User Guide

BCS API PROGRAMMER'S MANUAL

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EURONEXT CLEARING

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Revision History

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Apr 2021	3.7	Euronext rebranding	Borsa Italiana
Oct 2022	3.7a	Rebranding	Borsa Italiana
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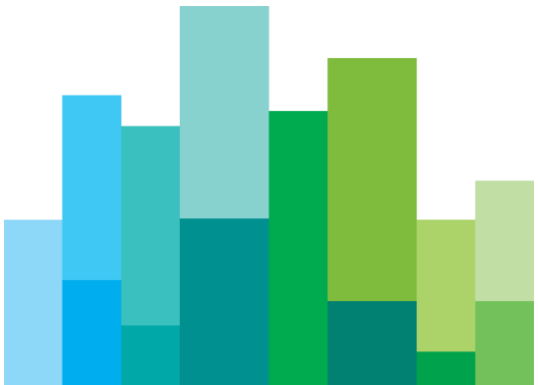
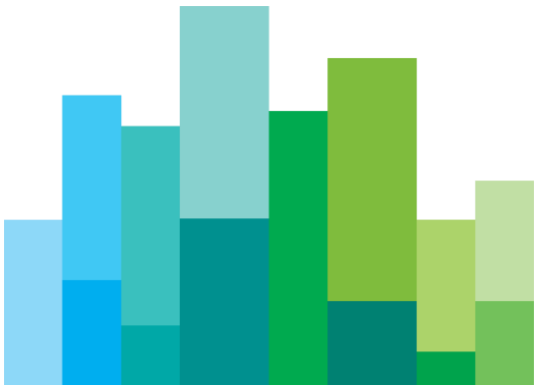


1. INTRODUCTION



This document describes the main features of BCS API library (GKAPI). It is to be used in conjunction with the BCS API Data Layouts document in order to have an overview of how to interface the BCS Clearing system using the BCS API libraries.

The BCS API library provides developers with a set of callback functions which allows third party applications to correctly interface toward the BCS Clearing system, managing connections, transactions, subscriptions and notifications. It also defines operation types (Connect, Submit, Subscribe, etc.) and response types (CallBackConnect, CallBackSubscribe, CallBackData, etc…).

The BCS API library:

- is a thread-safe library;
- allows connections to the BCS Clearing System through one or more application servers;
- implements a proprietary protocol to exchange application data messages; it maintains a live connection until the client disconnection has been requested;
- manages configurable application windows;
- monitors the TCP/IP connection and alerts when connectivity problems arise;
- traces all working activities;

2. CONNECTION TO THE BCS CLEARING SYSTEM

In order to properly connect to the BCS Clearing System, a set of technical callback functions should be used. The following steps need to be executed before sending/receiving data:

- Initialize: this allows to initialize the BCS API library;
- Create Context: this allows to establish a physical connection to the specified application server of the BCS Clearing system; the Context Id returned by the callback should be used as an input parameter in any request sent to the system (Submit, Inquire, Subscribe, UnSubscribe, …);
- Start a dedicated thread to manage Dispatch: this allows to handle callbacks as soon as an event raises; a thread should be created for each working context;
- Connect: this allows to start a communication session to the BCS Clearing system;
- Create Transaction: this allows to get a Transaction Id which has to be used in every Submit sent to the BCS Clearing system; if the system is still processing a submit request, it will reject any other submit request using the same Transaction Id, whereas it will accept requests with different Transaction Ids (previously received with a Create Transaction);

The following steps have to be executed in order to properly disconnect from the BCS Clearing system:

- Destroy Transaction: this allows to release all internal structures set up by the CreateTransaction function;
- Disconnect: this allows to disconnect from the BCS Clearing system;
- Release Context: this allows to release/destroy a working context;
- Terminate: this allows to release the BCS API library;

3. CONFIGURATION FILE

The BCS API library configuration file (GKApi.cfg) allows to define:

- the keep-alive message frequency;
- the application windows size;
- the application servers of the BCS Clearing system the BCS library should connect to;

The configuration file structure is defined as follows:

```
[GENERIC_SETTINGS]
TRACE_FILE=.\GKApi.log          // Application messages trace output file.
TRACE_LEVEL=ERR                 // ERR,WRN,INF,DBG
MESSAGES_FILE=.\GKMessages.cfg  // Configuration file which contains
// debugging messages
CALLBACK_QUEUE_SIZE=1024        // Maximum number of queued call-backs
MAX_NUMBER_OF_CONTEXT=512       // Maximum number of contexts that can be
                                // created and used at the same time (this value
                                // depends on the  number of available sockets)

[GATEMARKET_SERVERS]
SERVER_LIST=METAMARKET01;METAMARKET02
// List of available application servers

[METAMARKET01]
TCP_IP= 212.107.67.4
TCP_PORT= 34900
KEEPALIVE_TIMEOUT=30            // Expressed in seconds
APPLICATION_WINDOW_SIZE=20000
                                // Maximum number of pending requests that can
                                // be managed at the same time for the current
                                // context.
TRACE_LEVEL=DBG                 // ERR,WRN,INF,DBG
TRANSACTION_BUFFER_SIZE=20000
                                // Maximum number of parallel transactions to be
                                // preallocated and used by the GK-API.
                                // If exceeded, new resources will be allocated
                                // upon request
```

SUBSCRIPTION_BUFFER_SIZE=20000
// Maximum number of parallel subscriptions to
// be preallocated and used by the GK-API.
// If exceeded, new resources will be allocated
// upon request
INQUIRE_BUFFER_SIZE=20000 // Maximum number of parallel inquiries to be
// preallocated and used by the GK-API.
// If exceeded, new resources will be allocated
// upon request
TCP_BUFFER_SIZE=30000 // Maximum I/O buffer size expressed in bytes.

[METAMARKET02]
TCP_IP=212.107.67.5
TCP_PORT=34900
KEEPALIVE_TIMEOUT=30 // Expressed in seconds
APPLICATION_WINDOW_SIZE=20000
// Maximum number of pending requests that can
// be managed at the same time for the current
// context.

TRACE_LEVEL=DBG // ERR,WRN,INF,DBG
TRANSACTION_BUFFER_SIZE=20000
// Maximum number of parallel transactions to be
// preallocated and used by the GK-API.
// If exceeded, new resources will be allocated
// upon request
SUBSCRIPTION_BUFFER_SIZE=20000
// Maximum number of parallel subscriptions to
// be preallocated and used by the GK-API.
// If exceeded, new resources will be allocated
// upon request
INQUIRE_BUFFER_SIZE=20000 // Maximum number of parallel inquiries to be
// preallocated and used by the GK-API.

// If exceeded, new resources will be allocated

// upon request

TCP_BUFFER_SIZE=30000 // Maximum I/O buffer size expressed in bytes.

4. TYPE DEFINITIONS

The BCS API library manages the following data types:

• GK_Reply_t	Reply code from each protocol session
• GK_MarketReply_t	Reply structure to handle returned events from previous requests
• GK_ClassType_t	Application data layout type
• GK_Status_t	Connection status types
• GK_Chain_t	Types for controlling chains for snapshot information
• GK_ApplicationData_t	Type structure which contains application data to be sent
• GK_Callback_t	Call-back generic structure
• GK_Tag_t	User Tag returned by each call-back; (void*)
• GK_Data_t	Application data handle (long)
• GK_Transaction_t	Transaction identifier (long)
• GK_Subscription_t	Subscription identifier (long)
• GK_Inquire_t	Inquire identifier (long)
• GK_Context_t	Connection session identifier
• GK_Connection_t	Identifier of a communication channel with an application server. It is a socket corresponding to connection on a context
• GK_Notification_t	Call-back notification types
• GK_Byte_t	Data type used for buffers containing binary data
• GK_Length_t	Data buffer's size
• GK_UnzipHelper_t	Internal structure used to unzip binary compressed data

4.1 GK_Reply_t

Contains return code coming back from a protocol session. It is an enumerated type and may assume the following values:

• GK_SUCCESS	Request successfully completed
• GK_FAILED	Generic error. Usually returned by all functions that extract data from call-backs
• GK_INVALID_CONFIG_FILE	Configuration file not valid

• GK_INVALID_SERVER	Application server not valid
• GK_INVALID_HANDLE	Handle not valid
• GK_API_ERROR	Internal API error
• GK_API_NOT_INITIALIZED	API not initialized
• GK_API_ALREADY_INITIALIZED	API already initialized
• GK_INVALID_CONTEXT	Market context not valid
• GK_SERVER_UNREACHABLE	Application server not reachable
• GK_INVALID_TRANSACTIONID	Request refused. Transaction identifier not valid
• GK_INVALID_SUBSCRIPTIONID	Request refused. Subscription identifier not valid
• GK_COMMAND_ON_GOING	Request refused. Request of the same type is still on going
• GK_TYPE_MISMATCH	Attempting to read -a field using a wrong field-type.
• GK_CONTEXT_BUSY	Context is busy whenever it is trying to connect to a context already in use
• GK_MISSING_CONNECTION	A request has been sent before establishing a connection
• GK_OVERLOAD	The application window is full. The client application must wait for the completion of some previously issued requests before sending a new one
• GK_INVALID_PARAMETER	Request refused. One or more supplied parameters are null or invalid.
• GK_DATA_ERROR	Request refused. Supplied data are invalid or corrupted.
• GK_MORE_OUTPUT_AVAILABLE	Request successfully completed. More output space have to be provided to complete the whole operation.
• GK_MORE_INPUT_NEEDED	Request successfully completed. More input data are required to complete the whole operation.

4.2 GK_MarketReply_t

Contains return codes from a market gateway or clearing house system. It is an enumerated type and may assume the following values:

• GK_REQUEST_ACCEPTED	Request accepted
• GK_REQUEST_REJECTED	Request refused. Generic Error
• GK_REQUEST_WARNING	Request has been accepted but a warning situation arises (e.g one of the contexts is not connected)
• GK_ALREADY_CONNECTED	Connection already established
• GK_INVALID_MARKET	Request refused. Market name is invalid
• GK_INVALID_CLASS	Request refused. Class name is invalid
• GK_NO_MARKET_CONTEXT	Request refused. Connection has not been established
• GK_INVALID_FIELD	Request refused. One of the class fields is invalid
• GK_REQUEST_ON_GOING	Request refused. A request of the same type is already pending
• GK_LICENCE_ERROR	Maximum number of connections reached
• GK_PROPOSAL_ALREADY_EXISTS	A proposal on the same transaction already exists
• GK_PROPOSAL_NOT_EXISTS	A proposal on the transaction does not exist
• GK_INVALID_PROPOSAL_KEY	Invalid proposal referenced
• GK_MISSING_FIELD_VALUE	Mandatory field not set
• GK_ACCESS_DENIED	User authentication completed unsuccessfully
• GK_INSUFFICIENT_PRIVILEGES	Insufficient privileges
• GK_WRONG_FIELD_VALUE	A field contains a wrong value (e.g. Side field is different from Buy and Sell)
• GK_SERVER_NOT_AVAILABLE	Application server unreachable
• GK_NOT_CONNECTED	Request refused. Connection not established
• GK_WRONG_PARAMETER	Request refused. Some parameters are wrong (e.g. parameter non allocated, etc.)

• GK_TIMED_OUT	Request refused. Client has been disconnected due to keep-alive timeout

4.3 GK_ClassType_t

Defines a class type and is an enumerated type and may assume the following values:

• GK_META_CLASS	Meta-market application data layout, i.e. class type used for a market class that merges all differences among different market class into a single class
• GK_MARKET_CLASS	Native market application data layout

4.4 GK_Status_t

Defines a market connection status. It is an enumerated type and may assume the following values:

• GK_CONNECTION_UP	Connection is active
• GK_CONNECTION_DOWN	Connection is broken
• GK_CONNECTION_WARNING	Applicable to OnMarketStatus event only: this means that not all connections are active. Depending on the market, it means that the bandwidth is being reduced or, alternatively, that interaction with the market can be seriously damaged
• GK_SERVER_DOWN	Connection lost from application server

4.5 GK_Chain_t

Defines a chain type of snapshot data coming from events. It is an enumerated type and may assume the following values:

• GK_CHAIN_CONTINUE	New snapshot data can arrive
• GK_CHAIN_END	Snapshot data are ended
• GK_CHAIN_NO_DATA	Snapshot data not available

4.6 GK_Notification_t

Defines notification types of call-backs. It is an enumerated type and may assume the following values:

- GK_MARKET_STATUS_NOTIFICATION
- GK_CONNECTION_RESPONSE_NOTIFICATION
- GK_DISCONNECTION_RESPONSE_NOTIFICATION
- GK_TRANSACTION_STATUS_NOTIFICATION
- GK_SUBSCRIPTION_STATUS_NOTIFICATION
- GK_SUBMIT_RESPONSE_NOTIFICATION
- GK_SUBSCRIBE_RESPONSE_NOTIFICATION
- GK_UNSUBSCRIBE_RESPONSE_NOTIFICATION
- GK_INQUIRE_RESPONSE_NOTIFICATION
- GK_NOTIFY_DATA_NOTIFICATION
- GK_INQUIRE_DATA_NOTIFICATION
- GK_SET_NOTIFICATION_PERIOD_NOTIFICATION
- GK_BINARY_INQUIRE_DATA_NOTIFICATION

4.7 GK_ApplicationData_t

Defines the template of application messages to be sent to a market or clearing house system.

```
typedef GK_ApplicationData_t
(
   GK_ClassType_t classType,
   const char* className,
   const char* data
)
```

Fields can have the following values:

Type	Property Name	Description
GK_ClassType_t	ClassType	Class type or application data layout type (meta-market or market class)
const char*	ClassName	Class name
const char*	Data	Data layout in the format field=value

4.8 GK_Callback_t

Defines the template of call-backs.

```
typedef void (*GK_Callback_t)
(
   GK_Context_t context,  // Context who did generate the event
   GK_Data_t      gkData,              // Data Handle
   GK_Tag_t       gkTag          // User Tag
)
```

4.9 GK_Tag_t

The user can assign a tag to each request. The call-back will return it to the caller.

```
typedef const void *       GK_Tag_t;
```

4.10 GK_Data_t

Data handle returned by the call-back. It can be used to find data coming from the call-back itself.

```
typedef long       GK_Data_t;
```

4.11 GK_Transaction_t

Transaction Id. This value has to be used in every Submit sent to the BCS Clearing system; if the system is still processing a submit request, it will reject any other submit request using the same Transaction Id, whereas it will accept requests with different Transaction Ids (previously received with a Create Transaction).

```
typedef long       GK_Transaction_t;
```

4.12 GK_Subscription_t

Subscription Id. This value identifies a Subscription sent to the BCS Clearing system.

```
typedef long       GK_Subscription_t;
```

4.13 GK_Inquire_t

Inquiry Id. This value identifies an Inquire sent to the BCS Clearing system.

```
typedef long        GK_Inquire_t;
```

4.14 GK_Context_t

Context Id. This value has to be used as an input parameter in any request sent to the system.

```
typedef long        GK_Context_t;
```

4.15 GK_Connection_t

Connection Id. This value identifies a socket connection to an application server. The client application must use it in the 'select' function to handle asynchronous events.

```
typedef int         GK_Connection_t;
```

4.16 GK_Length_t

Data buffer's size. Given a pointer to a data buffer, it defines how many elements of the buffer are significant starting from the element pointed to.

```
typedef unsigned int        GK_Length_t;
```

4.17 GK_Byte_t

Data type used for binary data buffers. It defines the data type of buffer elements used to store binary data.

```
typedef unsigned char       GK_Byte_t;.
```

4.18 GK_UnzipHelper_t

Structure used to unzip binary compressed data. It is managed internally by the GK-API.

```
typedef void*       GK_UnzipHelper_t;
```

5. MAIN CALLBACK FUNCTIONS

The following sections describe all the BCS API callback functions.

5.1 GK_Initialize

GK_Reply_t ***GK_Initialize****(const char* *ConfigFile);*

Parameters	ConfigFile	Pathname of the file which contains configuration parameters for the GK-API
Return values	GK_SUCCESS	Initialization has been successfully completed
	GK_INVALID_CONFIG_FILE	Initialization failure. Configuration file not found or corrupted
	GK_API_ERROR	Internal error
	GK_API_ALREADY_INITIALIZED	GK-API already initialized
	GK_INVALID_PARAMETER	*ConfigFile* is null
Description	This function must be called before any other GK-API function in order to initialize the GK-API library.	

5.2 GK_Terminate

GK_Reply_t ***GK_Terminate****();*

Parameters	none	
Return values	GK_SUCCESS	Initialization has been successfully completed
	GK_API_NOT_INITIALIZED	API not initialized
Description	This function must be called in order to release the GK-API library.	

5.3 GK_CreateContext

```
GK_Reply_t    GK_CreateContext (const char* serverName,
                                GK_Context_t* pContext,
                                GK_Connection_t* pConnection);
```

Parameters	**serverName**	Name of the application server through which connection must be set up (one from the list in SERVER_LIST in the configuration file)
	pContext	Working context identifier returned by the GK-API
	pConnection	Identifier of a socket connection to the application server. The client application must use it in 'select' function to handle asynchronous events
Return values	GK_SUCCESS	Context available, socket connection established
	GK_API_ERROR	Internal error
	GK_INVALID_SERVER	Application server name invalid (check if it is present in the configuration file
	GK_SERVER_UNREACHABLE	Server unreachable
	GK_API_NOT_INITIALIZED	GK-API not initialized
	GK_INVALID_PARAMETER	At least one of *serverName*, *pContext* or *pConnection* is *null*
Description	This function must be called to establish a physical connection to the specified application server. A Context Id is returned. This identifier must be used in any other request sent to the BCS Clearing system (i.e. Submit, Inquire, Subscribe, UnSubscribe, …). It is possible to create more than one context.	

5.4 GK_Dispatch

GK_Reply_t ***GK_Dispatch*** *(GK_Context_t context);*

Parameters	**context**	Working context identifier
Return values	GK_SUCCESS	Dispatch successfully completed
	GK_API_ERROR	Internal error
	GK_INVALID_CONTEXT	Context not valid
	GK_API_NOT_INITIALIZED	API not initialized
Description	This function is used to handle callbacks. GK_Dispatch must be called as soon as an event raises from the working context and in any case no less frequently than every 5 seconds. For this purpose, before calling GK_Dispatch, call "select" API on the socket returned by GK_CreateContext using a positive timeout values (i.e. not zero; usual timeout value is 5 seconds). Moreover, it is recommended to call GK_Dispatch using a dedicated thread, one for each working context.	

5.5 GK_ReleaseContext

GK_Reply_t ***GK_ReleaseContext*** *(GK_Context_t context);*

Parameters	**context**	Working context identifier
Return values:	GK_SUCCESS	Context successfully released.
	GK_API_ERROR	GK-API not initialized or internal error
	GK_INVALID_CONTEXT	Context not valid
	GK_API_NOT_INITIALIZED	GK-API not initialized
Description	This function must be called to release/destroy a working context.	

5.6 GK_Connect

```
GK_Reply_t          GK_Connect (GK_Context_t context,
                                const char* userName,
                                const char* password,
                                const char* market,
                                GK_Callback_t pCallbackResponse,
                                GK_Callback_t pCallbackMarketStatus,
                                GK_Tag_t gkTag)
```

Parameters	**context**	Active context identifier through which a connection must be performed.
	userName	Name of the user requiring the connection
	password	Password of the user requiring the connection.
	market	Market or Clearing House name to which a connection is requested (e.g. MTA, CCG, ...)
	pCallbackResponse	Callback to handle a notification event for the related request.
	pCallbackMarketStatus	Callback to handle a notification event for the connection status
	gkTag	User tag returned by the callback
Return values:	GK_SUCCESS	Connection request successfully executed
	GK_API_ERROR	Internal error
	GK_INVALID_CONTEXT	Context is not valid
	GK_SERVER_UNREACHABLE	Server unreachable
	GK_API_NOT_INITIALIZED	API not initialized
	GK_COMMAND_ON_GOING	A connection request is still on going and a notification event for the previous request must be received

GK_CONTEXT_BUSY	Context is already in use (a connection on the context is already in place)
GK_INVALID_PARAMETER	At least one of *userName*, *password* or *market* is null or too long

from pCallbackResponse

GK_REQUEST_ACCEPTED	Connection accepted
GK_REQUEST_REJECTED	Connection refused
GK_ALREADY_CONNECTED	Connection already in place
GK_INVALID_MARKET	MarketName is invalid
GK_ACCESS_DENIED	Unknown user
GK_LICENCE_ERROR	Maximum number of concurrent connections exceeded
GK_INSUFFICIENT_PRIVILEGES	User cannot connect to the specified market

from pCallbackMarketStatus

GK_MARKET_STATUS_NOTIFICATION	
• GK_CONNECTION_UP	All connections are active
• GK_CONNECTION_WARNING	At least one connection is active, while one or more other connections can be down
• GK_CONNECTION_DOWN	No connection is active
• GK_SERVER_DOWN	Application server not reachable
GK_TRANSACTION_STATUS_NOTIFICATION	
• GK_CONNECTION_UP	Transaction is active
• GK_CONNECTION_DOWN	Transaction is not active
GK_SUBSCRIPTION_STATUS_NOTIFICATION	
• GK_CONNECTION_UP	Subscription is active
• GK_CONNECTION_DOWN	Subscription is not active

Description	This function must be invoked to establish a connection to the BCS Clearing system.

5.7 GK_Disconnect

```
GK_Reply_t      GK_Disconnect (GK_Context_t  context,
                               GK_Callback_t pCallbackResponse,
                               GK_Tag_t      gkTag);
```

Parameters:	**context**	Context identifier
	pCallbackResponse	Call-back for request notification
	gkTag	User tag returned by the call-back
Return values:	GK_SUCCESS	Disconnection successfully completed
	GK_API_ERROR	Internal error
	GK_INVALID_CONTEXT	Context is not valid
	GK_SERVER_UNREACHABLE	Server unreachable
	GK_API_NOT_INITIALIZED	API not initialized
	from pCallbackResponse	
	GK_REQUEST_ACCEPTED	Connection accepted
	GK_REQUEST_REJECTED	Connection refused
	GK_NOT_CONNECTED	Connection not existing

Description: This function must be invoked to release a connection to the BCS Clearing system.

5.8 GK_CreateTransaction

```
GK_Reply_t      GK_CreateTransaction
                               (GK_Context_t  context,
                GK_Transaction_t* pTransactionID);
```

Parameters:	**context**	Context identifier
	pTransactionID	Transaction identifier returned by the function

Return values	GK_SUCCESS	Transaction creation successfully completed
	GK_INVALID_CONTEXT	Context is not valid
	GK_API_ERROR	Internal error
	GK_API_NOT_INITIALIZED	GK-API not initialized
	GK_INVALID_PARAMETER	*pTransactionID* is null

Description: This function must be invoked in order to create a transaction within the BCS Clearing system. A transaction is a physical connection between the client and the BCS Clearing system which allows handling fault detection and load balancing. The Transaction Id returned by this function has to be used in every Submit sent to the BCS Clearing system; if the system is still processing a submit request, it will reject any other submit request using the same Transaction Id, whereas it will accept requests with different Transaction Ids (previously received with a Create Transaction).

5.9 GK_DestroyTransaction

GK_Reply_t ***GK_DestroyTransaction***
(GK_Context_t context,
GK_Transaction_ t transactionID);

Parameters:	**context**	Context identifier
	transactionID	Transaction identifier

Return values	GK_SUCCESS	Destroy transaction successfully completed
	GK_INVALID_TRANSACTIONID	Transaction identifier is not valid
	GK_INVALID_CONTEXT	Context not valid
	GK_API_ERROR	Internal error
	GK_API_NOT_INITIALIZED	API not initialized
	GK_SERVER_UNREACHABLE	Server unreachable

Description: This function must be invoked to release all internal structures set up by the CreateTransaction function. It must be invoked before the GK_Disconnect function.

5.10 GK_Submit

```
GK_Reply_t  GK_Submit (GK_Context_t       context,
                       GK_Transaction_t   transactionID,
                       GK_ApplicationData_t* applicationData,
                       GK_Callback_t      pCallbackResponse,
                       GK_Tag_t           gkTag);
```

Parameters:	**context**	Context identifier
	transactionID	Transaction identifier
	applicationData	Application data layout to be executed. It can be built using proper functions (see below)
	pCallbackResponse	Callback to handle a notification event for that request.
	gkTag	User tag returned by the callback

Return values	GK_SUCCESS	Submit request successfully executed
	GK_INVALID_CONTEXT	Context not valid
	GK_API_ERROR	Internal error
	GK_INVALID_TRANSACTIONID	Transaction identifier is not valid
	GK_API_NOT_INITIALIZED	GK-API not initialized
	GK_SERVER_UNREACHABLE	Server unreachable
	GK_COMMAND_ON_GOING	A connection request is still on going and a notification event for the previous request must be received
	GK_OVERLOAD	Application window is exhausted. The caller must wait for completion of some previous accepted requests
	GK_INVALID_PARAMETER	*applicationData* is null

from pCallbackResponse	
GK_REQUEST_ACCEPTED	Connection accepted
GK_REQUEST_REJECTED	Connection refused
GK_REQUEST_WARNING	Request accepted with some specified warning
GK_NO_MARKET_CONTEXT	The market or clearing house context is not available
GK_INVALID_FIELD	The specified field name is invalid
GK_REQUEST_ONGOING	A previous submit operation on the same transaction identifier is still on going
GK_PROPOSAL_ALREADY_EXISTS	A proposal belonging to the specified transaction identifier already exists
GK_PROPOSAL_NOT_EXISTS	A proposal belonging to the specified transaction identifier does not exist
GK_INVALID_PROPOSAL_KEY	Invalid proposal referenced
GK_MISSING_FIELD_VALUE	Mandatory Field is emptymissing
GK_INVALID_CLASS	Class not valid
GK_NOT_CONNECTED	Connection in not in place
GK_INVALID_TRANSACTIONID	Transaction identifier is not valid

Description: This function must be invoked to send a Submit data structure to the BCS Clearing system. If this message will be accepted, a callback will be fired. if the system is still processing a submit request, it will reject any other submit request using the same Transaction Id, whereas it will accept requests with different Transaction Ids (previously received with a Create Transaction).

5.11 GK_Subscribe

```
GK_Reply_t          GK_Subscribe (GK_Context_t context,
                    GK_ApplicationData_t* applicationData,
                    GK_Callback_t pCallbackResponse,
                    GK_Callback_t pCallbackData,
```

GK_Tag_t gkTag,

GK_Subscription_t pSubscriptionID);*

Parameters:	**context**	Context identifier
	applicationData	Application Data layout to be executed. It can be built using proper functions (see below)
	pCallbackResponse	Call-back to handle a notification event for that request.
	pCallbackData	Call-back to handle a notification event containing returned data.
	gkTag	User tag returned by the call-back
	pSubscriptionID	Unique identifier for the requested subscription
Return values	GK_SUCCESS	Subscription request successfully executed
	GK_INVALID_CONTEXT	Context not valid
	GK_API_ERROR	Internal error
	GK_INVALID_ SUBSCRIPTIONID	Transaction identifier is not valid
	GK_API_NOT_INITIALIZED	GK-API not initialized
	GK_SERVER_UNREACHABLE	Server unreachable
	GK_OVERLOAD	Application window is exhausted. The caller must wait for completion of some previous accepted requests
	GK_INVALID_PARAMETER	At least one of *applicationData* or *pSubscriptionID* is null
	from pCallbackResponse	
	GK_REQUEST_ACCEPTED	Connection accepted
	GK_REQUEST_REJECTED	Connection refused
	GK_REQUEST_WARNING	Request accepted with some specified warnings
	GK_NO_MARKET_CONTEXT	The market or clearing house context is not available

GK_INVALID_FIELD	The specified field name is invalid
GK_MISSING_FIELD_VALUE	Mandatory field is empty
GK_INVALID_CLASS	Class not valid
GK_NOT_CONNECTED	Connection has not been set
GK_WRONG_PARAM	Wrong parameters passed

Description: This function must be invoked to send a Subscribe data structure to the BCS Clearing system.

5.12 GK_UnSubscribe

```
GK_Reply_t    GK_UnSubscribe (GK_Context_t    context,
                              GK_Subscription_t* pSubscriptionID,
                              GK_Callback_t    pCallbackResponse,
                              GK_Tag_t         gkTag);
```

Parameters:		
	context	Context identifier
	pSubscriptionID	Unique identifier for the requested subscription to be ended
	pCallbackResponse	Call-back to handle a notification event for that request.
	gkTag	User tag returned by the callback

Return values		
	GK_SUCCESS	Unsubscribe request successfully executed
	GK_INVALID_CONTEXT	Context not valid
	GK_API_ERROR	Internal error
	GK_INVALID_ SUBSCRIPTIONID	Suscription identifier is not valid
	GK_API_NOT_INITIALIZED	API not initialized
	GK_SERVER_UNREACHABLE	Server unreachable
	GK_COMMAND_ON_GOING	A connection request is still on going and a notification event for the previous request must be received
	GK_OVERLOAD	Application window is exhausted. The caller must wait for

		completion of some previous accepted requests
	from pCallbackResponse	
	GK_REQUEST_ACCEPTED	Connection accepted
	GK_REQUEST_REJECTED	Connection refused
	GK_REQUEST_WARNING	Request accepted with some specified warming
	GK_NO_MARKET_CONTEXT	The market or clearing house context is not available
	GK_REQUEST_ONGOING	A previous submit operation on the same transaction identifier is still on going
	GK_NOT_CONNECTED	Connection in not in place

Description: This function must be invoked to remove an active subscription. Subscriptions are not removed when a client application logs off via the GK_Disconnect function.

5.13 GK_Inquire

```
GK_Reply_t          GK_Inquire (GK_Context_t context,
                    GK_ApplicationData_t* applicationData,
                    GK_Callback_t pCallbackResponse,
                    GK_Callback_t pCallbackData,
                    GK_Tag_t gkTag;
                    GK_Inquire_t* pInquiryID);
```

Parameters:	**context**	Context identifier
	applicationData	Application Data layout to be executed. It can be built using proper functions (see below)
	pCallbackResponse	Call-back to handle a notification event for that request.
	pCallbackData	Call-back to handle a notification event containing returned data.
	gkTag	User tag returned by the call-back

	pInquiryID	Unique identifier for the requested inquiry
Return values	GK_SUCCESS	Inquire request successfully executed
	GK_INVALID_CONTEXT	Context not valid
	GK_API_ERROR	Internal error
	GK_API_NOT_INITIALIZED	API not initialized
	GK_SERVER_UNREACHABLE	Server unreachable
	GK_OVERLOAD	Application window is exhausted. The caller must wait for completion of some previous accepted requests
	GK_INVALID_PARAMETER	At least one of *applicationData* or *pInquiryID* is null
	from pCallbackResponse	
	GK_REQUEST_ACCEPTED	Connection accepted
	GK_REQUEST_REJECTED	Connection refused
	GK_REQUEST_WARNING	Request accepted with some specified warnings
	GK_NO_MARKET_CONTEXT	The market or clearing house context is not available
	GK_INVALID_FIELD	The specified field name is invalid
	GK_MISSING_FIELD_VALUE	Mandatory field is empty
	GK_INVALID_CLASS	Class not valid
	GK_NOT_CONNECTED	Connection has not been set
	GK_REQUEST_ONGOING	A previous inquiry operation on the same transaction identifier is still on going
	GK_WRONG_PARAM	Wrong parameters passed

Description: This function must be invoked to send an Inquire data structure to the BCS Clearing system.

5.14 GK_GetVersion

```
GK_Reply_t    GK_GetVersion(char** company,
                            char** version,
                            char** creationDate,
                            char** comment);
```

Parameters	**company**	Company that distributes the GK-API
	version	Version Identifier
	creationDate	Creation date
	comment	Any comment
Return values:	GK_SUCCESS	Request successfully executed
	GK_API_ERROR	Internal error
Description	This function must be invoked in order to know the current GK-API version. The output parameters are allocated by the library and they must be released by the client application using the GK_FreeString() function.	

5.15 GK_ConnectEx

```
GK_Reply_t    GK_ConnectEx (GK_Context_t  context,
                            const char*  userName,
                            const char*  password,
                            const char*  market,
                            const char*  ClientIP,
                            const char*  ClientData,
                            GK_Callback_t  pCallbackResponse,
                            GK_Callback_t  pCallbackMarketStatus,
                            GK_Tag_t  gkTag)
```

Parameters	**context**	Active context identifier through which a connection must be performed.
	userName	Name of the user requiring the connection. Maximum allowed length: 40 characters.
	password	Password of the user requiring the connection. Maximum allowed length: 40 characters.
	market	Market or Clearing House name to which a connection is requested (e.g. MTA, CCG, ...). Maximum allowed length: 40 characters.
	ClientIP	IP address of the client host. It is sent to the server in order to univocally identify the client. Maximum allowed length: 15 characters.
	ClientData	Free text sent to the server for log purpose. Maximum allowed length: 512 characters.
	pCallbackResponse	Callback to handle a notification event for the related request.
	pCallbackMarketStatus	Callback to handle a notification event for the connection status
	gkTag	User tag returned by the callback
Return values:	GK_SUCCESS	Connection request successfully executed
	GK_API_ERROR	Internal error
	GK_INVALID_CONTEXT	Context is not valid
	GK_SERVER_UNREACHABLE	Server unreachable
	GK_API_NOT_INITIALIZED	API not initialized
	GK_COMMAND_ON_GOING	A connection request is still on going and a notification event for the previous request must be received
	GK_CONTEXT_BUSY	Context is already in use (a connection on the context is already in place)

GK_INVALID_PARAMETER	At least one of *userName*, *password*, *market*, *ClientIP* or *ClientData* is null or too long

from pCallbackResponse

GK_REQUEST_ACCEPTED	Connection accepted
GK_REQUEST_REJECTED	Connection refused
GK_ALREADY_CONNECTED	Connection already in place
GK_INVALID_MARKET	Invalid MarketName
GK_ACCESS_DENIED	Unknown user
GK_LICENCE_ERROR	Maximum number of concurrent connections exceeded
GK_INSUFFICIENT_PRIVILEGES	User cannot connect to the specified market

from pCallbackMarketStatus

GK_MARKET_STATUS_NOTIFICATION	
• GK_CONNECTION_UP	All connections are active
• GK_CONNECTION_WARNING	At least one connection is active, while one or more other connections can be down
• GK_CONNECTION_DOWN	No connection is active
• GK_SERVER_DOWN	Application server not reachable
GK_TRANSACTION_STATUS_NOTIFICATION	
• GK_CONNECTION_UP	Transaction is active
• GK_CONNECTION_DOWN	Transaction is not active
GK_SUBSCRIPTION_STATUS_NOTIFICATION	
• GK_CONNECTION_UP	Subscription is active
• GK_CONNECTION_DOWN	Subscription is not active

Description This function must be invoked in order to establish a connection to the BCS Clearing system.

6. INTRODUCTION TO CALLBACKS

All callback functions have the following structure:

void ***Callback*** (*GK_Context_t context*,
GK_Data_t gkData,
GK_Tag_t gkTag);

The callback function is invoked by the GK-API to provide the calling application with asynchronous notifications that can contains data or connection monitoring information. The client application can define as many callbacks as required and then it can bind them to each single request by passing its pointer to the function call.

To know the notification type belonging to the callback, the client application must invoke the GK_GetNotificationType() function in the callback itself, passing the gkData parameter.

The following notification types are available:

- GK_MARKET_STATUS_NOTIFICATION
- GK_CONNECTION_RESPONSE_NOTIFICATION
- GK_DISCONNECTION_ RESPONSE _NOTIFICATION
- GK_TRANSACTION_ STATUS_NOTIFICATION
- GK_SUBSCRIPTION_STATUS_NOTIFICATION
- GK_SUBMIT_ RESPONSE _NOTIFICATION
- GK_SUBSCRIBE_ RESPONSE _NOTIFICATION
- GK_UNSUBSCRIBE_ RESPONSE _NOTIFICATION
- GK_INQUIRE_ RESPONSE _NOTIFICATION
- GK_NOTIFY_DATA_NOTIFICATION
- GK_INQUIRE_DATA_NOTIFICATION
- GK_SET_NOTIFICATION_PERIOD_NOTIFICATION
- GK_BINARY_INQUIRE_DATA_NOTIFICATION

After notification type detection, the calling application can invoke proper functions, as described below. It is possible (even if not recommended) to receive all notification events through a unique callback. It is recommended to process each received callback as soon as possible, in order to avoid disconnections due to keep-alive timeout.

6.1 Connection request result

void ***ConnectionResp*** *context,*
(GK_Context_t
GK_Data_t gkData,

GK_Tag_t gkTag);

Parameters:	**context**	Context identifier
	gkData	Data returned from the Notification event
	gkTag	User tag returned by the callback

Description

The callback function pointer is passed to the connection request function. The GK-API will call the callback whenever it must notify connection result. If this callback function pointer is passed only to the connection request function, it will be possible to receive only notification of the GK_CONNECTION_RESPONSE_NOTIFICATION type. In order to know the request result the GK_GetMarketResponse() function must be invoked passing gkData.

6.2 Disconnect request result

void ***DisconnectionResp*** *(GK_Context_t context,*
GK_Data_t gkData,
GK_Tag_t gkTag);

Parameters:	**context**	Context identifier
	gkData	Data returned from the Notification event
	gkTag	User tag returned by the callback

Description

The callback function pointer is passed to the disconnection request function. The GK-API will call the callback whenever it must notify disconnection result. If this call-back function pointer is passed only to the connection request function, it will be possible to receive only notifications of the GK_DISCONNECTION_RESPONSE_NOTIFICATION type. In order to know the request result the GK_GetMarketResponse() function must be invoked passing gkData.

6.3 Connection monitoring

void	***MarketStatus (GK_Context_t***	*context,*
	GK_Data_t	*gkData,*
	GK_Tag_t	*gkTag);*

Parameters:	**context**	Context identifier
	gkData	Data returned from the Notification eve
	gkTag	User tag returned by the callback

Description

The callback function pointer is passed to the connection request function. The GK-API will call the callback whenever it must notify the market connection status. If this callback function pointer is passed only to the connection request function, it will be possible to receive notification of the following types:

- GK_MARKET_STATUS_NOTIFICATION type
- GK_TRANSACTION_ STATUS_NOTIFICATION type
- GK_SUBSCRIPTION_STATUS_NOTIFICATION type

As regards the GK_MARKET_STATUS_NOTIFICATION type, it will possible to receive the following notifications:

- The GK_CONNECTION_UP status means all connections are active.
- The GK_CONNECTION_DOWN status means all connections are inactive.
- The GK_CONNECTION_WARNING status means at least one connection is active.
- The GK_SERVER_DOWN status means the connection to the server is lost.

In order to know the status value, the GK_GetConnectionStatus() function must be invoked passing gkData.

As regards the GK_TRANSACTION_STATUS_NOTIFICATION type it will be possible to receive the following notifications:

- The GK_CONNECTION_UP status means the related transaction is active.
- The GK_CONNECTION_DOWN status means the related transaction is inactive.

In order to know the related transaction identifier, the GK_GetTransactionID() function must be invoked passing gkData.

As regards the GK_SUBSCRIPTION_STATUS_NOTIFICATION type it will be possible to receive the following notifications:

- The GK_CONNECTION_UP status means therelated subscription is active.
- The GK_CONNECTION_DOWN status means the related subscription is inactive. In this case, the calling application should perform a new subscription from scratch.

In order to know the related subscription identifier, the GK_GetSubscriptionID() function must be invoked passing gkData.

6.4 Application message submission result

void ***SubmitResp*** *(GK_Context_t context,*
GK_Data_t gkData,
GK_Tag_t gkTag);

Parameters:	**context**	Context identifier
	gkData	Data returned from the Notification event
	gkTag	User tag returned by the callback

Description

The callback function pointer is passed to the submit request function. The GK-API will call the callback whenever it must notify new results. If this callback function pointer is passed only to the submit request function, it will be possible to receive only notification of the GK_SUBMIT_RESPONSE_NOTIFICATION type. In order to know the submit result the GK_GetMarketResponse() function must be invoked passing gkData. On the other hand, to know the transaction identifier belonging to that submit the GK_GetTransactionID() function must be invoked passing gkData.

6.5 Application message subscription result

void ***SubscribeResp*** *(GK_Context_t context,*
GK_Data_t gkData,
GK_Tag_t gkTag);

Parameters:	**context**	Context identifier
	gkData	Data returned from the Notification event

	gkTag	User tag returned by the call-back

Description

The callback function pointer is passed to the subscribe request function. The GK-API will call the callback whenever it must notify new results. If this callback function pointer is passed only to the subscribe request function, it will be possible to receive only notification of the GK_SUBSCRIBE_RESPONSE_NOTIFICATION type. In order to know the subscription identifier the GK_GetSubscriptionID() function must be invoked passing gkData. On the other hand, to know the request result the GK_GetMarketResponse() function must be invoked passing gkData.

6.6 Application message unsubscription result

```
void        UnSubscribeResp (GK_Context_t context,
                             GK_Data_t gkData,
                             GK_Tag_t gkTag);
```

Parameters:	**context**	Context identifier
	gkData	Data returned from the Notification event
	gkTag	User tag returned by the call-back

Description

The callback function pointer is passed to the unsubscribe request function. The GK-API will call the callback whenever it must notify new results. If this callback function pointer is passed only to the unsubscribe request function, it will be possible to receive only notification of the GK_UNSUBSCRIBE_RESPONSE_NOTIFICATION type. In order to know the subscription identifier the GK_GetSubscriptionID() function must be invoked passing gkData. On the other hand, to know the request result the GK_GetMarketResponse() function must be invoked passing gkData.

6.7 Data inquiry request result

```
void        InquireResp (GK_Context_t context,
                         GK_Data_t gkData,
                         GK_Tag_t gkTag);
```

Parameters:	**context**	Context identifier

	gkData	Data returned from the Notification event
	gkTag	User tag returned by the call-back

Description

The callback function pointer is passed to the snapshot subscription (inquiry) request function. The GK-API will call the callback whenever it must notify a result. If this callback function pointer is passed only to the snapshot subscription request function, it will be possible to receive only notification of the GK_INQUIRE_RESPONSE_NOTIFICATION type. In order to know the submit result the GK_GetMarketResponse() function must be invoked passing gkData. On the other hand, to know the enquiry identifier belonging to that subscription the GK_GetInquireID() function must be invoked passing gkData.

6.8 Data subscription notification

void ***NotifyData*** *(GK_Context_t context,*
GK_Data_t gkData,
GK_Tag_t gkTag);

Parameters:	**context**	Context identifier
	gkData	Data returned from the Notification event
	gkTag	User tag returned by the call-back

Description

The callback function pointer is passed to the subscribe notification function. The GK-API will call the callback whenever it must notify new data. If this callback function pointer is passed only to the subscription request function, it will be possible to receive only notification of the GK_NOTIFY_DATA _NOTIFICATION type. In order to unpack incoming data the GK_GetClassName(), GK_GetClassData(), GK_GetFieldClassData() functions must be invoked passing gkData. On the other hand, to know the subscription identifier belonging to that subscription, the GK_GetSubscriptionID() function must be invoked passing gkData.

6.9 Data inquiry notification

void ***NotifyData*** *(GK_Context_t context,*
GK_Data_t gkData,
GK_Tag_t gkTag);

Parameters:	**context**	Context identifier
	gkData	Data returned from the Notification event
	gkTag	User tag returned by the call-back

Description

The callback function pointer is passed to the snapshot subscription (inquiry) notification function. The GK-API will call the callback whenever it must notify new data. If this callback function pointer is passed only to the inquiry request function, it will be possible to receive only notification of the GK_INQUIRE_DATA_NOTIFICATION and GK_BINARY_INQUIRE_DATA _NOTIFICATION types. The received notification type only depends on the class used in the inquiry request.

In order to unpack incoming data of GK_INQUIRE_DATA_NOTIFICATION type, the GK_GetClassName(), GK_GetClassData(), GK_GetFieldClassData() functions must be invoked passing gkData. On the other hand, to know the inquiry identifier belonging to that snapshot subscription, the GK_GetInquireID() function must be invoked passing gkData. Instead, in order to manage incoming data of GK_BINARY_INQUIRE_DATA_NOTIFICATION type, the GK_GetClassName() and GK_GetBinaryData() functions must be invoked passing gkData. Data retrieved using the GK_GetBinaryData() function are binary data. If multiple binary notifications are received on an inquiry request, user have to concatenate each binary data segment in the order they are received to obtain the whole inquiry response data. Depending on the class used in the inquiry request, the received binary data can be compressed by the server. To decompress binary data, the GK_UnzipBinaryData function must be invoked (see section **Error! Reference source not found.**~~9.0~~).

7. RETRIEVING DATA FROM CALLBACK OBJECTS

7.1 Connection request result

GK_Reply_t ***GK_FreeString*** *(char* data);*

Parameters:	**data**	Data to be freed
Return values:	GK_SUCCESS	Function successfully completed
Description:	This function must be invoked to release all string-type and binary-type data allocated by the GK-API.	

7.2 GK_GetNotificationType

GK_Reply_t ***GK_GetNotificationType***
(GK_Data_t gkData,
GK_Notification_t pNotificationType);*

Parameters:	**gkData**	Handle of available data
	pNotificationType	Notification type
Return values:	GK_SUCCESS	Function successfully completed
	GK_FAILED	Function not completed
	GK_INVALID_HANDLE	The referred handle is not valid
	GK_API_ ERROR	Internal error
	GK_API_NOT_INITIALIZED	GK-API not initialized
Description:	This function must be invoked in order to extract the notification type related to a callback. The function can be used for any notification type.	

7.3 GK_GetConnectionStatus

GK_Reply_t ***GK_GetConnectionStatus***

(GK_Data_t gkData,
GK_ Status_t pMarketStatus);*

Parameters:	**gkData**	Handle of available data
	pMarketStatus	Connection status
Return values:	GK_SUCCESS	Function successfully completed
	GK_FAILED	Function not completed
	GK_INVALID_HANDLE	The referred handle is not valid
	GK_API_ ERROR	Internal error
	GK_API_NOT_INITIALIZED	GK-API not initialized
Description:	This function must be invoked in order to extract the connection status notified by a callback. The function can be used only for the following notification types: • GK_MARKET_STATUS_NOTIFICATION • GK_TRANSACTION_STATUS_NOTIFICATION • GK_SUBSCRIPTION_STATUS_NOTIFICATION	

7.4 GK_GetTransactionID

GK_Reply_t ***GK_ GetTransactionID***
(GK_Data_t gkData,
GK_Transaction_t pTransaction);*

Parameters:	**gkData**	Handle of available data
	pTransaction	Transaction identifier
Return values:	GK_SUCCESS	Function successfully completed
	GK_FAILED	Function not completed
	GK_INVALID_HANDLE	The referred handle is not valid
	GK_API_ ERROR	Internal error
	GK_API_NOT_INITIALIZED	GK-API not initialized

Description:	This function must be invoked in order to extract the transaction identifier notified by a callback. The function can be used only for the following notification types: • GK_SUBMIT_RESPONSE_NOTIFICATION • GK_TRANSACTION_STATUS_NOTIFICATION

7.5 GK_GetMarketResponse

```
GK_Reply_t    GK_GetMarketResponse
                        (GK_Data_t          gkData,
                         GK_MarketReply_t*  pReply,
                         char**             specification);
```

Parameters:	**gkData**	Handle of available data
	pReply	Reply coming from the market
	specification	Subscription status

Return values:	GK_SUCCESS	Function successfully completed
	GK_FAILED	Function not completed
	GK_INVALID_HANDLE	The referred handle is not valid
	GK_API_ ERROR	Internal error
	GK_API_NOT_INITIALIZED	GK-API not initialized

Description:	This function must be invoked in order to extract the market reply notified by a callback. The **specification** parameter is allocated by the GK-API and must be released by the calling application by using the GK_FreeString function. The function can be used only for the following notification types: • GK_SUBMIT_RESPONSE_NOTIFICATION • GK_CONNECTION_RESPONSE_NOTIFICATION • GK_DISCONNECTION_RESPONSE_NOTIFICATION • GK_SUBMIT_RESPONSE_NOTIFICATION • GK_SUBSCRIBE_RESPONSE_NOTIFICATION • GK_UNSUBSCRIBE_RESPONSE_NOTIFICATION • GK_INQUIRE_RESPONSE_NOTIFICATION

7.6 GK_GetSubscriptionID

GK_Reply_t ***GK_GetSubscriptionID*** *(GK_Data_t gkData, GK_Subscription_t* pSubscription);*

Parameters:	**gkData**	Handle of available data
	pSubscription	Subscription identifier
Return values:	GK_SUCCESS	Function successfully completed
	GK_FAILED	Function not completed
	GK_INVALID_HANDLE	The referred handle is not valid
	GK_API_ ERROR	Internal error
	GK_API_NOT_INITIALIZED	GK-API not initialized

Description: This function must be invoked in order to extract the subscription identifier notified by a callback. The function can be used only for the following notification types:

- GK_SUBSCRIBE_RESPONSE_NOTIFICATION
- GK_UNSUBSCRIBE_RESPONSE_NOTIFICATION
- GK_SUBSCRIPTION_STATUS_NOTIFICATION
- GK_NOTIFY_DATA_NOTIFICATION

7.7 GK_GetInquireID

GK_Reply_t ***GK_GetInquireID*** *(GK_Data_t gkData, GK_Inquire_t* pInquire);*

Parameters:	**gkData**	Handle of available data
	pInquire	Inquiry identifier
Return values:	GK_SUCCESS	Function successfully completed
	GK_FAILED	Function not completed
	GK_INVALID_HANDLE	The referred handle is not valid

	GK_API_ ERROR	Internal error
	GK_API_NOT_INITIALIZED	GK-API not initialized

Description: This function must be invoked in order to extract the inquiry identifier notified by a callback. The function can be used only for the following notification types:

- GK_INQUIRE_RESPONSE_NOTIFICATION
- GK_INQUIRE_DATA_NOTIFICATION
- GK_BINARY_INQUIRE_DATA_NOTIFICATION

7.8 GK_GetClassName

```
GK_Reply_t      GK_GetClassName
                        (GK_Data_t      gkData,
                         char**         className,
                         GK_ClassType_t* pClassType);
```

Parameters:	**gkData**	Handle of available data
	className	Class name
	pClassType	Class type

Return values:	GK_SUCCESS	Function successfully completed
	GK_FAILED	Function not completed
	GK_INVALID_HANDLE	The referred handle is not valid
	GK_API_ ERROR	Internal error
	GK_API_NOT_INITIALIZED	GK-API not initialized

Description: This function must be invoked in order to extract the class name notified by a callback. The className parameter is allocated by the GK-API and must be released by the calling application using the GK_FreeString function. The function can be used only for the following notification types:

- GK_NOTIFY_DATA_NOTIFICATION
- GK_INQUIRE_DATA_NOTIFICATION
- GK_BINARY_INQUIRE_DATA_NOTIFICATION

7.9 GK_DecodeData

```
GK_Reply_t      GK_DecodeData  gkData,
                    (GK_Data_t
                        char**  data);
```

Parameters:	**gkData**	Handle of available data
	data	Application data
Return values:	GK_SUCCESS	Function successfully completed
	GK_FAILED	Function not completed
	GK_INVALID_HANDLE	The referred handle is not valid
	GK_API_ ERROR	Internal error
	GK_API_NOT_INITIALIZED	GK-API not initialized

Description: This function must be invoked in order to extract the application data (string) notifyed by a callback. The data parameter is allocated by the GK-API and must be released by the calling application using GK_FreeString. The function can be used only for the following notification types:

- GK_NOTIFY_DATA_NOTIFICATION
- GK_INQUIRE_DATA_NOTIFICATION

7.10 GK_GetValueString

```
GK_Reply_t    GK_GetValueString (GK_Data_t  gkData,
                          const char*  Key ,
                              char**  value);
```

Parameters:	**gkData**	Handle of available data
	Key	Filed name of the application data
	Value	Returned value of requested filed
Return values:	GK_SUCCESS	Function successfully completed
	GK_FAILED	Function not completed

GK_INVALID_HANDLE	The referred handle is not valid
GK_API_ ERROR	Internal error
GK_API_NOT_INITIALIZED	GK-API not initialized
GK_TYPE_MISMATCH	The requested Key does not exist

Description: This function must be invoked in order to extract the application data (string) from the message notified by a callback. The Value parameter is allocated and returned by the GK-API and must be released by the calling application using the GK_FreeString function. The function can be used only for the following notification types:

- GK_NOTIFY_DATA_NOTIFICATION
- GK_INQUIRE_DATA_NOTIFICATION

7.11 GK_GetValueLong

```
GK_Reply_t      GK_GetValueLong  gkData,
                    (GK_Data_t
                 const char*  key,
                       long*  value);
```

Parameters:		
	gkData	Handle of available data
	Key	Filed name of the application data
	Value	Returned value of requested field

Return values:		
	GK_SUCCESS	Function successfully completed
	GK_FAILED	Function not completed
	GK_INVALID_HANDLE	The referred handle is not valid
	GK_API_ ERROR	Internal error
	GK_API_NOT_INITIALIZED	GK-API not initialized
	GK_TYPE_MISMATCH	The requested Key does not exist

Description: This function must be invoked in order to extract the application data (long) from the message notified by a callback. The function can be used only for the following notification types:

- GK_NOTIFY_DATA_NOTIFICATION
- GK_INQUIRE_DATA_NOTIFICATION

7.12 GK_GetValueDouble

```
GK_Reply_t      GK_GetValueDouble (GK_Data_t  gkData,
                                   const char*  key ,
                                   double*  value);
```

Parameters:	**gkData**	Handle of available data
	Key	Filed name of the application data
	Value	Returned value of requested field

Return values:	GK_SUCCESS	Function successfully completed
	GK_FAILED	Function not completed
	GK_INVALID_HANDLE	The referred handle is not valid
	GK_API_ ERROR	Internal error
	GK_API_NOT_INITIALIZED	GK-API not initialized
	GK_TYPE_MISMATCH	The requested Key does not exist

Description: This function must be invoked in order to extract the application data (double) from the message notified by a callback. The function can be used only for the following notification types:

- GK_NOTIFY_DATA_NOTIFICATION
- GK_INQUIRE_DATA_NOTIFICATION

7.13 GK_GetValueInt

```
GK_Reply_t      GK_GetValueInt (GK_Data_t  gkData,
                                const char*  key,
                                int*  value);
```

Parameters:	**gkData**	Handle of available data
	Key	Filed name of the application data
	value	Returned value of requested field

Return values:	GK_SUCCESS	Function successfully completed
	GK_FAILED	Function not completed
	GK_INVALID_HANDLE	The referred handle is not valid
	GK_API_ ERROR	Internal error
	GK_API_NOT_INITIALIZED	GK-API not initialized
	GK_TYPE_MISMATCH	The requested Key does not exist

Description: This function must be invoked in order to extract the application data (integer) from message notified by a callback. The function can be used only for the following notification types:

- GK_NOTIFY_DATA_NOTIFICATION
- GK_INQUIRE_DATA_NOTIFICATION

7.14 GK_GetChain

GK_Reply_t ***GK_GetChain*** *(GK_Data_t gkData,*
GK_Chain_t pChain);*

Parameters:	**gkData**	Handle of available data
	pChain	Data chain

Return values:	GK_SUCCESS	Function successfully completed
	GK_FAILED	Function not completed
	GK_INVALID_HANDLE	The referred handle is not valid
	GK_API_ ERROR	Internal error
	GK_API_NOT_INITIALIZED	GK-API not initialized
	GK_TYPE_MISMATCH	The requested Key does not exist

Description: This function must be invoked in order to extract the inquiry status notified by a callback. The function can be used only for the following notification types:

- GK_INQUIRE_DATA_NOTIFICATION
- GK_BINARY_INQUIRE_DATA_NOTIFICATION

7.15 GK_GetBinaryData

```
GK_Reply_t          GK_GetBinaryData (GK_Data_t      gkData,
                                      GK_Byte_t**    pData,
                                      GK_Length_t*   pDataLength);
```

Parameters:	**gkData**	Handle of available data
	pData	Application binary data buffer
	pDataLength	Returned length of binary data buffer

Return values:	GK_SUCCESS	Function successfully completed
	GK_FAILED	Function not completed
	GK_INVALID_HANDLE	The referred handle is not valid
	GK_API_ ERROR	Internal error
	GK_API_NOT_INITIALIZED	GK-API not initialized

Description: This function must be invoked in order to extract the application binary data notifyed by a callback. The pData parameter is allocated by the GK-API and must be released by the calling application using GK_FreeString. The function can be used only for the following notification types:

- GK_BINARY_INQUIRE_DATA_NOTIFICATION

8. BUILDING APPLICATION DATA MESSAGES

8.1 GK_CreateApplicationData

```
GK_Reply_t
        GK_CreateApplicationData (const char*  className,
                                  GK_ClassType_t  classType,
                                  GK_ApplicationData_t**  pApplicationData);
```

Parameters:	**className**	Data class name
	classType	Data class type
	pApplicationData	Pointer to the message structure
Return values:	GK_SUCCESS	Function successfully completed
	GK_FAILED	Function not completed
	GK_API_ ERROR	Internal error
	GK_API_NOT_INITIALIZED	GK-API not initialized
Description:	This function must be invoked to create an application message pApplicationData The pApplicationData parameter is allocated and returned by the GK-API and must be released by the calling application using the GK_FreeApplicationData() function.	

8.2 GK_EncodeData

```
GK_Reply_t
        GK_EncodeData (GK_ApplicationData_t*  pApplicationData,
                       const char*  data);
```

Parameters	**pApplicationData**	Pointer to the message structure to be filled
	data	Application fields (format: "*field=value; field=value;..*")
Return values:	GK_SUCCESS	Function successfully completed

	GK_FAILED	Function not completed
	GK_API_ ERROR	Internal error
	GK_API_NOT_INITIALIZED	GK-API not initialized

Description: This function must be invoked to insert the application message using the following format: "field=value". As opposed to the GK_Set… functions (which set a single field value at the time), this function will set the complete message string abiding by the message layout.

8.3 GK_SetValueString

```
GK_Reply_t      GK_SetValueString
                (GK_ApplicationData_t*  pApplicationData,
                 const char*            key,
                 const char*            value);
```

Parameters	**pApplicationData**	Pointer to the message structure to be filled
	Key	Application filed name
	Value	Field value to insert
Return values:	GK_SUCCESS	Function successfully completed
	GK_FAILED	Function not completed
	GK_API_ ERROR	Internal error
	GK_API_NOT_INITIALIZED	GK-API not initialized

Description: This function must be invoked to assign the value "value" to the field "key" . If a value already exists, the new value will replace the previous one.

8.4 GK_SetValueLong

```
GK_Reply_t      GK_SetValueLong
                (GK_ApplicationData_t*  pApplicationData,
                 const char*            key,
                 long                   value);
```

Parameters	**pApplicationData**	Pointer to the message structure to be filled
	Key	Application filed name
	Value	Field value to insert
Return values:	GK_SUCCESS	Function successfully completed
	GK_FAILED	Function not completed
	GK_API_ ERROR	Internal error
	GK_API_NOT_INITIALIZED	GK-API not initialized
Description:	This function must be invoked to assign the value "value" to the field "key" . If a value already exists, the new value will replace the previous one.	

8.5 GK_SetValueDouble

```
GK_Reply_t      GK_SetValueDouble
                (GK_ApplicationData_t*  pApplicationData,
                 const char*            key,
                 double                 value);
```

Parameters	**pApplicationData**	Pointer to the message structure to be filled
	key	Application filed name
	value	Field value to insert
Return values:	GK_SUCCESS	Function successfully completed
	GK_FAILED	Function not completed
	GK_API_ ERROR	Internal error
	GK_API_NOT_INITIALIZED	GK-API not initialized
Description:	This function must be invoked to assign the value "value" to the field "key" . If a value already exists, the new value will replace the previous one.	

8.6 GK_SetValueInt

```
GK_Reply_t          GK_SetValueInt
                    (GK_ApplicationData_t*  pApplicationData,
                     const char*            key,
                     int                    value);
```

Parameters	**pApplicationData**	Pointer to the message structure to be filled
	key	Application field name
	value	Field value to insert
Return values:	GK_SUCCESS	Function successfully completed
	GK_FAILED	Function not completed
	GK_API_ ERROR	Internal error
	GK_API_NOT_INITIALIZED	GK-API not initialized

Description: This function must be invoked to assign the value "value" to the field "key" . If a value already exists, the new value will replace the previous one.

8.7 GK_DestroyApplicationData

```
GK_Reply_t          GK_
                    DestroyApplicationData
                    (GK_ApplicationData_t*  pApplicationData);
```

Parameters	**pApplicationData**	Pointer to the message structure to be filled
Return values:	GK_SUCCESS	Function successfully completed
	GK_FAILED	Function not completed
	GK_API_ ERROR	Internal error
	GK_API_NOT_INITIALIZED	GK-API not initialized

Description:	This function must be invoked to release the message structure.

8.8 GK_SetTransactionID

GK_Reply_t ***GK_SetTransactionID***
*(GK_ApplicationData_t** *pApplicationData,*
GK_Transaction_t transaction);

Parameters	**pApplicationData**	Pointer to the message structure to be filled
	transaction	Transaction identifier
Return values:	GK_SUCCESS	Function successfully completed
	GK_FAILED	Function not completed
	GK_API_ ERROR	Internal error
	GK_API_NOT_INITIALIZED	GK-API not initialized

Description:	This function must be invoked to insert a transaction identifier within an application message. This type of application message is needed to subscribe information related to the related transaction (e.g. status, proposal information belonging to the transaction).

9. UNZIPPING CALLBACK FUNCTIONS

Binary compressed data received on notification of GK_BINARY_INQUIRE_DATA_ NOTIFICATION type can be decompressed using the GK_UnzipBinaryData() function, which provides an in-memory decompression mechanism including integrity checks of the uncompressed data.

To call the GK_UnzipBinaryData() function, user application must provide an input buffer containing the binary compressed data and an output buffer that will receive the uncompressed data. If the input buffer contains all the binary compressed data and the output buffer is large enough, decompression can be done in a single step. Otherwise, the unzip activity can be done by repeated calls of the GK_UnzipBinaryData() function. In the latter case, the user application must provide more input and/or consume the output (providing more output space) before each call. The GK_UnzipBinaryData() function provides each time as much output as possible, until there is no more input data or no more space in the output buffer.

In order to use the GK_UnzipBinaryData() function, user application must also provide a parameter of GK_UnzipHelper_t type, which is an internal structure managed by the GK-API during the unzip process. Before starting to unzip binary data, user application has to create an instance of GK_UnzipHelper_t type by means of the GK_CreateUnzipHelper() function. Then, in order to provide the input data buffer, user have to initialize the GK_UnzipHelper_t structure using the GK_InitializeUnzipHelper() function; this function has to be called every time more input is needed to complete the unzip process. After that, user application have to repeatedly call the GK_UnzipBinaryData() function until no more output is available. When the unzip process is terminated (as well as or an error has occurred), the helper structure has to be cleared using the GK_ClearUnzipHelper() function. Finally, the helper structure has to be released using the GK_DestroyUnzipHelper() function since it cannot be reused to start another unzip session.

9.1 GK_CreateUnzipHelper

GK_Reply_t ***GK_CreateUnzipHelper*** *(GK_UnzipHelper_t* **pUnzipHelper***);*

Parameters:	**pUnzipHelper**	Pointer to the returned internal helper structure
Return values:	GK_SUCCESS	Function successfully completed
	GK_FAILED	Function not completed
	GK_API_ ERROR	Internal error
	GK_API_NOT_INITIALIZED	GK-API not initialized

Description:	This function must be invoked to create an internal helper structure pUnzipHelper. The pUnzipHelper parameter is allocated and returned by the GK-API and must be released by the calling application using the GK_DestroyUnzipHelper() function.

9.2 GK_DestroyUnzipHelper

```
GK_Reply_t    GK_DestroyUnzipHelper
                  (GK_UnzipHelper_t unzipHelper);
```

Parameters:	**unzipHelper**	Internal helper structure created using GK_CreateUnzipHelper()
Return values:	GK_SUCCESS	Function successfully completed
	GK_FAILED	Function not completed
	GK_API_NOT_INITIALIZED	GK-API not initialized
Description:	This function must be invoked to deallocate an internal helper structure allocated using the GK_CreateUnzipHelper() function.	

9.3 GK_InitializeUnzipHelper

```
GK_Reply_t    GK_InitializeUnzipHelper (GK_UnzipHelper_t unzipHelper,
                  const GK_Byte_t* Data,
                  GK_Length_t DataLength);
```

Parameters:	**unzipHelper**	Internal helper structure created using GK_CreateUnzipHelper()
	Data	Pointer to a user buffer containing binary data to be unzipped
	DataLength	Length of the data in the user buffer

Return values:	GK_SUCCESS	Function successfully completed
	GK_FAILED	Function not completed
	GK_API_NOT_INITIALIZED	GK-API not initialized
	GK_INVALID_PARAMETER	Value of parameter DataLength is not valid

Description: This function must be invoked to initialize an internal helper structure allocated using the GK_CreateUnzipHelper() function. If binary data has to be unzipped in a single step, the Data parameter must point to a buffer containing all the binary data to be unzipped; otherwise, the Data parameter can point to a buffer containing only a part of the binary data to be unzipped.

9.4 GK_ClearUnzipHelper

```
GK_Reply_t      GK_ClearUnzipHelper
                    (GK_UnzipHelper_t unzipHelper);
```

Parameters:	**unzipHelper**	Internal helper structure created using GK_CreateUnzipHelper()

Return values:	GK_SUCCESS	Function successfully completed
	GK_FAILED	Function not completed
	GK_API_NOT_INITIALIZED	GK-API not initialized

Description: This function must be invoked to clear an internal helper structure allocated using the GK_CreateUnzipHelper() function. Internal helper structures used to unzip binary data must be cleared after each unzip session is terminated, successfully or unsuccessfully.

9.5 GK_UnzipBinaryData

```
GK_Reply_t      GK_UnzipBinaryData
                    (GK_UnzipHelper_t unzipHelper,
                                char* buffer,
                          GK_Length_t bufferLength,
                         GK_Length_t* pDataLength);
```

Parameters:	**unzipHelper**	Internal helper structure created using GK_CreateUnzipHelper()
	buffer	Pointer to a user output buffer
	bufferLength	Length of user output buffer
	pDataLength	Returned length of unzipped data
Return values:	GK_SUCCESS	Function successfully completed. All the binary data have been unzipped, i.e. the end of the compressed data has been reached and all uncompressed output has been produced
	GK_MORE_OUTPUT_AVAILABLE	Function successfully completed. User buffer is full and the function must be called again because there might be more output pending
	GK_MORE_INPUT_NEEDED	Function successfully completed. All provided binary data have been unzipped and the function must be called again providing more input binary data to complete the unzip process.
	GK_FAILED	Function not completed
	GK_API_ ERROR	Internal error
	GK_API_NOT_INITIALIZED	GK-API not initialized
	GK_INVALID_PARAMETER	Value of parameter bufferLength is not valid
	GK_DATA_ERROR	Supplied data are invalid or corrupted.
Description:	This function must be invoked to unzip compressed binary data. This function decompresses as much data as possible, and stops when the input buffer becomes empty or the output buffer becomes full.	

10. RECOVERY

This section describes the recovery process implemented by the BCS system and the actions to be taken when the system notifies the events concerning the services. In order to receive the connection status, the client application has to invoke the Subscribe.System.ServiceMarketStatus subscription class and it has to evaluate the data provided by the Notify.System.ServiceMarketStatus callback function.

Instead, events concerning the status of the connection between client and server are provided through the MarketStatus callback (see section 6.3).

10.1 Services

The BCS system is based on a set of services, each one managing a specific set of functions. It is possible to be notified about the status of a single service of the system. Possible values for service id are the following:

Service	ServiceID	Description
Risk Manager	2000	The service that manages all Risk Management requests
Clearing Data Manager	2100	The service that stores all market realtime data
Report Manager	2200	The service that manages all report requests
Transactional Gateway	2300	The gateway that connects to CC&G Clearing system and manages all transactional requests
Realtime Gateway	2400	The gateway that connects to CC&G Clearing system and receives real time data
Sola Gateway	2500	The service that manages the connection to SOLA Derivatives

Is it possible, using API, still call a Subscribe.System.ServiceMarketStatus that include a group of components (ServiceID=100). This layout is obsolete and will be dismissed soon.

Please note that in the following tables the length column stands for the maximum length of the field.

10.2 Subscribe.System.ServiceMarketStatus

Request the service market connection status. The status is notified by Notify.System.ServiceMarketStatus.

Field	Type	Length	Description
ServiceID	integer	10	The ID of the service
RequestedMember	string	100	Not mandatory.

10.3 Notify.System.ServiceMarketStatus

Notify the service connection status.

Field	Type	Length	Description
Member	String	100	Member name.
ServiceID	integer	10	The ID of the service
Market	string	100	Market identifier
Status	string	50	The connection status of the service <ServiceID> operating on the market <Market> for the member <Member>. The possible values are: CONNECTION_UP: the service is available. CONNECTION_CRASH: the service is not available

The following actions need to be taken when Notify.System.ServiceMarketStatus events are received:

CONNECTION_UP	The connection is successfully established: the user can start its activity.

CONNECTION_CRASH	The service is no longer available: the user should wait for a CONNECTION_UP event in order to restart its activity. All the Subscribe calls executed before the CONNECTION_CRASH event should be unsubscribed and then called again by the user.

Please note that the status "CONNECTION_DOWN" and "CONNECTION_WARNING" has been dismissed so is not possible receive this notifies.

The below table list the link between the ServideID and the related Subscriptions:

Service	ServiceID	Subscriptions
Risk Manager	2000	SubscribeStandardPortfolioParameters SubscribeCustomPortfolioParameters SubscribeTradeLimitParameters SubscribeTradeLimitAlarms SubscribePositionLimitParameters SubscribePositionLimitAlarms SubscribeMarginLimitParameters SubscribeMarginLimitAlarms
Clearing Data Manager	2100	SubscribeSeries SubscribePositions SubscribeRectifications SubscribePositionTransfers SubscribeContracts SubscribeContractTransfers SubscribeOpenCloseContractChanges SubscribeClientCodeContractChanges SubscribeSplitContracts SubscribeCollateralGuarantees SubscribeDepositedGuarantees SubscribeEarlyExercises SubscribeExByEx SubscribeExerciseAtExpiry

Service	ServiceID	Subscriptions
		SubscribeAssignments SubscribeAssignmentsSent SubscribeClearingMessages SubscribeIntradayMarginCalls SubscribeIntradayMarginCallsSent SubscribeSubAccountTransfers SubscribeSubAccountParameters SubscribeSubAccountClientCodeLinks SubscribeSubAccountClientCodeLinkChange SubscribeGiveOutParameters SubscribeTakeUpParameters
Report Manager	2200	SubscribeReport
Transactional Gateway	2300	-
Realtime Gateway	2400	-
Sola Gateway	2500	SubscribeFirmStatus

10.4 Recovery Simulation in CDS (Test) environment

It's possible to test the System.ServiceMarketStatus messages receiption in the CDS (Test) environment every Tuesday. Two sessions are available, one starting at 10:00 (GMT) and one starting at 15:00 (GMT).

After the login to the system, the user should send a Subscribe.System.ServiceMarketStatus message for each service managed by his application, in order to receive the related status updates (as per highlighted in the table at section 10.1).

The crash simulation of the BCS components will be executed as follows:

GMT Time	Description
10:00 / 15:00	The component Report Manager crashes; one or more messages with status CONNECTION_CRASH and ServiceId=2200 are received.
10:05 / 15:05	The component Report Manager is restored; one or more messages with status CONNECTION_UP and ServiceId=2200 are received.
10:15 / 15:15	The component Realtime Gateway crashes; one or more messages with status CONNECTION_CRASH and ServiceId=2400 are received.
10:20 / 15:20	The component Realtime Gateway is restored; one or more messages with status CONNECTION_UP and ServiceId=2400 are received.
10:30 / 15:30	The component Transactional Gateway crashes; one or more messages with status CONNECTION_CRASH and ServiceId=2300 are received.
10:35 / 15:35	The component Transactional Gateway is restored; one or more messages with status CONNECTION_UP and ServiceId=2300 are received.
10:45 / 15:45	The component Clearing Data Manager crashes; one or more messages with status CONNECTION_CRASH and ServiceId=2100 are received.
10:50 / 15:50	The component Clearing Data Manager is restored; one or more messages with status CONNECTION_UP and ServiceId=2100 are received.
11:00 / 16:00	The component Risk Managment crashes; one or more messages with status CONNECTION_CRASH and ServiceId=2000 are received.
11:05 / 16:05	The component Risk Managment is restored; one or more messages with

GMT Time	Description
	status CONNECTION_UP and ServiceId=2000 are received.
11:15 / 16:15	The component Sola Gateway crashes; one or more messages with status CONNECTION_CRASH and ServiceId=2500 are received.
11:20 / 16:20	The component Risk Managment is restored; one or more messages with status CONNECTION_UP and ServiceId=2500 are received.

After every recovery simulation session, the system becomes available as per the usual schedule.

An additional Connection Crash on the Transactional Gateway component may be received during the recovery sessions. This is caused by CCG settlement procedures.

Please note that, in case a user sends more than a Subscribe.System.MarketStatus for the same ServiceId, it will receive a number of CONNECTION_CRASH and CONNECTION_UP messages equal to the number of Subscribe.System.ServiceMarketStatus active (accepted by the system).

For instance, i**f** a user has 3**x**Subscribe.System.ServiceMarketStatus active with ServiceId=2300, it **will receive** 3**xNotify.System.ServiceMarketStatus with** status **CONNECTION_CRASH** and ServiceId=2300 followed by 3**xNotify.System.ServiceMarketStatus with** status **CONNECTION_UP and ServiceId=2300**.

CONTACT

Client Support

T (toll free): 0080026772000

T (from mobile): +39 02 45411399

E: Client-Support@borsaitaliana.it

Customer Relationship Management

T: +39 02 72426 512

E: clients-services@borsaitaliana.it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