> (1679)	TradeAtClose

**Note:** The new product state CLOSING\_WITH\_TAC is not mapped to a new valid value in the EMDI/EOBI interface. For this product state the field *TradingSessionSubID* (625) is still set to the existing 'CLOSING'

### 6.3 Market Data – Pre-trade Transparency

For TaC the quantity at one price level, the closing auction price, is relevant. The quantity of all opt-in orders with a price equal to or better than the closing auction price including market orders are accumulated

The displayed quantity can be non-zero only on one side of the book at any time.

#### EOBI – Top of Book message (“TaC Top of Book”)

*BidPx/OfferPx* = closing auction price  
*BidSize/OfferSize* = accumulated quantity

#### EMDI/MDI – Depth Incremental message (“TaC Top-of-Book”)

*MDEntryType* = bid/ask  
*MDEntryPx* = closing auction price  
*MDEntrySize* = accumulated quantity

---



## 6.4 Market Data – Post-trade Transparency

Trades resulting from the TaC phase are reported in the usual way with a new valid value in the field *TradeCondition* (277).

### EOBI Trade Report message

TradeCondition = TradeAtClose

### EMDI/MDI Depth incremental message

MDEntryType = 2

TradeCondition = TradeAtClose

---

## 7 GUIs

The Trader GUI and the Market Supervision Controller GUI must be enhanced in order to support the Trade at Close functionality.

### 7.1 Trader GUI

#### 7.1.1 Order Entry

The Order Entry view is the view to support the entry (add, modify) of on-exchange orders.

The view is enhanced with a new field *TradeAtClose* (checkbox) to enter an order which should be subject to TaC, i.e. opted in.

#### 7.1.2 Order History

The Order History view shows an overview of all order changes of own standard orders of the logged in user for the current business day. The columns displayed are enhanced with the field *TradeAtClose*.

#### 7.1.3 Trades

The Trades view displays an overview of own trades. TaC trades are also be displayed for which a specific *TradeTyp* is used.

### 7.2 Admin GUI

#### 7.2.1 User Maintenance Wizard

The wizard is enhanced to allow setting of the field *optInRegularOrdersTaC*, cf. 3.1.1.

### 7.3 Controller GUI

#### 7.3.1 Order Entry

The Order Entry view is the view to support the entry (add, modify) of on-exchange orders.

The view is enhanced to with a new field *TradeAtClose* (checkbox) to enter an order which should be subject to TaC, i.e. opted in.

#### 7.3.2 Order History

The Order History view shows an overview of all order changes of own standard orders of the logged in user for the current business day. The columns displayed is enhanced with the field *TradeAtClose*.

#### 7.3.3 Trades/Trade Summary

The Trades view displays an overview of on-exchangetrades. The view is enhanced to display TaC trades with a new a specific *TradeTyp*.

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### **7.3.4 Time and Sales**

The Time & Sales view displays an overview of all trades executed for a particular instrument within the specified time boundaries, listed by the MatchStepID. The view is enhanced to display TaC trades with a new a specific *TradeTyp*.

## **8 OFI**

OFI is affected by the introduction of new requests/responses, and enhancements for existing requests/responses, broadcasts and RDA views. Details of the interface changes will be defined along the course of the implementation.

## 9 Trade Feed Handler

In the trade report message generated by the Trade Feed Handler the new valid value for the match event subtype is mapped to '*XP – Xetra matched trade*'.

## **10 Downstream Systems**

### **10.1 StatistiX**

Changes in the AT (cf. 4.4) need to be reflected on StatistiX side.

Affected XML reports due to TaC are:

- TC540 Daily Order Maintenance
- TC550 Open Order
- TC810 T7 Daily Trade Confirmation
- TC910 T7 Daily Match Step Activity
- RD110 User Profile Maintenance
- RD115 User Profile Status
- Reference Data Audit Trail Reports

### **10.2 PND**

Changes in the AT (cf. 4.4) need to be reflected on PND side.

### **10.3 Billing**

Please refer to *BRA9025 T7 Xetra – Trade-at-Close*, no impact on T7 expected.

### **10.4 CCP**

No impact expected.

### **10.5 CEF**

Changes in market data (cf.6.2, 6.3, 6.4) and AT (cf. 4.4) need to be reflected on CEF side.

### **10.6 Scila**

Changes in the AT (cf. 4.4) need to be reflected on Scila side.

### **10.7 WSS**

For the assignment of new products/instruments to a market model the derivation rules on WSS side could potentially be impacted as well as the derivation rules for the schedule selector.

### **10.8 Other Areas**

No impact expected.

---

## 11 Introduction Strategy

This chapter covers the introduction strategy with respect to this requirement only, concerning the parameter settings, conversions and example setup which is TaC related. The provided information relates to the introduction of the software for this requirement in T7. The purpose is to ensure a proper initial technical setup with the introduction of the software.

The overall introduction strategy for the functional migration is not yet available.

### 11.1 Conversions

No specific 'technical' conversion is required to introduce TaC with T7 Release 9.0 software. The new parameter on market model level is initially set to 'False', so TaC is disabled for all existing market models.

For the functional introduction the usage of a new schedule which includes the new product state is nevertheless mandatory (cf. 11.2) and will be setup manually by Market Operations, in addition to setting the market model parameter hasTaC to 'True'.

### 11.2 Example Setup of Scheduler for TaC in DAX Products/Instruments

The following schedule allows for a closing phase starting with a closing auction followed by a TaC phase lasting until 17:45. Potentially still running closing auctions at that time keep running. If there is none, the product state changes to post-trading, cf. 4.1. Changes compared to the existing schedule for DAX products are highlighted.

scheduleName	businessIdentifier	eventTypeID	isManualEvent	triggerDeltaTime	CET
DAX_FULL	MOVE PRODUCT TO START OF DAY	2	0	21600	06:00
DAX_FULL	MOVE PRODUCT TO PRE	3	0	27000	07:30
DAX_FULL	MOVE PRODUCT TO TRADING	4	0	31800	08:50
DAX_FULL	COMMIT OPENING AUCTION	25	0	32400	09:00
DAX_FULL	START INTRADAY AUCTION	19	0	46800	13:00
DAX_FULL	COMMIT INTRADAY AUCTION	22	0	46920	13:02
DAX_FULL	MOVE PRODUCT TO CLOSING_WITH_TAC	nn	0	63000	17:30
DAX_FULL	COMMIT CLOSING AUCTION	28	0	63300	17:35

DAX_FULL	MOVE PRODUCT TO CLOSING	5	0	63900	17:45
DAX_FULL	MOVE PRODUCT TO END OF DAY	7	0	73800	20:30
DAX_FULL	MOVE PRODUCT TO POSTENDOFDAY	8	0	77400	21:30