
Technical Specifications June 2016

27 January 2014

SOLA Derivatives HSVF Market Data

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1.0 Introduction

1.1 Purpose

The purpose of this publication is to provide participants with the knowledge and technical details necessary for accessing and using the Exchange derivatives market data feed.

The High Speed Vendor Feed (HSVF) is comprised of trades, quotes, market depth, strategies, bulletins, summaries and other statistics.

This HSVF market data specification defines the communications interface and message formats for the high-speed transmission which broadcasts real-time trading and statistical information from the Exchange derivatives platform.

1.2 Readership

The target audience for this publication is the business or Information Technology level of an organisation interested in the functional design of the Exchange derivatives platform.

1.3 Revision History

| Issue | Date | Description of change |
|-------|-------------------|---|
| 1.0 | 21 December 2010 | |
| 1.1 | 04 March 2011 | |
| 1.2 | 04 April 2011 | |
| 1.3 | 15 April 2011 | |
| 1.4 | 28 June 2011 | |
| 1.5 | 29 July 2011 | |
| 1.6 | 19 March 2012 | |
| 2.0 | 27 July 2012 | |
| 2.1 | 16 December 2012 | |
| 3.0 | 14 September 2014 | Message modifications for SOLA 7 in sections: Group Messages (GC, GR, GS) and Fields Description (Delivery Type). Modified document layout. Added sections of Message Processing and Tick Increment Tables. |
| 3.1 | 7 November 2014 | Added Align End message (VE). |
| 3.2 | 17 December 2014 | Minor corrections |
| 3.3 | 30 January 2015 | Added Field Description of Instrument Status Marker and Group Status Marker |
| 3.4 | 12 March 2015 | Rewording Expiry Date with Maturity Date in message's layout. |
| 3.5 | June 2016 | Tick table items review for Stock Option (E0) |

2.0 Overview

The High Speed Vendor Feed (HSVF) market data feed uses a TCP/IP broadcast interface. Each message type is fixed in format and messages are non-blocked (i.e. the Exchange does not wait for an acknowledgement before sending the following message) re-transmission of any data is available.

HSVF messages consist of a standard message header followed by the message body which varies in format according to the message type.

2.1 Transmission format

Each message is framed by an STX and an ETX character. The format used is:

| | | | |
|---|----------------|---------|---|
| S | | | E |
| T | MESSAGE HEADER | MESSAGE | T |
| X | | | X |

STX and ETX indicate the beginning and the end of the record being transmitted.

2.2 Message Header

The standard message header attached to all messages has the following format:

| Field Name | L=11 | T | Definition / Validation Rules |
|-----------------|------|---|---|
| Sequence Number | 9 | N | Each message is assigned a sequence number starting at '000000001' every day and incremented by 1 for each message sent. The sequence numbers will range from 000000001 to 999999999 (decimal, ASCII) with wrap around. <i>Note: Retransmitted messages will contain the original sequence numbers.</i> |
| Message Type | 2 | X | Identifies the type of message being sent. Format is left-aligned, right 'blank' filled (if necessary). |

2.3 Transmission capability

The following table describes Transmission Capability. For formatting details on examples shown, refer to the Message Type RS - Connection Message - Min. 32 / Max. 6026 bytes.

| | |
|---|--|
| Normal Connection <i>(i.e. Start of Day)</i> | 1) Participant connects to specified port 2) Participant sends RS message type ex. 00000001RS000000000YNYNYE5000 3) The Exchange sends data to Participant with: Starting sequence number 00000001 Regular market messages on Options, not Futures Market depth messages for all Trading Instruments Regular market messages and Strategies for all Trading Instruments Regular market messages with Summaries GAP Control: Y (will receive GAP messages) Protocol version E5 All options classes |
| RETRANSMISSION -A- (REQUESTING TO RECEIVE FROM BEGINNING OF THE DAY) | 1) Participant connects to specified port 2) Participant sends RS message type ex. 00000001RS 000000000 YNYNYE5000 3) The Exchange resends all messages disseminated so far through out the day |
| RETRANSMISSION -B- (REQUESTING THE NEXT MESSAGE IN LINE) | 1) Participant connects to specified port 2) Participant sends RS message type ex. 00000001RS 999999999 YNYNYE5000 3) The Exchange sends the next message to Participant |
| RETRANSMISSION -C- (FROM A SPECIFIC SEQUENCE NUMBER) | 1) Participant connects, if disconnected to specified port 2) Participant sends RS message type ex. 00000001RS 000013247 YNYNYE5000 3) The Exchange sends all messages with sequence numbers greater than 13247 <i>Note: If the Exchange's sequence number is lower than participant's, transmission will begin with the next message</i> |
| DISCONNECTION | 1) Participant disconnects from port |

Notes:

1) For a retransmission (type 'A' or 'C'), participants should keep the same parameters

(Type of market data / GAP Control / Option classes requested).

2) Participants are required to reconnect every day. If they do not disconnect, their connection is terminated by the Exchange at the end of the day.

2.4 Record format and definitions

- Whenever a field is indicated as being blank it contains the ASCII space character (hex 20).
- All numeric fields: Numbers (0 to 9), Right justified and zero filled.
- All alphanumeric fields (except 'Strategy Symbol' and 'Instrument External Code'): All characters possible (numbers, letters, others), right justified, zero filled unless stated otherwise.

- 'Strategy Symbol' and 'Instrument External Code' alphanumeric field: All characters possible, left justified, blank filled.
- All alphabetic fields: Letters (A to Z) left justified, blank filled unless stated otherwise.
- The 'Filler' field can have any format [numeric, alphanumeric, ASCII space character (hex 20)].

In the following tables, the column **L** represents the length in bytes of the described field, and the column **T** ('Data Type') will be represented by the following characters. Refer to the above for a more detail description of each:

A = Alphabetic

N = Numeric

X = Alphanumeric

3.0 Trade Messages

3.1 Message Type C - Option Trade

| Field Name | L= 72 | T | Definition / Validation Rules |
|------------------|-------|---|---|
| Message Header | 11 | | Refer to "Message Header" paragraph. |
| Exchange ID | 1 | A | Exchange on which the trade occurred. Refer to Field Description "Exchange ID" |
| Symbol Root | 6 | A | Option base symbol (symbol of the underlying) |
| Maturity Year | 2 | N | Last two digits of the maturity year of the contract |
| Maturity Month | 1 | A | Maturity month code of the contract |
| Maturity Day | 2 | N | Maturity day of the contract |
| Call/Put Code | 1 | A | Refer to Field Description "Call/Put Code" |
| Strike Price | 8 | X | Strike price of the option in full. Refer to Field Description "Fraction Indicator Code" |
| Corporate Action | 1 | A | Refer to Field Description "Corporate Action Marker" |
| Volume | 8 | X | Number of contracts for the trade. Refer to Field Description "Indicator code" |

| Field Name | L= 72 | T | Definition / Validation Rules |
|-----------------|-------|---|---|
| Trade Price | 8 | X | Price at which the transaction took place Refer to Field Description "Fraction Indicator Code" |
| Net Change Sign | 1 | X | Sign +/- for the net change field |
| Net Change | 8 | X | Net change = last trade price - previous close Refer to Field Description "Fraction Indicator Code" |
| Stamp Time | 6 | N | Time of transaction HHMMSS |
| Open Interest | 7 | N | Outstanding number of contracts in the series as of previous day Refer to Field Description "Indicator code" |
| Price Indicator | | | Identifies the type of transaction |
| Marker | 1 | A | Refer to Field Description "Price Indicator Marker" |

3.2 Message Type CF - Futures Trade

| Field Name | L= 56 | T | Definition / Validation Rules |
|----------------|-------|---|---|
| Message Header | 11 | | Refer to "Message Header" paragraph. |
| Exchange ID | 1 | A | Exchange on which the trade occurred. Refer to Field Description "Exchange ID" |
| Symbol Root | 6 | A | Futures series symbol |
| Maturity Year | 2 | N | Last two digits of the maturity year of the contract |
| Maturity Month | 1 | A | Maturity month code of the contract |

| Field Name | L= 56 | T | Definition / Validation Rules |
|------------------------|-------|---|--|
| Maturity Day | 2 | N | Maturity day of the contract |
| Corporate Action | 1 | A | Refer to Field Description "Corporate Action Marker" |
| Volume | 8 | X | Total number of contracts traded Refer to Field Description "Indicator code" |
| Trade Price | 8 | X | Price at which the transaction took place. Refer to Field Description "Fraction Indicator Code" |
| Net Change Sign | 1 | A | Sign +/- for net change field (sign) |
| Net Change | 8 | X | Net change = last trade price - previous settlement price. Refer to Field Description "Fraction Indicator Code" |
| Stamp Time | 6 | N | Time of transaction HHMMSS |
| Price Indicator Marker | 1 | A | Identifies the type of transaction Refer to Field Description "Price Indicator Marker" |

3.3 Message Type CS - Strategy Trade

A Strategy Trade is a message notification of a transaction on a strategy (which are 2 instruments being involved in the 1 trade).

| Field Name | L= 75 | T | Definition / Validation Rules |
|----------------|-------|---|---|
| Message Header | 11 | | Refer to "Message Header" paragraph. |
| Exchange ID | 1 | A | Exchange on which the trade occurred. Refer to Field Description "Exchange ID" |

| Field Name | L= 75 | T | Definition / Validation Rules |
|---------------------------|-------|---|--|
| Symbol | 30 | X | Identification of the strategy The legs (underlying) are defined in message type NS Alphanumeric with ".", "+", "-" |
| Volume | 8 | X | Total number of contracts traded Refer to Field Description "Indicator Code" |
| Trade Price Sign +/- | 1 | X | For Trade Price field (sign) |
| Trade Price | 8 | X | Price at which the transaction took place. Refer to Field Description "Fraction Indicator Code" |
| Net Change Sign +/- | 1 | A | For net change field |
| Net Change | 8 | X | Net change = last trade price - previous close Refer to Field Description "Fraction Indicator Code" |
| Stamp Time | 6 | N | Time of transaction HHMMSS |
| Price Indicator Marker | 1 | A | Identifies the type of transaction Refer to Field Description "Price Indicator Marker" |

4.0 Request for Quote Messages (RFQ)

4.1 Message Type D - Option Request for Quote (RFQ)

| Field Name | L= 41 | T | Definition / Validation Rules |
|------------------|-------|---|---|
| Message Header | 11 | | Refer to "Message Header" paragraph. |
| Exchange ID | 1 | A | Exchange on which the RFQ occurred. Refer to Field Description "Exchange ID" |
| Symbol Root | 6 | A | Option base symbol |
| Maturity Year | 2 | N | Last two digits of the maturity year of the contract |
| Maturity Month | 1 | A | Maturity month code of the contract |
| Maturity Day | 2 | N | Maturity day of the contract |
| Call/Put Code | 1 | A | Refer to Field Description "Call/Put Code" |
| Strike Price | 8 | X | Strike price of the option in full. Refer to Field Description "Fraction Indicator Code" |
| Corporate Action | 1 | A | Refer to Field Description "Corporate Action Marker" |
| Size of the RFQ | 8 | X | Number of contracts for which the price is requested Refer to Field Description "Indicator Code" |

4.2 Message Type DF - Futures Request for Quote (RFQ)

| Field Name | L= 32 | T | Definition / Validation Rules |
|------------------|-------|---|--|
| Message Header | 11 | | Refer to "Message Header" paragraph. |
| Exchange ID | 1 | A | Exchange on which the RFQ occurred. Refer to Field Description "Exchange ID" |
| Symbol Root | 6 | A | Symbol for the Future series |
| Maturity Year | 2 | N | Last two digits of the maturity year of the contract |
| Maturity Month | 1 | A | Maturity month code of the contract |
| Maturity Day | 2 | N | Maturity day of the contract |
| Corporate Action | 1 | A | Refer to Field Description "Corporate Action Marker" |
| Size of the RFQ | 8 | N | Number of contracts for which the price is requested Positive whole number Refer to Field Description "Indicator Code" |

4.3 Message Type DS - Strategy Request for Quote (RFQ)

| Field Name | L= 50 | T | Definition / Validation Rules |
|----------------|-------|---|---|
| Message Header | 11 | | Refer to "Message Header" paragraph. |
| Exchange ID | 1 | A | Exchange on which the RFQ occurred. Refer to Field Description "Exchange ID" |

| | | | |
|-----------------|----|---|--|
| Symbol | 30 | X | <p>Identification of the strategy</p> <p>The legs (underlying) are defined in message type NS. Alphanumeric with ".", "+", "-"</p> |
| Size of the RFQ | 8 | X | <p>Number of contracts for which the price is requested</p> <p>Positive whole number</p> <p>Refer to Field Description "Fraction Indicator Code"</p> |

5.0 Instrument Schedule Notice

5.1 Message Type E - Instrument Schedule Notice Option

| Field Name | L= 40 | T | Definition / Validation Rules |
|----------------|-------|---|--|
| Message Header | 11 | | Refer to "Message Header" paragraph. |
| Exchange ID | 1 | A | <p>Exchange on which the group status notice occurred.</p> <p>Refer to Field Description "Exchange ID"</p> |
| Symbol Root | 6 | X | Root of the instrument group |
| Maturity Year | 2 | N | Last two digits of the maturity year of the contract |
| Maturity Month | 1 | A | Maturity month code of the contract |
| Maturity Day | 2 | N | Maturity day of the contract |
| Call/Put Code | 1 | A | Refer to Field Description "Call/Put Code" |

| Field Name | L= 40 | T | Definition / Validation Rules |
|------------------------------|-------|---|---|
| Strike Price | 8 | X | Strike price of the option in full. Refer to Field Description "Fraction Indicator Code" |
| Corporate Action | 1 | A | |
| Scheduled Instrument Status | 1 | A | Refer to Field Description "Instrument Status Marker" |
| Scheduled Status Change Time | 6 | N | HMMSS |

5.2 Message Type EB - Instrument Schedule Notice Futures Option

| Field Name | L= 40 | T | Definition / Validation Rules |
|----------------|-------|---|--|
| Message Header | 11 | | Refer to "Message Header" paragraph. |
| Exchange ID | 1 | A | Exchange on which the instrument status notice occurred. Refer to Field Description "Exchange ID" |
| Symbol Root | 6 | X | Root of the instrument group |
| Maturity Year | 2 | N | Last two digits of the maturity year of the contract |
| Maturity Month | 1 | A | Maturity month code of the contract |
| Maturity Day | 2 | N | Maturity day of the contract |

| Field Name | L= 40 | T | Definition / Validation Rules |
|------------------------------|-------|---|---|
| Call/Put Code | 1 | A | Refer to Field Description "Call/Put Code" |
| Strike Price | 8 | X | Strike price of the option in full. Refer to Field Description "Fraction Indicator Code" |
| Corporate Action | 1 | A | |
| Scheduled Instrument Status | 1 | A | Refer to Field Description "Instrument Status Marker" |
| Scheduled Status Change Time | 6 | N | HHMMSS |

5.3 Message Type EF - Instrument Schedule Notice Future

| Field Name | L= 31 | T | Definition / Validation Rules |
|----------------|-------|---|--|
| Message Header | 11 | | Refer to "Message Header" paragraph. |
| Exchange ID | 1 | A | Exchange on which the instrument status notice occurred. Refer to Field Description "Exchange ID" |
| Symbol Root | 6 | X | Symbol for the Future series |
| Maturity Year | 2 | N | Last two digits of the maturity year of the contract |
| Maturity Month | 1 | A | Maturity month code of the contract |
| Maturity Day | 2 | N | Maturity day of the contract |

| Field Name | L= 31 | T | Definition / Validation Rules |
|------------------------------|-------|---|---|
| Corporate Action | 1 | A | |
| Scheduled Instrument Status | 1 | A | Refer to Field Description "Instrument Status Marker" |
| Scheduled Status Change Time | 6 | N | HHMMSS |

5.4 Message Type ES - Instrument Schedule Notice Strategy

| Field Name | L= 49 | T | Definition / Validation Rules |
|------------------------------|-------|---|--|
| Message Header | 11 | | Refer to "Message Header" paragraph. |
| Exchange ID | 1 | A | Exchange on which the Instrument status notice occurred. Refer to Field Description "Exchange ID" |
| Symbol | 30 | X | |
| Scheduled Instrument Status | 1 | A | Refer to Field Description "Instrument Status Marker" |
| Scheduled Status Change Time | 6 | N | HHMMSS |

6.0 Quote Messages

6.1 Message Type F - Option Quote

| Field Name | L= 60 | T | Definition / Validation Rules |
|------------------|-------|---|---|
| Message Header | 11 | | Refer to "Message Header" paragraph. |
| Exchange ID | 1 | A | Exchange on which the quote occurred. Refer to Field Description "Exchange ID" |
| Symbol Root | 6 | A | Option base symbol |
| Maturity Year | 2 | N | Last two digits of the maturity year of the contract |
| Maturity Month | 1 | A | Maturity month code of the contract |
| Maturity Day | 2 | N | Maturity day of the contract |
| Call/Put Code | 1 | A | Refer to Field Description "Call/Put Code" |
| Strike Price | 8 | X | Strike price of the option in full. Refer to Field Description "Fraction Indicator Code" |
| Corporate Action | 1 | A | Refer to Field Description "Corporate Action Marker" |
| Bid Price | 8 | X | Bid price for the option series. Refer to Field Description "Fraction Indicator Code" |

| Field Name | L= 60 | T | Definition / Validation Rules |
|--------------------------|-------|---|---|
| Bid Size | 5 | N | Number of option contracts represented by the Bid Price. If size is greater than 99999, the 5th character becomes an exponent Refer to Field Description "Indicator Code" |
| Ask Price | 8 | X | Ask price for the option series. Refer to Field Description "Fraction Indicator Code" |
| Ask Size | 5 | N | Number of option contracts represented by the Ask Price. If size is greater than 99999, the 5th character becomes an exponent Refer to Field Description "Indicator Code" |
| Instrument Status Marker | 1 | A | Refer to Field Description "Instrument Status Marker" |

6.2 Message Type FF - Futures Quote

| Field Name | L= 51 | T | Definition / Validation Rules |
|----------------|-------|---|--|
| Message Header | 11 | | Refer to "Message Header" paragraph. |
| Exchange ID | 1 | A | Refer to Field Description "Exchange ID" |
| Symbol Root | 6 | A | Symbol for the Future series |
| Maturity Year | 2 | N | Last two digits of the maturity year of the contract |

| Field Name | L= 51 | T | Definition / Validation Rules |
|--------------------------|-------|---|---|
| Maturity Month | 1 | A | Maturity month code of the contract |
| Maturity Day | 2 | N | Maturity day of the contract |
| Corporate Action | 1 | A | Refer to Field Description "Corporate Action Marker" |
| Bid Price | 8 | X | Bid price for the future contract. Refer to Field Description "Fraction Indicator Code" |
| Bid Size | 5 | N | Number of futures contracts represented by the Bid Price. If size is greater than 99999, the 5th character becomes an exponent Refer to Field Description "Indicator Code" |
| Ask Price | 8 | X | Ask Price for the future contract. Refer to Field Description "Fraction Indicator Code" |
| Ask Size | 5 | N | The number of futures contracts represented by the Ask Price. If size is greater than 99999, the 5th character becomes an exponent Refer to Field Description "Indicator Code" |
| Instrument Status Marker | 1 | A | Indicates Instrument Status. Refer to Field Description "Instrument Status Marker" |

6.3 Message Type FS - Strategy Quote

A Strategy Quote is the first limit of the market depth message diffused from the Exchange routing engine for a strategy Instrument. It has the current established Best Bid/Best Ask, and Best Bid Volume/ Best Ask Volume (not including hidden volumes). It is a simple snapshot of what the market conditions are on the Instrument. The same types of strategy rules written above apply in the same manner for the strategy.

| Field Name | L= 71 | T | Definition / Validation Rules |
|----------------|-------|---|--|
| Message Header | 11 | | Refer to "Message Header" paragraph. |
| Exchange ID | 1 | A | Refer to Field Description "Exchange ID" |
| Symbol | 30 | X | Identification of the strategy The legs (underlying) are defined in message type NS. Alphanumeric with ".", "+", "-" |
| Bid Price Sign | 1 | A | Sign +/- for Bid Price field |
| Bid Price | 8 | X | Bid price for the future contract Refer to Field Description "Fraction Indicator Code" |
| Bid Size | 5 | N | Number of futures contracts represented by the Bid Price. If size is greater than 99999, the 5th character becomes an exponent Refer to Field Description "Indicator Code" |
| Ask Price Sign | 1 | A | Sign +/- for for Ask Price field |
| Ask Price | 8 | X | Ask price for the future contract. Refer to Field Description "Fraction Indicator Code" |
| Ask Size | 5 | N | The number of futures contracts represented by the Ask Price. If size is greater than 99999, the 5th character becomes an exponent Refer to Field Description "Indicator Code" |

| Field Name | L= 71 | T | Definition / Validation Rules |
|--------------------------|-------|---|--|
| Instrument Status Marker | 1 | A | Indicates Instrument Status. Refer to Field Description "Instrument Status Marker" |

7.0 Group Messages

7.1 Message Type GC - Group Status Schedule Notice

| Field Name | L= 146 | T | Definition / Validation Rules |
|------------------------|--------|---|--|
| Message Header | 11 | | Refer to "Message Header" paragraph. |
| Exchange ID | 1 | A | Refer to Field Description "Exchange ID" |
| Symbol Root | 6 | X | Root of the instrument group |
| Instrument Group | 2 | X | Group of the instrument |
| Group Status | 1 | A | Group status of the trading instrument. Refer to Field Description "Group Status Marker" |
| Scheduled Time | 6 | N | HHMMSS |
| Underlying Symbol Root | 10 | X | Symbol Root of the Underlying |
| Delivery Type | 1 | A | Refer to Field Description "Delivery Type" |
| Default Contract Size | 8 | N | Number of contract or shares |
| Description | 100 | X | Group Description |

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7.2 Message Type GR - Group Status

This message will be sent when a group of trading instruments enters a new status:

| Field Name | L= 146 | T | Definition / Validation Rules |
|------------------------|--------|---|--|
| Message Header | 11 | | Refer to "Message Header" paragraph. |
| Exchange ID | 1 | A | Refer to Field Description "Exchange ID" |
| Symbol Root | 6 | A | Root of the instrument group |
| Group Instrument | 2 | X | Group of the instrument |
| Group Status | 1 | A | Group status of the trading instrument. Refer to Field Description "Group Status Marker" |
| Filler | 6 | X | |
| Underlying Symbol Root | 10 | X | Symbol Root of the Underlying |
| Delivery Type | 1 | A | Refer to Field Description "Delivery Type" |
| Default Contract Size | 8 | N | Number of contract or shares |
| Description | 100 | X | Group Description |



7.3 Message Type GS - Group Status (Strategies)

This message will be sent when a Strategy group of trading instruments enters a new status. All strategies have a predetermined group that can be found in the JS message (Strategy Instrument Keys message).

| Field Name | L= 146 | T | Definition / Validation Rules |
|------------------------|--------|---|--|
| Message Header | 11 | | Refer to "Message Header" paragraph. |
| Exchange ID | 1 | A | Refer to Field Description "Exchange ID" |
| Group Instrument | 2 | X | Group of the instrument |
| Group Status | 1 | A | Group status of the trading instrument. Refer to Field Description "Group Status Marker" |
| Filler | 6 | X | |
| Symbol Root | 6 | X | Symbol Root of the Instrument Group |
| Underlying Symbol Root | 10 | X | Symbol Root of the Underlying |
| Delivery Type | 1 | A | Refer to Field Description Delivery Type" |
| Default Contract Size | 8 | N | Number of contract or shares |
| Description | 100 | X | Group Description |

8.0 Market Depth Messages

8.1 Message Type H - Option Market Depth

| Field Name | L= 66 up to 190 | T | Definition / Validation Rules |
|--------------------------|-----------------|---|---|
| Message Header | 11 | | Refer to "Message Header" paragraph. |
| Exchange ID | 1 | A | Refer to Field Description "Exchange ID" |
| Symbol Root | 6 | A | Option base symbol |
| Maturity Year | 2 | N | Last two digits of the maturity year of the contract |
| Maturity Month | 1 | A | Maturity month code of the contract |
| Maturity Day | 2 | N | Maturity day of the contract |
| Call/Put Code | 1 | A | Refer to Field Description "Call/Put Code" |
| Strike Price | 8 | X | Strike price of the option in full. Refer to Field Description "Fraction Indicator Code" |
| Corporate Action | 1 | A | Refer to Field Description "Corporate Action Marker" |
| Instrument Status Marker | 1 | A | Indicates Instrument Status. Refer to Field Description "Instrument Status Marker" |

| Field Name | L= 66 up to 190 | T | Definition / Validation Rules |
|-----------------------|-----------------|---|--|
| Number of Level | 1 | N | Number of level for the trading instrument 1 to 5 |
| Level of Market Depth | 1 | A | Level of market depth 1 to 5: 1 to 5 levels A: Implied prices |
| Bid Price | 8 | X | Bid price for the option series or '0000OUV0' to represent a market order at the top of the book in a pre-auction phase. Refer to Field Description "Fraction Indicator Code" |
| Bid Size | 5 | N | Number of option contracts represented by the Bid Price. If size is greater than 99999, the 5th character becomes an exponent. Refer to Field Description "Indicator Code" |
| Number of Bid Orders | 2 | X | Number of bid orders, present at a given moment in the order book. If greater than 99 the 2nd character becomes an exponent. Refer to Field Description "Indicator Code" |
| Ask Price | 8 | X | Ask price for the option series or '0000OUV0' to represent a market order at the top of the book in a pre-auction phase. Refer to Field Description "Fraction Indicator Code" |
| Ask Size | 5 | N | Number of option contracts represented by the Ask Price. If size is greater than 99999, the 5th character becomes an exponent. Refer to Field Description "Indicator Code" |
| Number of Ask Orders | 2 | X | Number of Ask Orders, present at a given moment in the order book. If greater than 99 the 2nd character becomes an exponent. Refer to Field Description "Indicator Code" |

8.2 Message Type HF - Futures Market Depth

| Field Name | L= 57 up to 181 | T | Definition / Validation Rules |
|--------------------------|--------------------|---|--|
| Message Header | 11 | | Refer to "Message Header" paragraph. |
| Exchange ID | 1 | A | Exchange on which the market depth message occurred. Refer to Field Description "Exchange ID" |
| Symbol Root | 6 | A | Symbol for the Future series |
| Maturity Year | 2 | N | Last two digits of the maturity year of the contract |
| Maturity Month | 1 | A | Maturity month code of the contract |
| Maturity Day | 2 | N | Maturity day of the contract |
| Corporate Action | 1 | A | Refer to Field Description "Corporate Action Marker" |
| Instrument Status Marker | 1 | A | Indicates Instrument Status. Refer to Field Description "Instrument Status Marker" |
| Number of Level | 1 | N | Number of level for the trading instrument 1 – 5 |

| Field Name | L= 57 up to 181 | T | Definition / Validation Rules |
|-----------------------|-----------------|---|---|
| Level of Market Depth | 1 | A | Level of market depth 1 to 5: 1 to 5 levels A: Implied prices |
| Bid Price | 8 | X | Bid price for the future contract or '0000OUV0' to represent a market order at the top of the book in a pre-auction phase. Refer to Field Description "Fraction Indicator Code" |
| Bid Size | 5 | N | Number of futures contracts represented by the Bid Price. If size is greater than 99999, the 5th character becomes an exponent. Refer to Field Description "Indicator Code" |
| Number of Bid Orders | 2 | X | Number of Bid Orders, present at a given moment in the order book. If greater than 99 the 2nd character becomes an exponent |
| Ask Price | 8 | X | Ask Price for the future contract or '0000OUV0' to represent a market order at the top of the book in a pre-auction phase. Refer to Field Description "Fraction Indicator Code" |
| Ask Size | 5 | N | The number of futures contracts represented by the Ask Price. If size is greater than 99999, the 5th character becomes an exponent. Refer to Field Description "Indicator Code" |
| Number of Ask Orders | 2 | N | Number of Ask Orders, present at a given moment in the order book. If greater than 99 the 2nd character becomes an exponent Refer to Field Description "Indicator Code" |

8.3 Message Type HS - Strategy Market Depth

| Field Name | L= 77 up to 209 | T | Definition / Validation Rules |
|--------------------------|-----------------------|---|--|
| Message Header | 11 | | Refer to "Message Header" paragraph. |
| Exchange ID | 1 | A | Refer to Field Description "Exchange ID" |
| Symbol | 30 | X | Identification of the strategy. The legs (underlying) are defined in message type NS Alphanumeric with ".", "+", "-" |
| Instrument Status Marker | 1 | A | Indicates Instrument Status. Refer to Field Description "Instrument Status Marker" |
| Number of Level | 1 | N | Number of level for the trading instrument 1 – 5 |
| Level of Market Depth | 1 | A | Level of market depth 1 to 5: 1 to 5 levels A: Implied prices |
| Bid Price Sign | 1 | A | Sign +/- for the Bid Price field |
| Bid Price | 8 | X | Bid price for the future contract or '0000OUV0' to represent a market order at the top of the book in a pre-auction phase. Refer to Field Description "Fraction Indicator Code" |
| Bid Size | 5 | N | Number of futures contracts represented by the Bid Price. If size is greater than 99999, the 5th character becomes an exponent Refer to Field Description "Indicator Code" |

| Field Name | L= 77 up to 209 | T | Definition / Validation Rules |
|----------------------|--------------------------------|----------|--|
| Number of Bid Orders | 2 | N | Number of Bid Orders, present at a given moment in the order book. If greater than 99 the 2nd character becomes an exponent Refer to Field Description "Indicator Code" |
| Ask Price Sign | 1 | X | Sign +/- for the Ask Price field. |
| Ask Price | 8 | X | Ask price for the future contract or '0000OUV0' to represent a market order at the top of the book in a pre-auction phase. Refer to Field Description "Fraction Indicator Code" |
| Ask Size | 5 | N | The number of futures contracts represented by the Ask Price. If size is greater than 99999, the 5th character becomes an exponent. Refer to Field Description "Indicator Code" |
| Number of Ask Orders | 2 | N | Number of Ask Orders, present at a given moment in the order book. If greater than 99 the 2nd character becomes an exponent. Refer to Field Description "Indicator Code" |

9.0 Trade Cancellation Messages

9.1 Message Type I - Option Trade Cancellation

A cancellation will reduce the total volume, value and transactions by the amount of the cancelled trade. A cancellation message is followed by an Options Summary message (message type N) which will reflect the corrected market.

| Field Name | L= 63 | T | Definition / Validation Rules |
|------------------|-------|---|--|
| Message Header | 11 | | Refer to "Message Header" paragraph. |
| Exchange ID | 1 | A | Refer to Field Description "Exchange ID" |
| Symbol Root | 6 | A | Option base symbol |
| Maturity Year | 2 | N | Last two digits of the maturity year of the contract |
| Maturity Month | 1 | A | Maturity month code of the contract |
| Maturity Day | 2 | N | Maturity day of the contract |
| Call/Put Code | 1 | A | Refer to Field Description "Call/Put Code" |
| Strike Price | 8 | X | Strike price of the option in full. Refer to Field Description "Fraction Indicator Code" |
| Corporate Action | 1 | A | Refer to Field Description "Corporate Action Marker" |
| Volume | 8 | N | Number of contracts being cancelled Refer to Field Description "Indicator Code" |
| Trade Price | 8 | X | Price at which the transaction took place. Refer to Field Description "Fraction Indicator Code" |

| Field Name | L= 63 | T | Definition / Validation Rules |
|------------------------|-------|---|--|
| Stamp Time | 6 | N | Time of the option trade HHMMSS |
| Open Interest | 7 | N | Outstanding number of contracts in the series as of the previous day. Refer to Field Description "Indicator Code" |
| Price Indicator Marker | 1 | X | Identifies the type of transaction. Refer to Field Description "Price Indicator Marker" |

9.2 Message Type IF - Futures Trade Cancellation

A cancellation will reduce the total volume, value and transactions by the amount of the cancelled trade. A cancellation message is followed by a Future Summary message (message type NF) which will reflect the corrected market.

| Field Name | L= 47 | T | Definition / Validation Rules |
|------------------|-------|---|--|
| Message Header | 11 | | Refer to "Message Header" paragraph. |
| Exchange ID | 1 | A | Refer to Field Description "Exchange ID" |
| Symbol Root | 6 | A | Symbol for the Future series |
| Maturity Year | 2 | N | Last two digits of the maturity year of the contract |
| Maturity Month | 1 | A | Maturity month code of the contract |
| Maturity Day | 2 | N | Maturity day of the contract |
| Corporate Action | 1 | A | Refer to Field Description "Corporate Action Marker" |
| Volume | 8 | N | Number of contracts being cancelled Refer to Field Description "Indicator Code" |

| Field Name | L= 47 | T | Definition / Validation Rules |
|---------------------------|-------|---|--|
| Trade Price | 8 | X | Price at which the transaction took place. Refer to Field Description "Fraction Indicator Code" |
| Stamp Time | 6 | N | Time of the futures trade HHMMSS |
| Price Indicator Marker | 1 | X | Identifies the type of transaction. Refer to Field Description "Price Indicator Marker" |

9.3 Message Type IS - Strategy Trade Cancellation

A cancellation will reduce the total volume, value and transactions by the amount of the cancelled trade. A cancellation message is followed by a Strategy Summary message (message type NS) which will reflect the corrected market.

| Field Name | L= 65 | T | Definition / Validation Rules |
|------------------|-------|---|--|
| Message Header | 11 | | Refer to "Message Header" paragraph. |
| Exchange ID | 1 | A | Refer to Field Description "Exchange ID" |
| Symbol | 30 | X | Identification of the strategy The legs (underlying) are defined in message type NS. Alphanumeric with ".", "+", "-" |
| Volume | 8 | N | Number of contracts being cancelled Refer to Field Description "Indicator Code" |
| Trade Price Sign | 1 | A | Sign +/- for the Trade Price field |
| Trade Price | 8 | X | Price at which the transaction took place. Refer to Field Description "Fraction Indicator Code" |

| Field Name | L= 65 | T | Definition / Validation Rules |
|------------|-------|---|-------------------------------------|
| Stamp Time | 6 | N | Time of the futures trade HHMMSS |

10.0 Instrument Keys Messages

10.1 Message Type J - Option Instrument Keys

| Field Name | L= 151 | T | Definition / Validation Rules |
|----------------|--------|---|---|
| Message Header | 11 | | Refer to "Message Header" paragraph. |
| Exchange ID | 1 | A | Exchange on which the instrument is listed. Refer to Field Description "Exchange ID" |
| Symbol Root | 6 | A | Option base symbol (symbol of the underlying) |
| Maturity Year | 2 | N | Last two digits of the maturity year of the contract |
| Maturity Month | 1 | A | Maturity month code of the contract |
| Maturity Day | 2 | N | Maturity day of the contract |
| Call/Put Code | 1 | A | Refer to Field Description "Call/Put Code" |
| Strike Price | 8 | X | Strike price of the option in full. Refer to Field Description "Fraction Indicator Code" |

| Field Name | L= 151 | T | Definition / Validation Rules |
|---------------------------------------|--------|---|---|
| Corporate Action | 1 | A | Refer to Field Description "Corporate Action Marker" |
| Strike Price Currency | 3 | A | Currency used for the Option Strike Price Refer to Field Description "Currency Code" |
| Maximum Number of Contracts per Order | 6 | N | Maximum authorized number of contract per order Refer to Field Description "Indicator Code" |
| Minimum Number of Contracts per Order | 6 | N | Minimum authorized number of contract per order Refer to Field Description "Indicator Code" |
| Maximum Threshold Price | 8 | X | Maximum threshold price authorized for an option contract Refer to Field Description "Fraction Indicator Code" |
| Minimum Threshold Price | 8 | X | Minimum threshold price authorized for an option contract Refer to Field Description "Fraction Indicator Code" |
| Tick Increment Table | 7 | X | Tick Table Identifier that indicates the precision with which the price of an order limit can be expressed. Refer to the Chapter "Tick Increment Tables" |
| Filler | 1 | X | |
| Option type | 1 | A | Type of option "A" for American "E" for European |
| Market Flow Indicator | 2 | A | Refer to the Field Description "Market Feed Indicator" |
| Group Instrument | 2 | X | Group of the instrument |

| Field Name | L= 151 | T | Definition / Validation Rules |
|--------------------------|--------|---|---|
| Instrument | 4 | X | Instrument SAIL ID |
| ISIN | 12 | X | External ISIN |
| Instrument External Code | 30 | X | External identifier used by traders when entering an order |
| Option Marker | 2 | A | Refer to Field Description "Markers for Options" |
| Underlying Symbol Root | 10 | X | Symbol root for the underlying security |
| Contract Size | 8 | N | Defines the quantity of deliverable underlyings in one contract. Refer to Field Description "Indicator Code" |
| Tick Value | 8 | X | Refer to Field Description "Fraction Indicator Code" |

Note: If both "Maximum Threshold Price" and "Minimum Threshold Price" are set to 0, no thresholds have been configured.

10.2 Message Type JF- Futures Instrument Keys

| Field Name | L= 144 | T | Definition / Validation Rules |
|----------------|--------|---|---|
| Message Header | 11 | | Refer to "Message Header" paragraph. |
| Exchange ID | 1 | A | Exchange on which the trade occurred. Refer to Field Description "Exchange ID" |
| Symbol Root | 6 | A | Futures series symbol |

| Field Name | L= 144 | T | Definition / Validation Rules |
|---------------------------------------|--------|---|---|
| Maturity Year | 2 | N | Last two digits of the maturity year of the contract |
| Maturity Month | 1 | A | Maturity month code of the contract |
| Maturity Day | 2 | N | Maturity day of the contract |
| Corporate Action | 1 | A | Refer to Field Description "Corporate Action Marker" |
| Expiry Year | 2 | N | Last two digits of the expiry year of the future |
| Expiry Month | 1 | A | Expiry month code of the future |
| Expiry Day | 2 | N | Expiry day of the future |
| Maximum Number of Contracts per Order | 6 | N | Maximum authorized number of contract per order Refer to Field Description "Indicator Code" |
| Minimum Number of Contracts per Order | 6 | N | Minimum authorized number of contract per order Refer to Field Description "Indicator Code" |
| Maximum Threshold Price | 8 | X | Maximum threshold price authorized for an option contract Refer to Field Description "Fraction Indicator Code" |
| Minimum Threshold Price | 8 | X | Minimum threshold price authorized for an option. Refer to Field Description "Fraction Indicator Code" |
| Tick Increment Table | 7 | X | Tick Table Identifier that indicates the precision with which the price of an order limit can be expressed. Refer to the Chapter "Tick Increment Tables" |
| Filler | 1 | X | |

| Field Name | L= 144 | T | Definition / Validation Rules |
|--------------------------|--------|---|---|
| Market Flow Indicator | 2 | A | Defines the type of instruments Refer to Field Description "Market Feed Indicators" |
| Group Instrument | 2 | X | Group of the instrument |
| Instrument | 4 | X | Instrument SAIL ID |
| ISIN | 12 | X | External ISIN |
| Instrument External Code | 30 | X | External identifier used by traders when entering an order |
| Currency | 3 | A | Refer to Field Description "Currency Code" |
| Underlying Symbol Root | 10 | X | Symbol Root of the Underlying |
| Contract Size | 8 | N | Defines the quantity of deliverable underlyings in one contract. Refer to Field Description "Indicator Code" |
| Tick Value | 8 | X | Refer to Field Description "Fraction Indicator Code" |

Note: If both "Maximum Threshold Price" and "Minimum Threshold Price" are set to 0, no thresholds have been configured.

10.3 Message Type JS- Strategy Instrument Keys

| Field Name | L= 125 | T | Definition / Validation Rules |
|----------------|--------|---|--------------------------------------|
| Message Header | 11 | | Refer to "Message Header" paragraph. |

| Field Name | L= 125 | T | Definition / Validation Rules |
|---------------------------------------|--------|---|---|
| Exchange ID | 1 | A | Exchange on which the instrument is listed. Refer to Field Description "Exchange ID" |
| Symbol | 30 | X | Identification of the strategy The legs (underlying) are defined in message type NS Alphanumeric with "." (when needed) |
| Maturity Year | 2 | N | Last two digits of the maturity year of the contract |
| Maturity Month | 1 | A | Maturity month code of the contract |
| Maturity Day | 2 | N | Maturity day of the contract |
| Maximum Number of Contracts per Order | 6 | N | Maximum authorized number of contract per order Refer to Field Description "Indicator Code" |
| Minimum Number of Contracts per Order | 6 | N | Minimum authorized number of contract per order Refer to Field Description "Indicator Code" |
| Maximum Threshold Price Sign | 1 | X | Sign +/- for the Maximum Threshold Price. |
| Maximum Threshold Price | 8 | X | Maximum threshold price authorized for an option contract Refer to Field Description "Fraction Indicator Code" |
| Minimum Threshold Price Sign | 1 | X | Sign +/- for the Minimum Threshold Price. |
| Minimum Threshold Price | 8 | X | Minimum threshold price authorized for an option contract. Refer to Field Description "Fraction Indicator Code" |

| Field Name | L= 125 | T | Definition / Validation Rules |
|--------------------------|--------|---|---|
| Tick Increment | 8 | X | Precision with which the price of an order limit can be expressed. Refer to Field Description "Fraction Indicator Code" It is calculated as the lowest tick level granularity allowed on the Strategy legs. |
| Market Flow Indicator | 2 | A | Defines the type of instruments Refer to "Market Feed Indicators" |
| Group Instrument | 2 | X | Group of the instrument |
| Instrument | 4 | X | Instrument SAIL ID |
| Instrument External Code | 30 | X | External identifier used by traders when entering an order |
| Strategy Allow Implied | 1 | A | Indicates if the Strategy supports Implied Pricing Y: Yes N: No |
| Strategy Pricing | 1 | A | Indicate the pricing method for the strategy. L : Same as legs N : Notional |

11.0 Bulletins

News and market surveillance advises are sent with bulletins messages. Bulletins will be sent throughout the trading day. More than one message will be used if the bulletin is longer than 79 characters. The continuation character "0" indicates that the bulletin continues to the next record.

When a Trading instrument has been halted by the Exchange, a Bulletin Message explaining the reason for the halt will be transmitted. When the trading instrument is reinstated, another Bulletin Message explaining the news that accompanied the reinstatement will be transmitted.

All records that make up a particular bulletin will be sent out together. No other message will be interspersed among the records that make up a complete bulletin.

11.1 Message Type L (1) - Regular Text Bulletin

| Field Name | L= 93 | T | Definition / Validation Rules |
|-------------------|-------|---|---|
| Message Header | 11 | | Refer to "Message Header" paragraph. |
| Reserved | 1 | | Reserved for future use |
| Bulletin Type | 1 | X | 1 = Regular Text Bulletin |
| Bulletin Contents | 79 | X | Bulletin in textual form. Left justified, blank fill |
| Continue Marker | 1 | N | 0 = bulletin continues in next record 1 = bulletin ended |

11.2 Message Type L (2) – Special Text Bulletin

This bulletin type will be used for bulletins relating to a specific trading instrument.

| Field Name | L= 93 | T | Definition / Validation Rules |
|----------------|-------|---|--------------------------------------|
| Message Header | 11 | | Refer to "Message Header" paragraph. |
| Reserved | 1 | | Reserved for future use |
| Bulletin Type | 1 | X | 2 = Special Text Bulletin |

| Field Name | L= 93 | T | Definition / Validation Rules |
|-------------------|-------|---|---|
| Symbol | 30 | X | |
| Bulletin Contents | 49 | X | Bulletin in textual form. Left justified, blank fill |
| Continue Marker | 1 | N | 0 = bulletin continues in next record 1 = bulletin ended |

12.0 Summary Messages

12.1 Message Type N - Option Summary

An option summary message is sent following an option trade cancellation. An option summary message is also sent each day at the start of the day in order to provide a list of options which will be trading each day. At that point, all price fields with the exception of the Closing price (which will have the previous day's Settlement price), and the Open interest will contain zero values.

Any option summary sent after the BEGINNING OF OPTIONS SUMMARY message (with Message Type = Q) contains the list of trading instruments for the day (sent prior to market opening) or the summaries after the close of the market.

| Field Name | L= 149 | T | Definition / Validation Rules |
|----------------|--------|---|--|
| Message Header | 11 | | Refer to "Message Header" paragraph. |
| Exchange ID | 1 | A | Identifies the exchange for the option Refer to Field Description "Exchange ID" |
| Symbol Root | 6 | A | Option base symbol |
| Maturity Year | 2 | N | Last two digits of the maturity year of the contract |
| Maturity Month | 1 | A | Maturity month code of the contract |

| Field Name | L= 149 | T | Definition / Validation Rules |
|------------------|--------|---|--|
| Maturity Day | 2 | N | Maturity day of the contract |
| Call/Put Code | 1 | A | Refer to Field Description "Call/Put Code" |
| Strike Price | 8 | X | Strike price of the option in full. Refer to Field Description "Fraction Indicator Code" |
| Corporate Action | 1 | A | Refer to Field Description "Corporate Action Marker" |
| Bid Price | 8 | X | Most recent bid price. Refer to Field Description "Fraction Indicator Code" |
| Bid Size | 5 | N | Number of contracts represented by the Bid Price. If size is greater than 99999, the 5th character becomes an exponent Refer to Field Description "Indicator Code" |
| Ask Price | 8 | X | Most recent ask price. Refer to Field Description "Fraction Indicator Code" |
| Ask Size | 5 | N | Number of contracts represented by the Ask Price. If size is greater than 99999, the 5th character becomes an exponent Refer to Field Description "Indicator Code" |
| Last Price | 8 | X | Most recent trade price. Refer to Field Description "Fraction Indicator Code" |

| Field Name | L= 149 | T | Definition / Validation Rules |
|------------------|--------|---|---|
| Closing Price | 8 | X | Internal closing price calculated by Sola internal based on the last trade/bid/ask in the book at the time of market closure. Refer to Field Description "Fraction Indicator Code" |
| Settlement Price | 8 | X | Official CC&G/OSLO Clearing Securing closing prices from the clearing houses which is used to calculate their daily settlements. 0 until market closes. Refer to Field Description "Fraction Indicator Code" |
| Open Interest | 7 | N | Outstanding number of contracts in the series as of previous day |
| Tick | 1 | X | Determined by the difference between last price and the previous different trade price + = uptick - = dow ntick |
| Volume | 8 | N | Total number of contracts traded or current volume if sent after a cancellation |
| Net Change Sign | 1 | A | Sign +/- for net change field |
| Net Change | 8 | X | Net change = last trade price - previous settlement Net change will be zero if the option did not trade on the last business day or did not trade today. Refer to Field Description "Fraction Indicator Code" |
| Open Price | 8 | X | Price of the first trade of the day. Refer to Field Description "Fraction Indicator Code" |

| Field Name | L= 149 | T | Definition / Validation Rules |
|------------------------|--------|---|--|
| High Price | 8 | X | Highest trade price of the day or current high price if sent after a cancellation. Refer to Field Description "Fraction Indicator Code" |
| Low Price | 8 | X | Low est trade price of the day or current low price if sent after a cancellation. Refer to Field Description "Fraction Indicator Code" |
| Option Marker | 2 | A | Refer to Field Description "Markers for Options" |
| Underlying Symbol Root | 10 | X | Symbol root for the underlying security |
| Delivery Year | 2 | N | Last two digits of the delivery year |
| Delivery Month | 1 | A | Delivery month for the contract |
| Delivery Day | 2 | N | Delivery day |

12.2 Message Type NF - Futures Summary

A Futures summary is sent following a Futures trade cancellation. A Futures summary is also sent each day at the start of the day in order to provide a list of Futures which will be trading each day. At that point, all price fields, with the exception of the previous day Settlement price and the open interest will contain zero values.

Any summary sent after the BEGINNING OF FUTURE SUMMARY message (with Message Type = QF) contains the list of trading instruments for the day (sent prior to market opening) or the summaries after the close of the market.

| Field Name | L= 140 | T | Definition / Validation Rules |
|------------|--------|---|-------------------------------|
|------------|--------|---|-------------------------------|

| Field Name | L= 140 | T | Definition / Validation Rules |
|------------------|--------|---|---|
| Message Header | 11 | | Refer to "Message Header" paragraph. |
| Exchange ID | 1 | A | Identifies the exchange for the future Refer to Field Description "Exchange ID" |
| Symbol Root | 6 | A | Symbol for the Future Series |
| Maturity Year | 2 | N | Last two digits of the maturity year of the contract |
| Maturity Month | 1 | A | Maturity month code of the contract |
| Maturity Day | 2 | N | Maturity day of the contract |
| Corporate Action | 1 | A | Refer to Field Description "Corporate Action Marker" |
| Bid Price | 8 | X | Closing bid or most recent bid if sent after a cancellation. Refer to Field Description "Fraction Indicator Code" |
| Bid Size | 5 | N | Number of contracts represented by the Bid Price If size is greater than 99999, the 5th character becomes an exponent Refer to Field Description "Indicator Code" |
| Ask Price | 8 | X | Closing Ask Price or most recent Ask Price if sent after a cancellation. Refer to Field Description "Fraction Indicator Code" |

| Field Name | L= 140 | T | Definition / Validation Rules |
|------------------|--------|---|--|
| Ask Size | 5 | N | <p>Number of contracts represented by the ask price</p> <p>If size is greater than 99999, the 5th character becomes an exponent</p> <p>Refer to Field Description "Indicator Code"</p> |
| Last Price | 8 | X | <p>Last trade price for the contract or the current price if sent after a cancellation.</p> <p>Refer to Field Description "Fraction Indicator Code"</p> |
| Open Price | 8 | X | <p>Price of the first trade of the day.</p> <p>Refer to Field Description "Fraction Indicator Code"</p> |
| High Price | 8 | X | <p>Highest trade price of the day or current high price if sent after a cancellation.</p> <p>Refer to Field Description "Fraction Indicator Code"</p> |
| Low Price | 8 | X | <p>Low est trade price of the day or current low price if sent after a cancellation.</p> <p>Refer to Field Description "Fraction Indicator Code"</p> |
| Closing Price | 8 | X | <p>Closing price sent at the closing of the market.</p> <p>Refer to Field Description "Fraction Indicator Code"</p> |
| Settlement Price | 8 | X | <p>Official CC&G/OSLO Clearing Securing closing prices from the clearing houses w hich is used to calculate they daily settlements. 0 until market closes.</p> <p>Refer to Field Description "Fraction Indicator Code"</p> |
| Net Change Sign | 1 | X | <p>Sign +/- for net change field</p> |

| Field Name | L= 140 | T | Definition / Validation Rules |
|------------------------|--------|---|--|
| Net Change | 8 | X | Net change = last Trade Price - previous Settlement Price If no previous settlement price (new series) then net change is zero. Refer to Field Description "Fraction Indicator Code" |
| Volume | 8 | N | Total number of contracts traded Refer to Field Description "Indicator Code" |
| Previous Settlement | 8 | X | Settlement Price for the previous day. Refer to Field Description "Fraction Indicator Code" |
| Open Interest | 7 | N | Outstanding number of contracts in the series as of previous day. Refer to Field Description "Indicator Code" |
| Underlying Symbol Root | 10 | X | Symbol root for the underlying security |

12.3 Message Type NS- Strategy summary

A Strategy summary is sent following a Strategy trade cancellation. A Strategy summary is also sent each day at the start of the day in order to provide a list of Strategies which will be trading each day. At that point, all price fields, with the exception of open interest will contain zero values.

Any Strategy summary sent after the BEGINNING OF STRATEGY SUMMARY message (with message Type. = QS) contains the list of trading instruments for the day (sent prior to market opening) or the summaries after the close of the market.

| Field Name | L= 191 up to 785 | T | Definition / Validation Rules |
|----------------|------------------|---|--------------------------------------|
| Message Header | 11 | | Refer to "Message Header" paragraph. |

| Field Name | L= 191 up to 785 | T | Definition / Validation Rules |
|-----------------|------------------|---|--|
| Exchange ID | 1 | X | Identifies the exchange for the strategy Refer to Field Description "Exchange ID" |
| Symbol | 30 | X | Identification of the strategy The legs (underlying) are defined in message type NS |
| Bid Price Sign | 1 | X | Sign + /- for the Bid Price field |
| Bid Price | 8 | X | Closing bid or most recent bid if sent after a cancellation. Refer to Field Description "Fraction Indicator Code" |
| Bid Size | 5 | N | Number of contracts represented by the Bid Price. If size is greater than 99999, the 5th character becomes an exponent Refer to Field Description "Indicator Code" |
| Ask Price Sign | 1 | X | Sign +/- for the Ask Price field |
| Ask Price | 8 | X | Closing ask or most recent ask if sent after a cancellation. Refer to Field Description "Fraction Indicator Code" |
| Ask Size | 5 | N | Number of contracts represented by the Ask Price. If size is greater than 99999, the 5th character becomes an exponent Refer to Field Description "Indicator Code" |
| Last Price Sign | 1 | A | Sign +/- for the Last Price field |

| Field Name | L= 191 up to 785 | T | Definition / Validation Rules |
|-----------------|------------------|---|---|
| Last Price | 8 | X | Last Trade Price for the contract or the current price if sent after a cancellation. Refer to Field Description "Fraction Indicator Code" |
| Open Price Sign | 1 | A | Sign +/- for the Open Price field |
| Open Price | 8 | X | Price of the first trade of the day. Refer to Field Description "Fraction Indicator Code" |
| High Price Sign | 1 | A | Sign +/- for the High Price field |
| High Price | 8 | X | Highest trade price of the day or current high price if sent after a cancellation. Refer to Field Description "Fraction Indicator Code" |
| Low Price Sign | 1 | A | Sign +/- for the Low Price field |
| Low Price | 8 | X | Low est Trade Price of the day or current low price if sent after a cancellation. Refer to Field Description "Fraction Indicator Code" |
| Net Change Sign | 1 | A | Sign +/- for net change field |
| Net Change | 8 | X | Net change = last trade price - previous close If no previous settlement price (new series) then net change is zero. Refer to Field Description "Fraction Indicator Code" |
| Volume | 8 | N | Total number of contracts traded Refer to Field Description "Indicator Code" |

| Field Name | L= 191 up to 785 | T | Definition / Validation Rules |
|----------------|------------------|---|---|
| Number of Legs | 2 | N | Number of legs in the strategy 2 to 20 |
| Ratio Sign | 1 | A | Identification of the transaction in the strategy (buy or sell of the underlying) + : Buy of the underlying - : Sell of the underlying |
| Ratio | 2 | N | Quantity (bought or sold) on underlying in the strategy. 1 to 20 |
| Leg Symbol | 30 | X | Identification of the leg |

13.0 Beginning of Summary Messages

13.1 Message Type Q – Beginning of Options Summary

This message indicates that the beginning and the end of day option summaries (message type N) are to follow . Other messages (such as bulletins) can be interspersed with the summaries.

| Field Name | L= 12 | T | Definition / Validation Rules |
|----------------|-------|---|---|
| Message Header | 11 | | Refer to "Message Header" paragraph. |
| Exchange ID | 1 | A | Identifies the exchange Refer to Field Description "Exchange ID" |

13.2 Message Type QB – Beginning of Futures Options Summary

This message indicates that the beginning and the end of day Future Options summaries (not available on IDEM) are to follow . Other messages (such as bulletins) can be interspersed with the summaries.

| Field Name | L= 12 | T | Definition / Validation Rules |
|----------------|-------|---|---|
| Message Header | 11 | | Refer to "Message Header" paragraph. |
| Exchange ID | 1 | A | Identifies the exchange Refer to Field Description "Exchange ID" |

13.3 Message Type QF – Beginning of Futures Summary

This message Indicates that the beginning or the end of day Futures summaries (message type NF) are to follow . Other messages can be interspersed with the summaries.

| Field Name | L= 12 | T | Definition / Validation Rules |
|----------------|-------|---|---|
| Message Header | 11 | | Refer to "Message Header" paragraph. |
| Exchange ID | 1 | A | Identifies the exchange Refer to Field Description "Exchange ID" |

13.4 Message Type QS – Beginning of Strategy Summary

This message indicates that the beginning or the end of day Strategy summaries (message type NS) are to follow . Other messages can be interspersed with the summaries.

| Field Name | L= 12 | T | Definition / Validation Rules |
|----------------|-------|---|---|
| Message Header | 11 | | Refer to "Message Header" paragraph. |
| Exchange ID | 1 | A | Identifies the exchange Refer to Field Description "Exchange ID" |

14.0 Other Messages

14.1 Message Type RS – Connection Message

| Field Name | L= 32 up to 6062 | T | Definition / Validation Rules |
|----------------|------------------|---|---|
| Message Header | 11 | X | Refer to "Message Header" paragraph. |
| Reset Sequence | 10 | N | Indicates the last message received. Messages will restart at '000000001' every day. |
| Equity Options | 1 | A | Client wants to receive all regular market messages on the Options market. Y: Yes N: No |
| Futures | 1 | A | Client wants to receive all regular market messages on the Futures market. Y: Yes N: No |
| Market Depth | 1 | A | Client wants to receive: Y: Market Depth messages (type H*) on the top 5 Bids/ Asks for the type of trading instruments chosen I: Market Depth messages (type H*) on the top 5 Bids/Asks and the calculated implied best limit N: The best Bid/Ask message (type F*) for the type of trading instrument chosen |

| Field Name | L= 32 up to 6062 | T | Definition / Validation Rules |
|-----------------------------|------------------|---|--|
| Strategies | 1 | A | Client wants to receive: Y: Regular market messages, and all the Strategies on the different trading instruments N: Only regular market messages |
| Market Summaries | 1 | A | Y: Client wants to receive ONLY the market summaries and the Instrument key messages N: Client wants to receive the regular market messages with the summaries and the Instrument key messages |
| GAP Control | 1 | N | Client will receive GAP messages: Y: Yes (or 0) N: No (or 1) <i>Note: The sequence number will not be in an n+1 order.</i> |
| HSVF Protocol Version | 2 | X | E5: LSE SOLA version E5. Only protocol supported. |
| Number of Classes Requested | 3 | N | 000: Client wants to receive messages on all classes. 001 to 999: Client wants to receive messages on indicated number of classes. |
| Classes Requested | 6 up to 5994 | X | Class requested (using the 6 character symbol root, right padded with blanks). Maximum: 999 classes. <i>Example: to request for classes ABC and DEF: ABC<blank><blank><blank>DEF<blank><blank><blank></i> |

14.2 Message Type S – End of sales – 18 bytes

The "End of Sales" message will be sent when there is no more trading activity to be transmitted. This will occur after the closing of the market.

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| Field Name | L= 18 | T | Definition / Validation Rules |
|----------------|-------|---|--|
| Message Header | 11 | | Refer to "Message Header" paragraph. |
| Reserved | 1 | | Reserved for future use |
| Time | 6 | N | Time at which the message is transmitted HHMMSS |

14.3 Message Type U – End of transmission

This message will be sent to indicate that the day's transmission is complete. After this, no HSVF messages will be transmitted. Transmission will resume the following day.

| Field Name | L= 18 | T | Definition / Validation Rules |
|----------------|-------|---|--|
| Message Header | 11 | | Refer to "Message Header" paragraph. |
| Exchange ID | 1 | A | Identifies the exchange. Refer to Field Description "Exchange ID" |
| Time | 6 | N | Time at which the message is transmitted HHMMSS |

14.4 Message Type V– Circuit Assurance

A Circuit Assurance message is sent out if no messages were sent by LSE for more than one minute once the broadcast has started (i.e. at the termination of the Test Loop message). This will be an assurance that the line is up.



This message will continue to be sent until the End of Transmission message (type U) is sent. The Circuit Assurance message will repeat the sequence number of the previous record transmitted (except if it is a re-transmit message) i.e. it will not augment the sequence number.

| Field Name | L= 17 | T | Definition / Validation Rules |
|----------------|-------|---|--|
| Message Header | 11 | | Refer to "Message Header" paragraph. |
| Time | 6 | N | Time at which the message is transmitted HHMMSS |

14.5 Message Type VE – Align End

Align End message indicates when the HSVF data flow is aligned, i.e. indicates that recovery data are terminated and from now on live data are being received.

The user will subscribe the enhanced gap control functionality by specifying the flag Y for the gap control field in the RS message.

The Align End message will repeat the sequence number of the previous record transmitted, as already happens for 'V' message (Circuit Assurance).

| Field Name | L= 11 | T | Definition / Validation Rules |
|----------------|-------|---|---|
| Message Header | 11 | | Refer to "Message Header" paragraph. Message type = VE |

14.6 Message Type W – Gap sequence

| Field Name | L= 20 | T | Definition / Validation Rules |
|----------------|-------|---|--|
| Message Header | 11 | | Refer to "Message Header" paragraph. <i>Note: Sequence Number for the 'W' message is the same as the Sequence Number for the first skipped message of a Class different from the Class requested.</i> |

| Field Name | L= 20 | T | Definition / Validation Rules |
|--------------------------|-------|---|--|
| Sequence Numbers Skipped | 9 | N | Sequence numbers skipped. <i>Note: This value must be equal to the Sequence Number of the last skipped message of a Class different from the Class requested.</i> |

The Gap message signals the beginning and ending sequence numbers of messages relating to classes different from those subscribed to by the client during the connection message.

The example outlined in the following table indicates the messages to be received by a client who has subscribed to receive market data on Class 'YYY', along with Gap messages.

The table data under Message Log lists a number of message types showing; Sequence Number, Message Type, Exchange ID, and Symbol Root. Based on what the client has subscribed to in the Connection Message (RS), the messages to be received are listed under the Client Received Messages section of the table. Refer to **Message Type RS - Connection Message - Min. 32 / Max. 6026 bytes** for details on subscription options.

| Message Log | | | | Client Received Messages | | | | |
|-------------|----------|-------------|-------------|--------------------------|----------|-------------|-------------|---------------|
| SeqNo | Msg Type | Exchange ID | Symbol Root | SeqNo | Msg Type | Exchange ID | Symbol Root | Skipped SeqNo |
| 000007393 | C | Q | YYY | 000007393 | C | E | YYY | n/a |
| 000007394 | H | Q | ZZZ | | | | | |
| 000007395 | C | Q | XXX | | | | | |
| 000007396 | C | Q | ZZZ | | | | | |
| 000007397 | H | Q | FFF | 000007394 | W | n/a | n/a | 000007397 |
| 000007398 | N | Q | YYY | 000007398 | N | E | YYY | n/a |
| 000007399 | H | Q | ZZZ | | | | | |

15.0 Fields Description

15.1 Call/Put Code

| Call/Put Code | Description |
|---------------|-------------|
| C | Call |
| P | Put |
| O | Over |

| Call/Put Code | Description |
|---------------|-------------|
| U | Under |

15.2 Corporate Action Marker

| Corporate Action Marker | Description |
|---------------------------|---|
| X, Y, Z, Q, R, S, G, U, V | Pending Corporate Action impacting contract |
| Blank | No Corporate Action impacting contract |

15.3 Currency code

| Marker | Description |
|--------|-----------------------|
| USD | US \$ |
| CAD | Canadian \$ |
| GBP | Pound Sterling |
| GBX | Penny Sterling |
| CHF | Swiss Franc |
| EUR | Euro |
| JPY | Yen |
| SEK | Swedish Krona |
| NOK | Norwegian Krone |
| DKK | Danish Krone |
| AUD | Australian Dollar |
| BRL | Brazilian Real |
| CNY | Chinese Yuan Renminbi |
| CZK | Czech Krone |
| HKD | Hong Kong Dollar |
| HUF | Hungarian Forint |
| INR | Indian Rupee |
| MYR | Malaysian Ringgit |
| PLN | Polish Zloty |
| RON | New Romanian Leu |
| RUB | Russian Rubble |
| SGD | Singapore Dollar |
| TRY | New Turkish Lira |
| ZAR | South African Rand |

| Marker | Description |
|--------|--------------|
| Blank | Not provided |

15.4 Delivery Type

| Delivery Type | Description |
|---------------|-------------|
| 'C' | Cash |
| 'P' | Physical |

15.5 Exchange ID

| Exchange ID | Description |
|-------------|-------------|
| I | IDEM |
| E | LSEDM |
| O | Oslo Bors |

15.6 Fraction Indicator Code

Prices will be a numeric field followed by the fraction or multiplier position. The delineation of the whole number portion of the price and the decimal/fractional portion of the price will be defined by the last character with the Fraction Indicator Code (FI).

Fraction Indicator Code will be one (1) Alphanumeric Character as follows:

| Fraction | Code | Multiplier | Code |
|-----------------|------|------------|------|
| 1/1 | 0 | | |
| 1/10 | 1 | 10 | L |
| 1/100 | 2 | 100 | M |
| 1/1,000 | 3 | 1,000 | N |
| 1/10,000 | 4 | 10,000 | O |
| 1/100,000 | 5 | 100,000 | P |
| 1/1,000,000 | 6 | 1,000,000 | Q |
| 1/10,000,000 | 7 | | |
| 1/100,000,000 | 8 | | |
| 1/1,000,000,000 | 9 | | |

15.7 Indicator code

This code is used for Bid/Ask Size, Volume, and Open Interest. When the number is higher than the maximum number possible to represent with the field length, the last character becomes an exponent.

| Marker | Description (the size of the bid/ask field) | |
|--------|---|---------------------|
| C | 100 | (Hundreds) |
| D | 1,000 | (Thousands) |
| E | 10,000 | (Ten-Thousands) |
| F | 100,000 | (Hundred-Thousands) |
| G | 1,000,000 | (Millions) |
| H | 10,000,000 | (Ten-Millions) |
| I | 100,000,000 | (Hundred-Millions) |
| J | 1,000,000,000 | (Billions) |

| Data | Message sent | Participant Display |
|------------------------------------|------------------------------------|---------------------|
| Bid size of 124 872 | Size field will indicate '1248C' | 124 800 |
| Volume of 8,457,188 | Volume will indicate '8457188' | 8,457,188 |
| Volume of 258,487,797 | Volume will indicate '2584877C' | 258,487,700 |
| Open Interest of 544,871 | Size field will indicate '544871' | 544871 |
| Open Interest of 17,458,795 | Size field will indicate '174587C' | 17,458,700 |

15.8 Market Feed Indicators

The following table lists the Market Feed indicators:

| First letter | Type of Instrument | Second Letter | Type of Underlying |
|--------------|----------------------------------|---------------|--------------------|
| F | Futures | U | Rate |
| P | Options on Futures | X | Index |
| O | Options | E | Equities |
| U | Strategies on Options on Futures | L | Long term |
| V | Strategies on Futures | | |

| First letter | Type of Instrument | Second Letter | Type of Underlying |
|--------------|-----------------------|---------------|--------------------|
| W | Strategies on Options | | |

15.9 Markers for Options

| First letter (Currency or type of market) | |
|---|----------------------------------|
| Marker | Description |
| B | Trading in British Pound |
| C | Trading in Canadian Dollar |
| F | Trading in Euro |
| E | Trading in Swiss Franc |
| U | Trading in US Dollar |
| Y | Trading in Japanese Yen |
| S | Trading in Swedish Krona |
| N | Trading in Norwegian Krone |
| D | Trading in Danish Krone |
| X | Trading in British Pence |
| A | Trading in Australian Dollar |
| L | Trading in Brazilian Real |
| R | Trading in Chinese Yuan Renminbi |
| K | Trading in Czech Krone |
| H | Trading in Hong Kong Dollar |
| O | Trading in Hungarian Forint |
| I | Trading in Indian Rupee |
| M | Trading in Malaysian Ringgit |
| Z | Trading in Polish Zloty |
| V | Trading in New Romanian Leu |
| P | Trading in Russian Ruble |
| G | Trading in Singapore Dollar |
| T | Trading in New Turkish Lira |
| J | Trading in South African Rand |

| 2nd letter (Type of options) | |
|------------------------------|-------------|
| Marker | Description |

2nd letter (Type of options)

| | |
|-------|---------------------------------|
| Blank | Regular Options (Plain vanilla) |
| B | Binary Options |

15.10 Instrument Status Marker

| Status Marker | Description |
|---------------|-------------|
|---------------|-------------|

| Status Marker | Description |
|---------------|---|
| E | Intervention before Opening phase |
| Y | Not Trading (for Strategy Instruments if at least one of the legs is in a not tradable state) |
| O | Opening phase |
| T | Continuous Trading phase |
| F | Forbidden phase |
| H | Interrupted (Trading Halted) |
| R | Reserved phase (Instrument goes into an intraday auction) |
| S | Suspended phase (only for Instrument Messages) |
| A | Exchange Intervention |
| C | End of Consultation phase |
| BLANK | If not used |

15.11 Group Status Marker

| Status Marker | Description |
|---------------|-----------------------------------|
| E | Intervention before Opening phase |
| Y | Pre-opening phase |

| Status Marker | Description |
|---------------|------------------------------|
| O | Opening phase |
| T | Continuous Trading phase |
| F | Forbidden phase |
| H | Interrupted (Trading Halted) |
| A | Exchange Intervention |
| C | End of Consultation phase |
| BLANK | If not used |

15.12 Price Indicator Markers

| Marker | Description |
|--------|-------------------------------|
| P | Strategy reporting |
| L | Late trade |
| A | As-of-trade |
| I | Implied trade |
| 1 | Exchange granted 1 (TG1) |
| 2 | Exchange granted 2 (TG2) |
| BLANK | Actual transaction took place |
| B | Block Trade |
| K | Committed Block |
| T | Committed |
| C | Crossed |

16.0 Tick Increment Tables

The naming convention on IDEM is as follows (Tick Increment Table Identifier):

| Short Name | Name |
|------------|--------------------------------|
| AG | AGREX Future |
| DF | IDEM DIVIDEND Future |
| DV | IDEM FTSE MIB DIV INDEX FUTURE |
| EF | IDEM Stock Future |
| EO | IDEM Stock Option |
| IF | IDEM FTSE MIB Future |
| IO | IDEM FTSE MIB Option |
| IW | IDEM FTSE MIB Weekly |
| MF | FTSE100 MINI Future |
| XF | IDEX Future |

16.1AG (AGREX Future)

| Price | | Tick Increment |
|-------|----|----------------|
| From | To | |
| 0 | + | 0.2500 |

16.2DF (IDEM DIVIDEND Future)

| Price | | Tick Increment |
|-------|----|----------------|
| From | To | |
| 0 | + | 0.0001 |

16.3DV (IDEM FTSE MIB DIV Index Future)

| Price | | Tick Increment |
|-------|----|----------------|
| From | To | |
| 1.00 | + | 1.0000 |

16.4EF (IDEM Stock Future)

| Price | | Tick Increment |
|-------|----|----------------|
| From | To | |
| 0 | + | 0.0001 |

16.5E0 (IDEM Stock Option)

| Price | | Tick Increment |
|-------|-------|----------------|
| From | To | |
| 0 | 0.005 | 0.0001 (*) |
| 0.005 | + | 0.0005(*) |

(*) As of the 11th of July 2016

16.6IF (IDEM FTSE MIB Future)

| Price | | Tick Increment |
|-------|----|----------------|
| From | To | |
| 5.00 | + | 5.0000 |

16.7IO (IDEM FTSE MIB Option)

| Price | | Tick Increment |
|--------|--------|----------------|
| From | To | |
| 1.00 | 100.00 | 1.0000 |
| 100.00 | 500.00 | 2.0000 |
| 500.00 | + | 5.0000 |

16.8IW (IDEM FTSE MIB Weekly)

| Price | | Tick Increment |
|-------|----|----------------|
| From | To | |
| 1.00 | + | 1.0000 |

16.9MF (FTSE100 MINI Future)

| Price | | Tick Increment |
|-------|----|----------------|
| From | To | |
| 0 | + | 0.5000 |

16.10 XF (IDEX Future)

| Price | | Tick Increment |
|-------|----|----------------|
| From | To | |
| 0 | + | 0.0100 |

17.0 Message processing

17.1 Summary messages

Summary messages are sent:

- At the beginning of the day to define the instruments traded on that day.
- After a trade cancellation if extreme values have been changed (Open/High/Low /Last).
- At the end of the day with relevant data such as the Open/High/Low /Last/Volume.
- During the day if a new instrument is added.

17.2 Instruments keys and the book updates

On HSVF the Instruments keys and the book updates are disseminated:

- For options the J message is disseminated for all the instrument that are **not yet expired.**
- For future the JF message is disseminated for all the instrument that are **not yet expired.**
- For options the H message is disseminated for all the instrument that are **tradable on the given date.**
- For future the HF message is disseminated for all the instrument that are **tradable on the given date.**

17.3 Strategies' processing

Messages to use:

- JS (Strategy Instrument Keys)
- J/JF (Leg Instrument key messages for options, and futures)
- NS (Strategy Summary Messages)

Process:

1. Collect all JS Messages broadcasted in the HSVF and maintain all of their Symbols for future linking to the Symbols in the NS message which will be disseminated after the HSVF JS message. Note JS messages can be broadcasted in HSVF at anytime during the normal trading day for newly created User Requested Flexible Combinations.
2. For each J/JF message record, create and maintain a table of Leg "Symbol – HSVF External Code" couplings.
3. For each leg received in each NS messages:

- Find the HSVF External Code which is now coupled to the leg Symbol created in step 1
 - Generate the leg description by joining the:
 - Leg Ratio Sign
 - Leg Ratio Integer
 - Leg HSVF External Code
 - Remove all the insignificant "0" and spaces
4. Generate the strategy description by joining the legs description in their respective order in the NS message and you remove all the insignificant spaces.

17.4 Group status change

For each group the status change is disseminated according the following schedule:

- At 8:00 the groups status change Intervention Before Opening is disseminated.
- At 8:30 the groups status change Preopening is disseminated (for FIB and MINI only).
- At 9:00 the groups status changes Opening and Continuous Trading are disseminated (all groups except for AGREX market that opens at 14:30).