User's Guide for SqlitePass Database Components Version 0.32

Last Revision
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SqlitePass components provides a easy and fast access to sqlite databases

At the moment, it partially supports reading from / writing to databases created with :

The Kexi project
for Linux and Windows

The Sqlite Expert
for Windows

SQLite Administrator
Database manager for Windows

SQLITE4FPC

Sqlite4Fpc
Database component for FPC

This project is open source, released under LGPL license. Libraries and components are free and currently tested with Delphi 4 - Lazarus 0.9.24 – FPC 2.0.4. Let me know in you want to use those components with other Delphi versions.

User's Guide Summary

Packages Description

Content of SQLitePass_x.xx Directory

Demo program in /Demo

/Databases	Databases samples in Kexi or SqliteAdministrator format.
/Delphi4	Demo Project files for Delphi 4
/Lazarus	Demo Project files for Lazarus
/Sources	Source files for the demo project. • *.pas files are shared by Delphi and Lazarus projects • *.dfm files are used by Delphi • *.lfm files are used by Lazarus

Documentation in /Documentation

• /UserGuide.odt or UserGuide..pdf	The file you are reading...
• /Changes.odt or Changes.pdf	Latest changes – Versions history

Components Packages in /Packages

Packages/Delphi4

D4_SqlitePassDbo_Runtime.dpk	Runtime package. Shoul be compiled first (see the installation section)
D4_SqlitePassDbo_Designtime.dpk	Designtime package, used to : • Register and display components in Delphi IDE, • Register property editors in Delphi IDE.

Packages/Lazarus

Laz_SqlitePassDbo_Runtime.dpk	Runtime package. Shoul be compiled first (see the installation section)
Laz_SqlitePassDbo_Designtime.dpk	Designtime package, used to : • Register and display components in Lazarus IDE, • Register property editors in Lazarus IDE.

Components sources files in /Sources

/Sources : Components source files. Sources files are shared by Delphi and Lazarus

SqlitePassApi_v3.pas	Loads the external Sqlite engine library (sqlitepass3.dll or libsqlitepass3.so) and registers the sqlite functions to be used by the SqlitePass components.
SqlitePassDbo.inc	Include file used to define compiler settings...etc
SqlitePassDbo.pas	SqlitePass Database Objects interfaces definitions. Implementations are stored in SlitePassDatabase.inc, SqlitePassDatabaseParts.inc, SqlitePassDataset..inc, SqlitePassRecordset.inc, SqlitePassSelectStmt.inc.
SqlitePassDbo.lrs	Lazarus ressource file used to dipslay components icons in IDE.
SqlitePassEngine.pas	Implements a basic sql engine used to communicate with sqlite library. Mainly used by TsqlitePassDatabase
SqlitePassConst.pas	Constant definitions
SqlitePassErrorLang.pas	Ressource strings for language support. Backup this file and translate the strings in your own language . Replace the SqlitePassErrorLang.pas with your own file. Compile and overwrite any existing runtime package. (see installation section). Only English file is available so far. A French one will be done shortly. Translators are welcome !
SqlitePassKexiDef.pas	Kexi specific constants definitions
SqlitePassUtils.pas	Implements a TobjectList (The code is just a copy from FCL) and other objects, mainly to provide code compatibility between Delphi 4 and Lazarus.

- **/Sources/DesignTimeEditors : Dialogs boxes to help you during design process in IDE.**
- *.pas files are shared by Delphi and Lazarus projects
- *.dfm files are used by Delphi
- *.lfm and *.lrs files are used by Lazarus

RegisterSqlitePassDbo.pas	Registers and displays components and property editors in IDE
SqlitePassChooseDatasetDialog.pas	Used by TsqlitePassDataset.Dataset property. Displays an treeview of available dataset in the current database.
SqlitePassIndexesDialog.pas	Used by TsqlitepassDataset.Indexes property. Displays a dialog to manage tables indexes.
SqlitePassCustomFieldDefsDialog.pas	Used by TsqlitePassDatabase.DataTypeOptions.CustomFieldDefs property. Display a dialog to manage custom field definitions
SqlitePassFieldDefsDialog.pas	Used by TsqlitepassDataset.FieldDefsInfo property. Display a dialog showing field definitions of the currently selected dataset.
SqlitePassSortByDialog.pas	Used by TsqlitepassDataset.SortedBy property. Displays a dialog to select fields to be sorted .
SqlitePassDataTypesDialog.pas	Used by TsqlitePassDatabase.DataTypeOptions.TranslationRules property. Display a dialog to manage TranslationRules.
SqlitePassMasterDetailFieldsDialog.pas	Used by TsqlitepassDataset.MasterFields property. Displays a dialog to link Master and Detail fields.
SqlitePassDesignErrorLang.pas	Defines DesignTime error messages.
CreateNewIndex.pas	Used by the indexes dialog when creating new table index.
RenameItem.pas	Used by the indexes dialog when renaming a existing table index.

Packages Installation

- **Download the last stable SQLite library** from sqlite.org or use the file provided with the SqlitePass package (..\SQLitePass_x.xx\SqliteLibrary). Decompress and install on your system.
  This file (sqlite3.dll or sqlite3.so) should be placed in a system directory, ..\Windows\system32 for example.
  From version 0.28, SqlitePass uses a special Sqlite library version (sqlitepass3.dll or libsqlitepass3.so) as the default sqlite library (this library exports the following functions to get schema information from an sql statement :
  - *sqlite3_column_database_name*
  - *sqlite3_column_database_name16*
  - *sqlite3_column_table_name*
  - *sqlite3_column_table_name16*
  - *sqlite3_column_origin_name*
  - *sqlite3_column_origin_name16*
  - *sqlite3_table_column_metadata*

  The compiled win32 (sqlitepass3.dll) and the Linux-i386 (libsqlitepass3.so) versions of this library are included in ..\SQLitePass\SqliteLibrary. A tutorial on how to compile the library is available on the SqlitePass website.

- ***Delphi users*** *(Delphi 4)* ***:***

  - **Uninstall any previous version of SqlitePassDbo components :**
    Choose [Components] [Install Packages] from IDE menu.
    Select the SqlitePass package and click Remove.

  - **Compile Runtime package :**
    Choose [File] [Open] from the IDE menu and select ..\SQLitePass\Packages\Delphi4\D4_SqlitePassDbo_Runtime.dpk. Compile this package and move the resulting file from SQLitePass_vX.XX\Packages\Delphi4\D4_SqlitePassDbo_Runtime.bpl to a directory inluded in the Delphi search path (like ..\Delphi4\Bin or ..\Windows\system32 for example). Delete or overwrite any previous D4_SqlitePassDbo_Runtime.bpl.

  - **Compile and install Designtime package :**
    Choose [File] [Open] from the IDE menu and select ..\SQLitePass\Packages\Delphi4\D4_SqlitePassDbo_Designtime.dpk. Compile this package, then choose install.

  - **Check installation :**
    Select SqlitePassDbo on component palette pages and drop a SqlitePassDatabase and a SqlitePassDataset on a new form. Check the components versions are correct in object inspector.

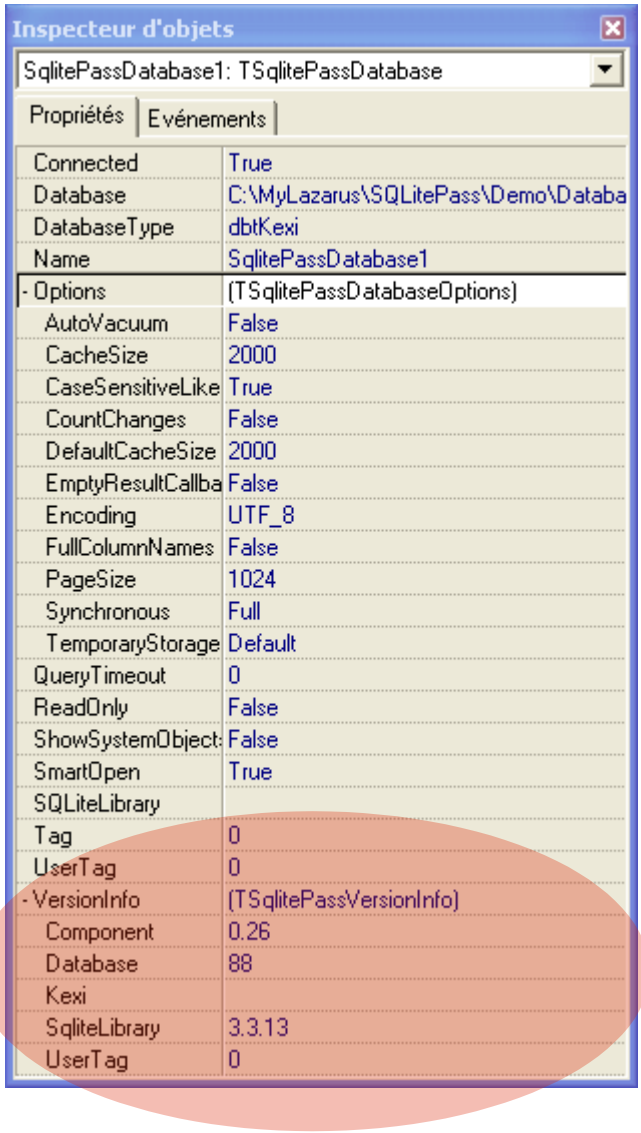
- ***Lazarus users** (>=0.9.20) **:***

  - **Uninstall any previous version of SqlitePassDbo components :**
    Choose [Components] [Configure Installed Packages] from IDE menu
    Select the Laz_SqlitePassDbo_Runtime and Laz_SqlitePassDbo_Designtime packages and click [Uninstall the selection] then [Save and quit the dialog].

  - **Compile Runtime package :**
    Choose [Components] [Open Package file] from IDE menu and select ..\SQLitePass\Packages\Lazarus\Laz_SqlitePassDbo_Runtime.lpk. Compile this package.

  - **Compile and install Designtime package :**
    Choose [File] [Open] from the IDE menu and select ..\SQLitePass\Packages\Lazarus\Laz_SqlitePassDbo_Designtime.lpk. In package dialog, Choose compile then install. This will rebuild the IDE.

  - **Check installation :**
    Select SqlitePassDbo on Component palette pages and drop a SqlitePassDatabase and a SqlitePassDataset on a new form. Check the components versions are correct in object inspector.



Quick Start

A demo application is available in ..\SQLitePass_x.xx\Demo\Sources. This application was first developped as a simple test program for the SqlitePass components. Du to many changes during developpement process and to avoid problems when changing properties behavior in IDE, the SqlitePassDatabase and SqlitePassDataset components are directly created by code at runtime.

This application tests also the designtime dialogs boxes used by the IDE Object Inspector. To do so, it links directly to *.pas | *.dfm | *.lfm files stored in ..\SQLitePass_x.xx\Sources\DesignTimeEditors directory.

The source code is (or will be) self documented and should cover the basic usage of the components.

Another way is to describe a simple application using SqlitePass component.

It could look like this :

1. Place a SqlitePassDatabase component on a form,
2. Choose Database file the Database property (a database *.kexi file from ..\SQLitePass_x.xx\Demo\Databases for example),
3. Set Connected property to True,
4. Place a SqlitePassDataset component on the form
5. Set Database property to the name of SqlitePassDatabase component (by default this is SqlitePassDatabase1),
6. Select a dataset from the DatasetName property dialog editor,
7. Set Active property to True.
8. Place a standart Delphi or Lazarus DataSource component on the page,
9. Set DataSet property to the name of the SqlitePassDataset component (by default this is SqlitePassDataset1)
10. Place any DBAware component like DBGrid, DBNavigator...etc, on the form.
11. Set DBGrid's, DBNavigator...etc, DataSource property to the name of DataSource component (by default this is DataSource1)
12. This is it !

The TSqlitePassDatabase component

The TsqlitePassDatabase component is the main link between your application and the sqlite library.
It currently supports sqlite engine version 3.xx

PROPERTIES

- AttachDatabase
- Close
- Compact
- Connected
- Database
- Databases
- DatabaseType
- Datasets
- DatatypeOptions
- DetachDatabase
- Engine
- IndexDefs
- IsSystemTable
- Open
- Options
- QueryDefs
- QueryTimeout
- ReadOnly
- RefreshDefinitions
- ShowSystemObjects
- SmartOpen
- SQLiteLibrary
- TableDefs
- Transaction
- Translator
- Triggers
- UserTag
- VersionInfo
- Views

EVENTS

- OnAfterConnect
- OnAfterDisconnect
- OnBeforeConnect
- OnBeforeDisconnect
- OnDataTypeConversion

How to select a database

Property Database: String
Represents the physical database file you want to connect. At design time, shows up a file selection dialog box.

Opening and closing a database

Property Connected: Boolean
Set this property to True to connect the database defined in the database property.
Set it to False to disconnect the database and all the datasets associated with it.
You can also verify if a database is connected using :

```
if MyDatabase.Connected
  then...
```

Property Open
Same as Connected := True

Property Close
Same as Connected := False

How to use an alternative sqlite library

Property SqliteLibrary: String
Represents an alternative library file to be used instead of the default one.
By default, sqlitepassDatabase tries to use the sqlitepass3.dll or libsqlitepass3.so file located in the system path directory (..\windows\system32\ or ..\user\lib for example).
Enter a complete library file path to use a different library.
From version 0.28 TsqlitePassDatabase needs the sqlite library compiled with the ENABLE_METADATA precompiler directive. These libraries are available from http://source.online.free.fr or you can compile your own following the tutorial available on the same internet site.

Property DatabaseType: String
Represents the database type detected from the database file extension you are using. (*.kexi for kei database for example).
Once the database type is recognised, the TsqlitePassDatabase component sets this property and creates an internal translator to take care of the database specifications.
You can also define this property by yourself if the file extension doesn't match the correct database type.

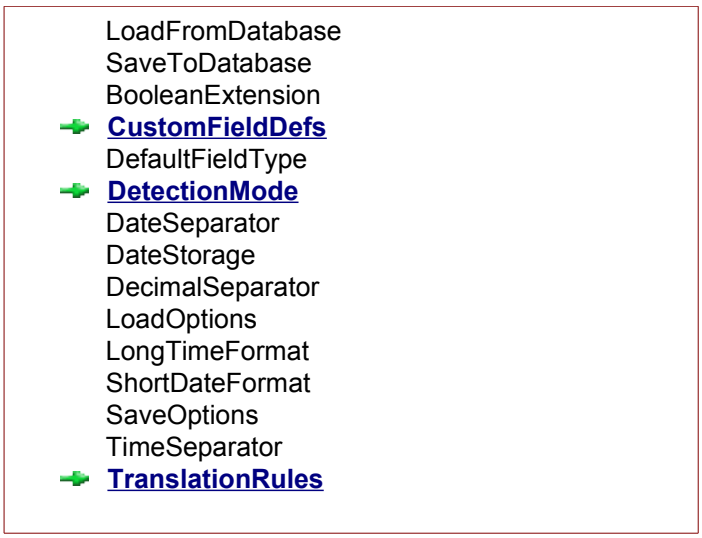
Working with fields.datatypes

One of the main difficulties when working with Sqlite databases is to detect and translate properly the fields.datatypes since sqlite datatype are not formely defined.

SqlitePass implements several ways to define a datatype

The **Database.DatatypeOptions** property gives you the opportunity to set custom or default behaviors for a given database and lets you also define how fields.datatype will be retrieved and translated into pascal datatypes using **TranslationRules** and **CustomFieldDefs** .

Database.DatatypeOptions Properties
ApplyCustomFieldDefs SetDefaultValues



Property DetectionMode: TsqlitePassDataTypeDetectionMode;
TSqlitePassDataTypeDetectionMode = (dmTypeName, dmDbSpecific, dmCustom, dmCustomFieldDefs, dmForceStr, dmNone);

The DetectionMode controls how the TsqlitePassDatabase component will behave when it tries to retrieve the database fields definition.
It can have on of the following values :

dmTypeName
FieldTypes are retrieved from the initial SQL CREATE statement of the table for example : 'CREATE TABLE cars_names (id INTEGER PRIMARY KEY, companycode Integer, name Text(200))'
Then the database uses the TranslationRules (a collection of translation Rule) to match the datatypes names found in the database table, for example 'integer' with a pascal datatype (ftInteger in this example).

dmDbSpecific
Field.datatypes are set directly by sqlitepass, depending on the Database.Databasetype value.
Note : This can only be used with the 'dbtKexi' Databasetype.

dmCustom
Field.datatypes are first preset directly by sqlitepass, depending on the Database.Databasetype value.
If the first match fails, it uses the TranslationRules if you defined some
Finally, it fires the OnDataTypeConversion event letting you modified directly the Field.Datatype Of course, the OnDataTypeConversion Event must be assigned...

dmForceStr
Converts any Datatype to ftString;

Property TranslationRules: TSqlitePassFieldTypesTranslationRules;

A collection of translation rules.
TranslationRules are stored in *.DFM or *.LFM file but can also be stored directly in the database

A translation rule is made of :

- A datatype name (whatever you want depending on how fields datatypes are named inside the database or the table create statement)
- A matching rule (mmExact, mmExactNoCase, mmPartial, mmPartialNoCase, mmAll);
- A resulting datatype (ft... pascal fieldtype)

The matching rule can be set for each translation rule and can be one of the following values:

mmExact
the datatype found in the database table definition must match exactly the rule datatype name. It is case sensitive.
For example if the 'Int' name is found in the database table definition then it will not match the ('Integer',mmExact,ftInteger) rule thus ftUnknown will be returned

mmExactNoCase
Same as mmExact but not case sensitive

mmPartial
the datatype found in the database table definition can partially match the rule datatype name. It is case sensitive.
For example if the 'Int' name is found in the database table definition then it will match the ('Integer',mmExact,ftInteger) rule and will return ftInteger

mmPartialNoCase
Same as mmPartial but not case sensitive

mmAll (Default)
Tries to determine the datatype using mmExact.
If it fails then another try is done using mmPartial

If the matching rule failed, the DefaultFieldType is returned (ftUnknown as default).
At design time, a specific editor lets you define the translation rules.

Property CustomFieldDefs: TSqlitePassCustomFieldDefs;
A collection of custom fielddefs.
A custom fielddef can be used to overwrite the fielddefs translation already done by the DetectionMode and the TranslationRules properties.

A custom fielddef is made of :

- A TableName and a FieldName to identify the field
- A FieldType: TfieldType (ftinteger, ftstring...etc)
- A FieldSize
- A FieldPrecision

This property can be very usefull when a fielddef cannot be built on the datatype. For example, two BLOB fields in a table can store text or graphic data but are declared with the same datatype in the table create statement.

At design time, a specific editor lets you define the translation rules.

How to use Transactions

Property Transaction: TSqlitePassTransaction
Sqlite engine supports only one active transaction at the same time. In other words, you can't use nested transactions. The TSqlitePassTransaction object will automatically handle this, so any attempt to start a transaction while one is running will have no effect.

Transactions are really helpfull to speed up and secure data operations. You should use them as often as you can.
If no transaction is active, the TSqlitePassDatabase will always try to start a new transaction before writing to the database and commit it. This could be time consuming if you need to update or add many records at the same time and you should proceed like this :

```
Database.Transaction.Start;
...
Your code here to update or create records;
...
Database.Transaction.Commit;
```

Procedure Start
Starts a new transaction unless one is already started.

Procedure Commit
Ends the transaction and write data to the database.

Procedure Rollback
Ends the transaction and discards any change made to the database.

How to work with foreign databases

Procedure AttachDatabase: String;
Enables to attach one or several foreign databases to the current one. The attached databases must be compatible with the current one (the databases must have been created with the same database manager application). Once a database is attached, its content becomes available as part of the current database. Then you can access to tables, queries... as if they were part of the main database.
Usage : AttachDatabase(DatabasePath: String);

Procedure DetachDatabase
Detaches a previously attached database.

Others properties (to be documented...)

Property Options: TSqlitePassDatabaseOptions
Represents the database optional settings.

Property TableDefs: TSqlitePassTableDefs
The TableDefs property is a collection that gives you access to the tables definitons stored in the database.

Property QueryDefs: TSqlitePassQueryDefs
The QueryDefs property is a collection that gives you access to the queries definitons stored in the database.

Property IndexDefs: TSqlitePassIndexDefs
The IndexDefs property is a collection that gives you access to the indexes definitons stored in the database.

Property ViewDefs: TSqlitePassViewDefs
The ViewDefs property is a collection that gives you access to the views definitons stored in the database.

Property TriggerDefs: TSqlitePassTriggerDefs
The TriggerDefs property is a collection that gives you access to the Triggers definitons stored in the database.

The TSqlitePassDataset component

The TSqlitePassDataset is a link between your application and the database content.
TSqlitePassDataset enables you to access tables, queries or even to create direct SQL queries to read and write data from/to your database.

Property Active
Classic dataset behavior.
When set to True, opens the dataset and displays data if dataware components are linked to the datasource.
When set to False, closes the dataset and frees the memory used to store dataset records.

Property Datasource
Classic dataset behavior.

Property DatabaseAutoActivate
When set to True, opens automatically the database if needed.

Property Database
Selects the TsqlitePassDatabase component you want
to depend on.

Property DatasetName: String;
Once you are connected to a database, enters a table name or a query name. At design time, a dialog will let you choose your dataset among all the available database datasets.

Property DatasetType
This property is only read. It gives you information about the currently selected dataset and can be one of the following values :

dtUnkown : The dataset type could not be recognized or the DatasetName property is empty.
dtTable : The dataset is a table.
dtQuery : The dataset is a query.
dtView : The dataset is a view.
dtSqlDirect : The SQL property has been modified or you entered a new SQL query. When the SQL text is changed, the DatasetName will automatically be set to '' assuming that the DatasetName and SQL text don't match anymore.

Property SmartOpen: Boolean;
When set to True, the TsqlitePassDataset will automatically take care of opening the database connection if the database is not connected. Set it to False to manually control the database connection.

Property SQL
Represents the SQL statement used to retrieve data from the database.
For tables, it will automatically be set to :
SELECT * FROM TableName; if all fields need to be retrieved from the table.

Or to
SELECT field1, field2... FROM TableName; if only some fields need to be retrieved from the table.

For queries, it will reflect the query SQL statement.

You can also directly write your own SQL statement to fit your needs or to interact directly with the database. In this case, the datasetname propery will be set to '' (empty) and the datasetType will be set to dtDirectSql.

Property IndexDefs
The IndexDefs property gives you access to the indexes definitions for the selected table. Indexes are only available if the DatasetType is a 'dtTable' type.

Property MasterSource: TDatasource
Classic table MasterSource behavior.

Property MasterFields: String
Classic table MasterFields behavior. At design time, a dialog will let you create or modify the relation between MasterFields and DetailFields.
A relation is defined like this : MasterFieldName=DetailFieldName
If you want set several relations, they must be separated by a ';'
MasterFieldName1=DetailFieldName1;MasterFieldName2=DetailFieldName2

Property Filter: String;
Classic dataset filter behavior. The filter property takes a SQL WHERE clause but without the WHERE word at the begining. You can also use wildcard characters as discribed in the Sqlite help.

Example : country = 'France'
customer like '%cur%'

Property Filtered: Boolean;
Determines whether or not the different filters are activated. The TsqlitePassDataset component can handle three filter levels that will be applied in this priority order :

1 : MasterFields/DetailFields property
2 : Filter property
3 : RecordLowerLimit/RecordUpperLimit properties

Property FilterRecordLowerLimit: Integer;
This is a range filter. If greater than 1, the -nth first records will not be retrieved. In other words, if FilterLowerLimit = 4, the fifth record will be the first one retrieved from the query.

Property FilterRecordUpperLimit: Integer;
This is a range filter.
If greater than 1, the -nth first records will be retrieved. In other words, if FilterUpperLimit = 4 and FilterLowerLimit = 0 then only the four first records will be retrieved from the query.
If lesser than 0, the -nth last records will be retrieved. In other words, if FilterUpperLimit = -9 and FilterLowerLimit = 0 then only the nine last records will be retrieved from the query.

Property SortedBy: String;
The SortedBy property takes a SQL ORDERBY clause but without the 'ORDER BY' expression at the begining. At design time, a dialog will let you create or modify the sort order.
Example : 'car_names ASC, car_types DESC'.

Property Sorted: Boolean;
Determines whether or not the sortedBy property is activated.

Roadmap for version 0.33

The following methods should be available from the 0.31 release

- Find
- FindNext
- FindPrevious
- FindFirst
- FindLast
- Locate
- Lookup
- LookupFields

Find
The internal implementation could work as a subset of the original query by adding the searchFields and values to the WHERE clause of the original query.
Then it could scroll the subset with FindFirst, FindPrevious...
If we need to locate the record in the original subset, we retrieve the subset record primary key and then scan the original query result until we find the matching primary key.
The way we scan the original subset will depend on the sort order.
If the primary key is ordered we could use a dichotomic search to speed up operation..., otherwise a classic loop could be used.

TODO
Enable to bind variables values in a filter expression.