Revision 05/2020

Siemens S7-1200/1500

TIA Portal (V13, V14, V15, V16)

MS SQL Functionality

Implementation into user project

PDSql Library v1.3.8

User guide

www.plcdirectsql.com

Contents

1 Introduction

PDSql Library allows you to connect your PLC Siemens S7-1200 or S7-1500 system directly to **Microsoft SQL Database**. With this library you are able to read and write data from/to SQL Database. As the communication between the PLC and the SQL Server takes place directly you don't need any PC as a broker in the communication between the PLC and SQL server.

1.1 Hardware requirements

PDSql library was built for **PLC Siemens S7-1200** (**fw 4.2**+) and **S7-1500 (fw 1.8**+).

1.2 Software requirements

Main requirements for this library is **TIA Portal V13+** and **Microsoft SQL Server (2000 or higher)**.

TIA Portal V13+ is available only with paid licence. Microsoft SQL Server 2017 is available as free Express Edition version with some limitations.

You can download it here: https://www.microsoft.com/en-us/sql-server/sql-server-editions-express

1.3 Supported SQL functions

This library allows you to execute all the basic SQL commands like

- SELECT
- INSERT
- DELETE
- UPDATE
- Execute Stored PROCEDURE

However, in addition to this basic SQL commands, **other commands can be also executed** depending on string content in query input. However, with some commands of this type, the query may end up with an error.

1.4 Supported SQL data types

Supported are only datatypes listed in the Table 1-1. Any other datatype that is not listed in Table 1.1 will either convert its value to a string or cause the query to quit with an error.

Table 1-1: SQL data types

Datatype		S7-1200	S7-1500
SQL	PLC		
bit	Bool	●	●
nchar(n)	String([1])	●	●
char(n)	String([1])	●	●
nvarchar(n)	String([1])	●	●
varchar(n)	String([1])	●	●
tinyint	DInt/LInt	● [2]	● [3]
smallint	DInt/LInt	● [2]	● [3]
int	DInt/LInt	● [2]	● [3]
bigint	LInt		●
float	LReal	●	●
real	LReal	●	●
datetime	DTL	●	●
smalldatetime	DTL	●	●
date	DTL	●	●
numeric	LReal	● [4]	● [5]
decimal	LReal	● [4]	● [5]
money	LReal		●
smallmoney	LReal	●	●

[1] The maximum length of string is defined in ***tSqlTable.MaxStringLength*** variable. By default the value is 50.
* If the string length of the SQL data type is greater than the string length in the PLC, so the rest of the text will be cut off.

[2] PLC data type DInt

[3] PLC data type LInt

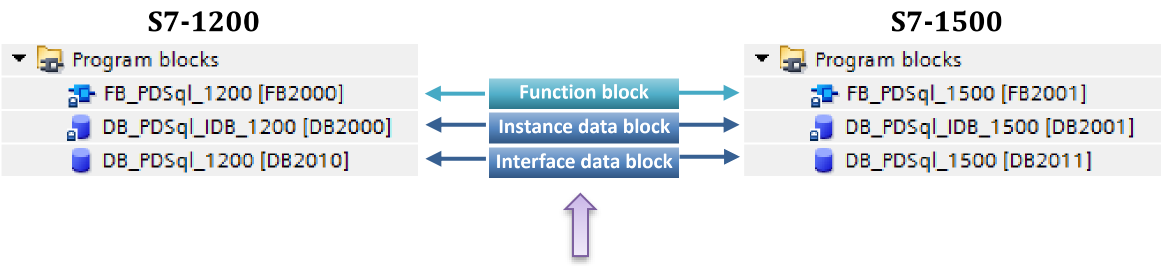
[4] Supported 32-bit value

[5] Supported 64-bit value

1.5 Program blocks

1.5.1 Function block FB_PDSql

The whole concept of this library was built on the ease of implementation into user projects. Therefore, all functions for communication with **MS SQL Server** are contained in only one function block **FB_PDSql**. This block is also associated with one instance of the data block **DB_PDSql_IDB**. The last one is the data block **DB_PDSql** which provides all parameters and the interface between the user application and the **PDSql library**. It contains the resulting SQL table obtained after SELECT command. These blocks are supplied in **2 versions** for **S7-1200** and **S7-1500**.



The only 3 program blocks you need to add
to your project to implementation of MS SQL functionality

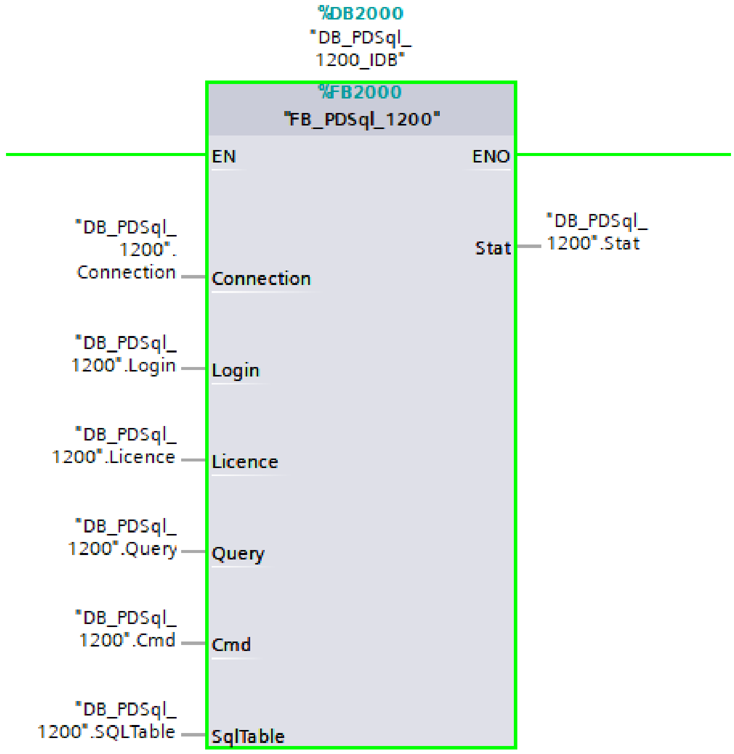


Table 1-2 : **FB_PDSql** interface

Type	Name	Data type	Comment
Input	Connection	tConnection	SQL server connection parameters
	Login	tLogin	Login parameters
	Licence	tLicence	Runtime license key
	Query	tQuery	SQL query string
Output	Stat	tStat	Status bits, messages and errors
InOut	Cmd	tCmd	Commands **Connect**, **Disconnect**, **ExecuteQuery**
	SqlTable	tSqlTable (1200/1500)	SQL parameters and table contents as a result of the SELECT statement

Recommended steps for executing SQL commands from a user application

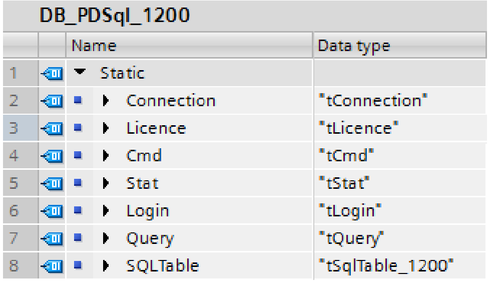
1. Create a string of SQL statements and write it to ***Query***
2. Set the ***Cmd.ExecuteQuery*** signal to **TRUE**
3. Wait for signal ***Stat.ExecutedOK*** or ***Stat.Error***
4. If the ***Stat.Error*** signal is **TRUE**, repeat the action from step 1.
   If the ***Stat.ExecutedOK*** signal is **TRUE,** application can continue to prepare another SQL statement and repeat from step 1.

The user application can fully control the ***Cmd.Connect*** or ***Cmd.Disconnect*** signals, but it is sufficient to control only ***Cmd.ExecuteQuery*** signal which ensure the connection automatically if needed.

1.5.2 Data block DB_PDSql

Data block **DB_PDSql** is composed of all the data types described in chapter 1.6. All communication between the user application and the SQL server is done through this data block.

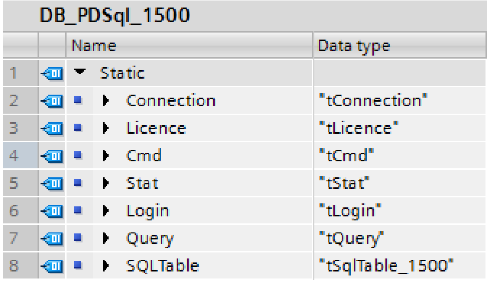
S7-1200



DB_PDSql_1200

	Name	Data type
1	Static	
2	Connection	"tConnection"
3	Licence	"tLicence"
4	Cmd	"tCmd"
5	Stat	"tStat"
6	Login	"tLogin"
7	Query	"tQuery"
8	SQLTable	"tSqlTable_1200"

S7-1500



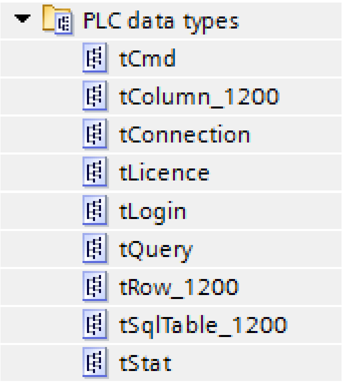
DB_PDSql_1500

	Name	Data type
1	Static	
2	Connection	"tConnection"
3	Licence	"tLicence"
4	Cmd	"tCmd"
5	Stat	"tStat"
6	Login	"tLogin"
7	Query	"tQuery"
8	SQLTable	"tSqlTable_1500"

1.6 PLC data types

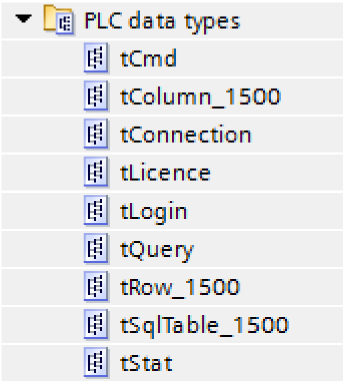
Function block **FB_PDSql** and data block **DB_PDSql** uses several custom PLC data types to communicate with user application. The following is a list and description of these data types used in the library for **S7-1200** and **S7-1500**.

S7-1200



- PLC data types
  - tCmd
  - tColumn_1200
  - tConnection
  - tLicence
  - tLogin
  - tQuery
  - tRow_1200
  - tSqlTable_1200
  - tStat

S7-1500



- PLC data types
  - tCmd
  - tColumn_1500
  - tConnection
  - tLicence
  - tLogin
  - tQuery
  - tRow_1500
  - tSqlTable_1500
  - tStat

1.6.1 tConnection

This data type provides path parameters to connect to SQL Server.

Name	Data type	Default value	Comment
IP1	USInt	192	Octet 1 of the SQL Server's IP address
IP2	USInt	168	Octet 2 of the SQL Server's IP address
IP3	USInt	1	Octet 3 of the SQL Server's IP address
IP4	USInt	1	Octet 4 of the SQL Server's IP address
Port	UDInt	1433	Remote port of the SQL Server. MS SQL default is 1433.
ConnID	CONN_OUC	1	Reference to this connection. The parameter uniquely identifies a connection within the PLC.
HW	HW_INTERFACE	64	Hardware ethernet interface of the PLC used to the communication. X1(64), X2(72)
Timeout	Time	T#2s	Maximum time allowed to wait for connect, disconnect and execute query command. After this time elapsed, the error status is triggered.

1.6.2 tCmd

This data type provides command triggers to the Function block.

Name	Data type	Default value	Comment
Connect [1]	Bool	False	Trigger to connect to SQL server
Disconnect [1]	Bool	False	Trigger to disconnect from SQL server
ExecuteQuery [1]	Bool	False	Trigger to execute SQL query. If the SQL server has not been connected before activating this signal, the connection process will start automatically and then the SQL command will be executed after a successful connection to the sql server. **So the user application control can use only this one trigger signal to connect and execute commands automatically.**

[1] The bit signal is active in TRUE and triggered on the rising edge. Function block always resets this bit.

1.6.3 tLogin

This data type provides login parameters to the SQL Server.

Name	Data type	Default value	Comment
HostName	String	''	Freely definable name (can be empty string)
UserName	String	''	The user name of SQL Server account
Password	String	''	The password of SQL Server account
Database	String	''	The name of database

1.6.4 tStat

This data type provides status signals from the Function block.

Name	Data type	Default value	Comment
Connected	Bool	False	TRUE when logged to SQL server successfully
Busy	Bool	False	TRUE during execution of SQL statement
ExecutedOK	Bool	False	TRUE when SQL statement was executed successfully
Error	Bool	False	TRUE when SQL statement ended with an error
Status	Word	W#16#0000	Info or error code
Message	String	''	Info or error message after the last SQL command executed

1.6.5 tLicense

This data type provides runtime license key.

Name	Data type	Default value	Comment
LicKey1	DWord	16#00	License Key part 1
LicKey2	DWord	16#00	License Key part 2
LicKey3	DWord	16#00	License Key part 3
LicKey4	DWord	16#00	License Key part 4
LicKey5	DWord	16#00	License Key part 5

1.6.6 tQuery

This data type provides SQL query string.

Name	Data type	Default value	Comment
Query	Array[1..2] of String	''	Array of SQL Query

1.6.7 tRow_1200

This data type provides row data for sql table result (S7-1200 version).

Name	Data type	Default value	Comment
Bool	Bool	False	Bool value
Null	Bool	False	NULL value
DInt	DInt	0	DInt value
LReal	LReal	0.0	LReal value
String	String[50]	''	String value
Datetime	DTL	DTL#1970-01-01-00:00:00	Datetime value

1.6.8 tRow_1500

This data type provides row data for sql table result (S7-1500 version).

Name	Data type	Default value	Comment
Bool	Bool	False	Bool value
Null	Bool	False	NULL value
LInt	LInt	0	LInt value
LReal	LReal	0.0	LReal value
String	String[50]	''	String value
Datetime	DTL	DTL#1970-01-01-00:00:00	Datetime value

1.6.9 tColumn_1200

This data type provides column data for sql table result (S7-1200 version).

Name	Data type	Default value	Comment
Name	String	''	Column's name
UserType	Byte	16#0	Column's user type
Type	Byte	16#0	Column's data type
LenSize	Byte	16#0	Column's length
TypeNumericPrecision	Byte	16#0	Precision factor in case of numeric or decimal data type
TypeNumericScale	Byte	16#0	Scale factor in case of numeric or decimal data type
Nullable	Bool	FALSE	Is Nullable
CaseSens	Bool	FALSE	Is Case Sensitive
Identity	Bool	FALSE	Is Identity type
Computed	Bool	FALSE	
FixedLenCLRType	Bool	FALSE	Internal use
UsUpdateable	Byte	16#0	0 – ReadOnly, 1 – Read/Write
Rows	Array[1..10] of "tRow_1200"		Array of rows

1.6.10 tColumn_1500

This data type provides column data for sql table result (S7-1500 version).

Name	Data type	Default value	Comment
Name	String	''	Column's name
UserType	Byte	16#0	Column's user type
Type	Byte	16#0	Column's data type
LenSize	Byte	16#0	Column's length
TypeNumericPrecision	Byte	16#0	Precision factor in case of numeric or decimal data type
TypeNumericScale	Byte	16#0	Scale factor in case of numeric or decimal data type
Nullable	Bool	FALSE	Is Nullable
CaseSens	Bool	FALSE	Is Case Sensitive
Identity	Bool	FALSE	Is Identity type
Computed	Bool	FALSE	
FixedLenCLRType	Bool	FALSE	Internal use
UsUpdateable	Byte	16#0	0 – ReadOnly, 1 – Read/Write
Rows	Array[1..10] of "tRow_1500"		Array of rows

1.6.11 tSqlTable_1200

This data type provides main parameters and sql table result (S7-1200 version).

Name	Data type	Default value	Comment
ColumnCount	UInt	0	The number of readed columns
RowCount	UInt	0	The number of readed rows
MaxColumns ⚠	UInt	10	Maximum allowed number of columns. The value must be less than or equal to ***tSqlTable.Columns*** array size
MaxRows ⚠	UInt	10	Maximum allowed number of rows. The value must be less than or equal to ***tColumn.Rows*** array size
MaxStringLength	USInt	50	Maximum number of characters in the string variable. Must be consistent with string length setting in ***tRow.String***
Columns	Array[1..10] of "tColumn_1200"		Array of columns

1.6.12 tSqlTable_1500

This data type provides main parameters and sql table result (S7-1500 version).

Name	Data type	Default value	Comment
ColumnCount	UInt	0	The number of readed columns
RowCount	UInt	0	The number of readed rows
MaxColumns ⚠	UInt	10	Maximum allowed number of columns. The value must be less than or equal to ***tSqlTable.Columns*** array size
MaxRows ⚠	UInt	10	Maximum allowed number of rows. The value must be less than or equal to ***tColumn.Rows*** array size
MaxStringLength	USInt	50	Maximum number of characters in the string variable. Must be consistent with string length setting in ***tRow.String***
Columns	Array[1..10] of "tColumn_1500"		Array of columns

⚠ The ***MaxColumns*** parameter must be less than equal to the array size of ***SqlTable.Columns*** and the ***MaxRows*** parameter must be less than equal to the array size of ***tColumn.Rows*** otherwise the PLC may go to STOP

1.7 Errors

Here is the list of errors written to the **tStat.Status** variable as output from the function block **FB_PDSql**. During the error code, a more detailed description of the error is written to the **tStat.Message.**

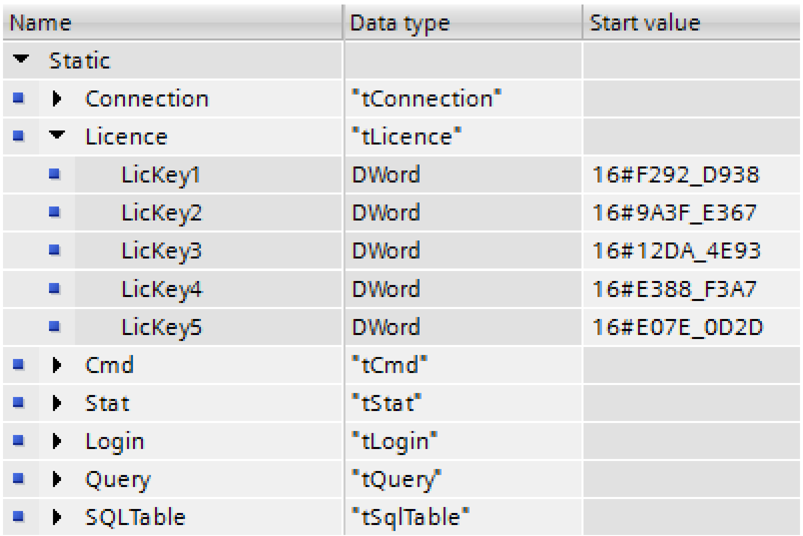
Table 1.3

Code	Error message	Tips
W#16#0000	No error	
W#16#8001	Cannot connect to the remote server	Check IP address and port
W#16#8002	Conection timeout	Check IP address and port
W#16#8003	Login failed	See details in tStat.Message
W#16#8004	Disconection timeout	Something is wrong with ethernet connection
W#16#8005	SQL Command execution timeout	SQL Server does not respond
W#16#8006	SQL Packet error	See details in tStat.Message
W#16#8007	SQL Command execution error	See details in tStat.Message
W#16#8080	Invalid license key	Check the license key

1.8 License / Demo

The license key is binded to the PLC serial number. After creating a license key with an online license tool on the webite **www.plcdirectsql.com**, these 5 license numbers need to be written to **LicKey1-5**. It is recommended to write them as the start value so that they remain written after the PLC restarts.

For the first **2 hours** after switching on the power supply of the PLC device, the library is **fully functional** even without a valid license key and works in **demo** mode.



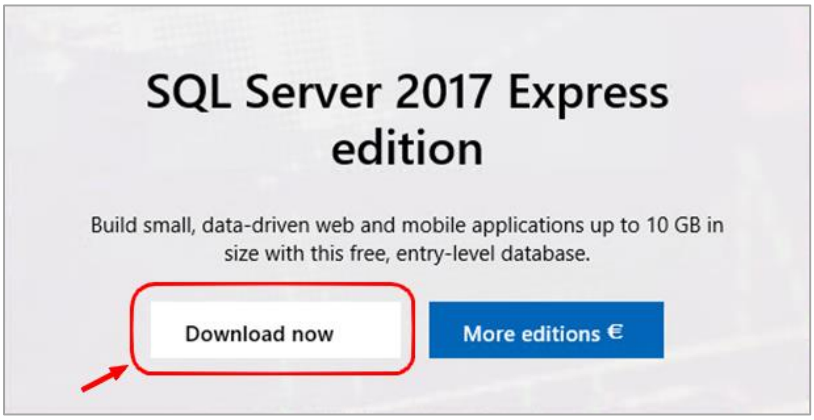
Name	Data type	Start value
▼ Static		
▶ Connection	"tConnection"	
▼ Licence	"tLicence"	
LicKey1	DWord	16#F292_D938
LicKey2	DWord	16#9A3F_E367
LicKey3	DWord	16#12DA_4E93
LicKey4	DWord	16#E388_F3A7
LicKey5	DWord	16#E07E_0D2D
▶ Cmd	"tCmd"	
▶ Stat	"tStat"	
▶ Login	"tLogin"	
▶ Query	"tQuery"	
▶ SQLTable	"tSqlTable"	

2 Installation

2.1 Microsoft SQL Server 2017

This chapter describes how to install Microsoft SQL Server 2017 Express Edition and set it up for communicating with the PDSql library. The link to download the instalation package is here -> https://www.microsoft.com/en-us/sql-server/sql-server-editions-express

1

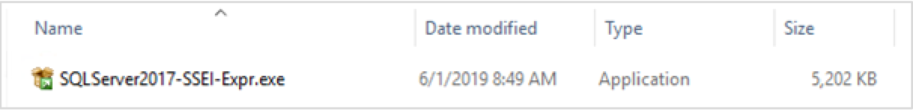


SQL Server 2017 Express edition

Build small, data-driven web and mobile applications up to 10 GB in size with this free, entry-level database.

Click on „**Download now**“

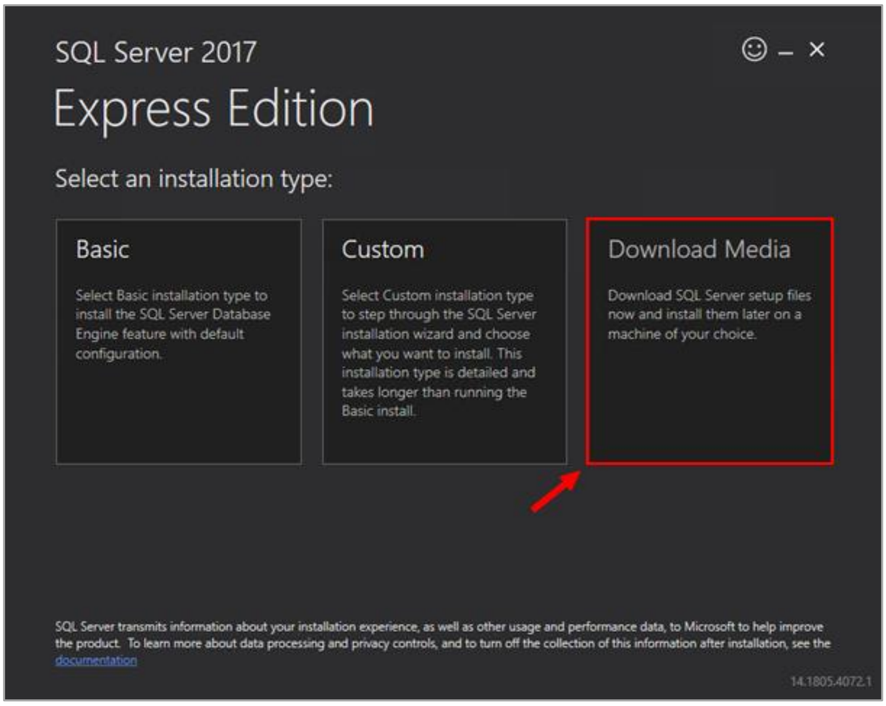
2



Name	Date modified	Type	Size
SQLServer2017-SSEI-Expr.exe	6/1/2019 8:49 AM	Application	5,202 KB

The **SQLServer2017-SSEI-Expr.exe** will be downloaded in your download directory. Run this file to continue.

3



SQL Server 2017

Express Edition

Select an installation type:

Basic

Select Basic installation type to install the SQL Server Database Engine feature with default configuration.

Custom

Select Custom installation type to step through the SQL Server installation wizard and choose what you want to install. This installation type is detailed and takes longer than running the Basic install.

Download Media

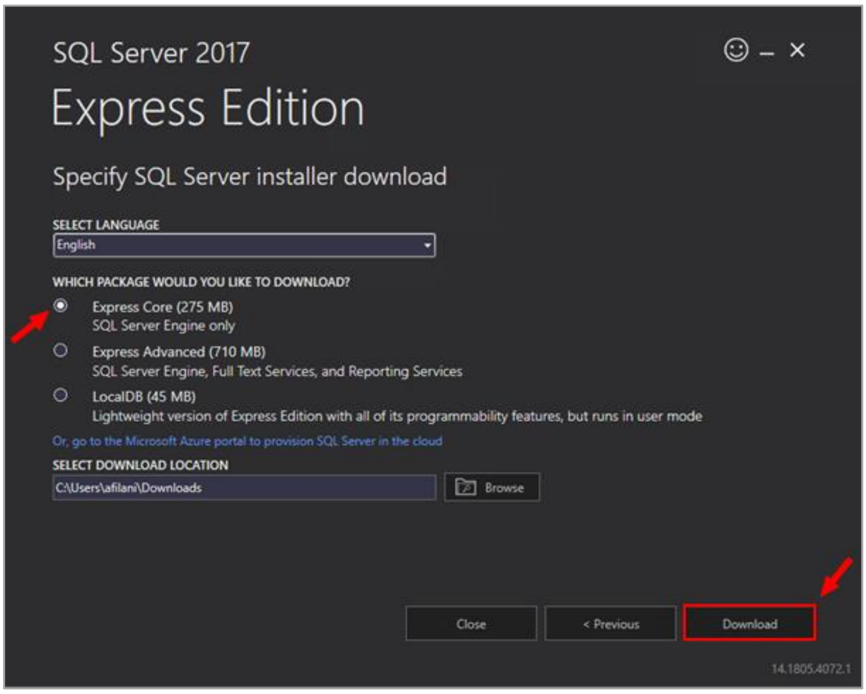
Download SQL Server setup files now and install them later on a machine of your choice.

SQL Server transmits information about your installation experience, as well as other usage and performance data, to Microsoft to help improve the product. To learn more about data processing and privacy controls, and to turn off the collection of this information after installation, see the documentation

14.1805.4072.1

Click on „**Download Media**“

4



SQL Server 2017

Express Edition

Specify SQL Server installer download

SELECT LANGUAGE: English

WHICH PACKAGE WOULD YOU LIKE TO DOWNLOAD?

● Express Core (275 MB)
SQL Server Engine only

○ Express Advanced (710 MB)
SQL Server Engine, Full Text Services, and Reporting Services

○ LocalDB (45 MB)
Lightweight version of Express Edition with all of its programmability features, but runs in user mode

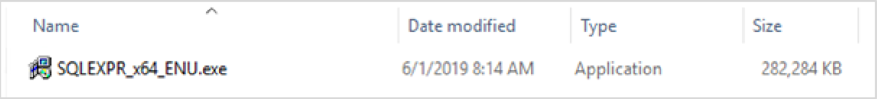
Or, go to the Microsoft Azure portal to provision SQL Server in the cloud

SELECT DOWNLOAD LOCATION: C:\Users\afilani\Downloads

14.1805.4072.1

Select „**Express Core**“ to install SQL Server Engine only and click on „**Download**“

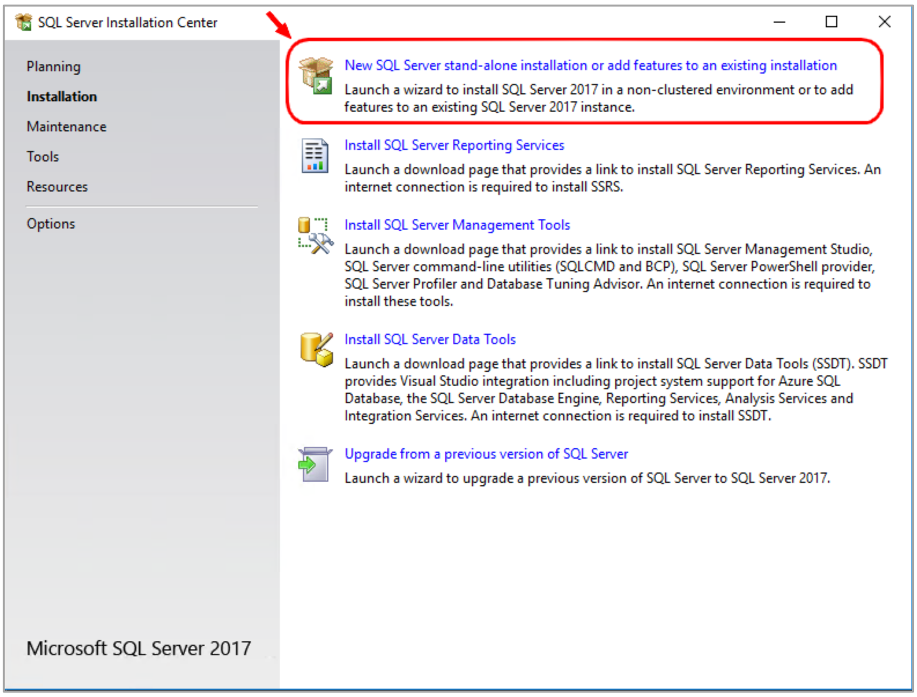
5



Name	Date modified	Type	Size
SQLEXPR_x64_ENU.exe	6/1/2019 8:14 AM	Application	282,284 KB

The **SQLEXPR_x64_ENU.exe** will be downloaded in your download directory. Run this file to continue.

6



SQL Server Installation Center

New SQL Server stand-alone installation or add features to an existing installation
Launch a wizard to install SQL Server 2017 in a non-clustered environment or to add features to an existing SQL Server 2017 instance.

Install SQL Server Reporting Services
Launch a download page that provides a link to install SQL Server Reporting Services. An internet connection is required to install SSRS.

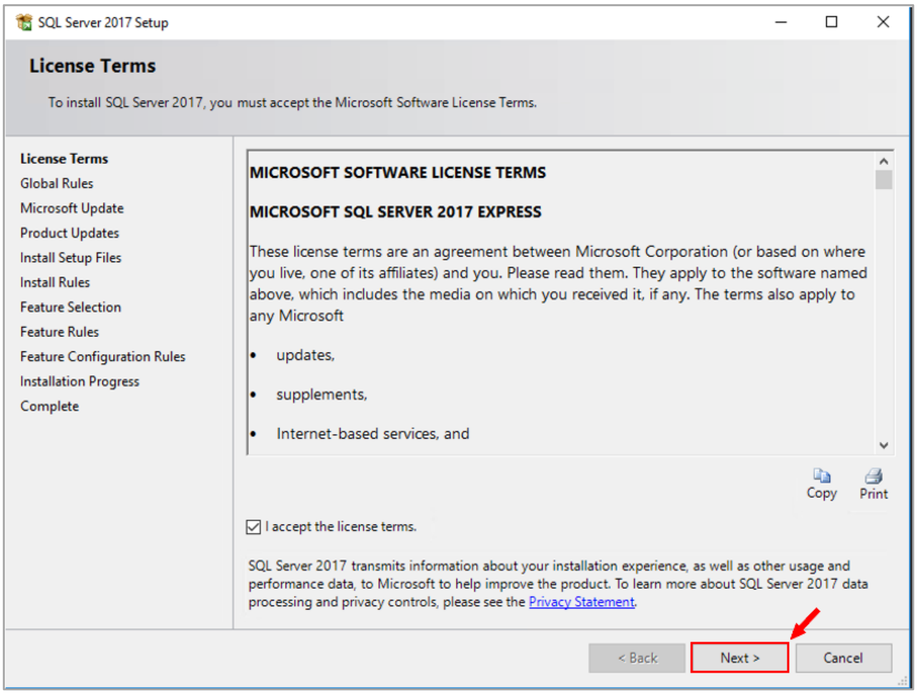
Install SQL Server Management Tools
Launch a download page that provides a link to install SQL Server Management Studio, SQL Server command-line utilities (SQLCMD and BCP), SQL Server PowerShell provider, SQL Server Profiler and Database Tuning Advisor. An internet connection is required to install these tools.

Install SQL Server Data Tools
Launch a download page that provides a link to install SQL Server Data Tools (SSDT). SSDT provides Visual Studio integration including project system support for Azure SQL Database, the SQL Server Database Engine, Reporting Services, Analysis Services and Integration Services. An internet connection is required to install SSDT.

Upgrade from a previous version of SQL Server
Launch a wizard to upgrade a previous version of SQL Server to SQL Server 2017.

Click on the link **„New SQL Server stand-alone instalation ....“**

7



SQL Server 2017 Setup

License Terms

To install SQL Server 2017, you must accept the Microsoft Software License Terms.

- **License Terms**
- Global Rules
- Microsoft Update
- Product Updates
- Install Setup Files
- Install Rules
- Feature Selection
- Feature Rules
- Feature Configuration Rules
- Installation Progress
- Complete

MICROSOFT SOFTWARE LICENSE TERMS

MICROSOFT SQL SERVER 2017 EXPRESS

These license terms are an agreement between Microsoft Corporation (or based on where you live, one of its affiliates) and you. Please read them. They apply to the software named above, which includes the media on which you received it, if any. The terms also apply to any Microsoft

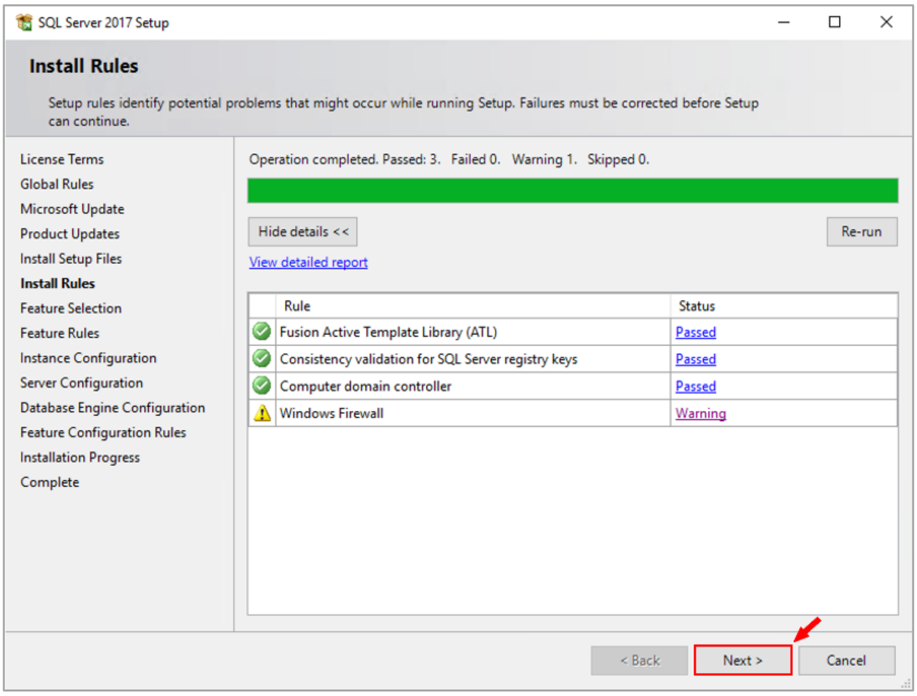
- updates,
- supplements,
- Internet-based services, and

☑ I accept the license terms.

SQL Server 2017 transmits information about your installation experience, as well as other usage and performance data, to Microsoft to help improve the product. To learn more about SQL Server 2017 data processing and privacy controls, please see the Privacy Statement.

Accept the license terms and click on „**Next**“

8



SQL Server 2017 Setup

Install Rules

Setup rules identify potential problems that might occur while running Setup. Failures must be corrected before Setup can continue.

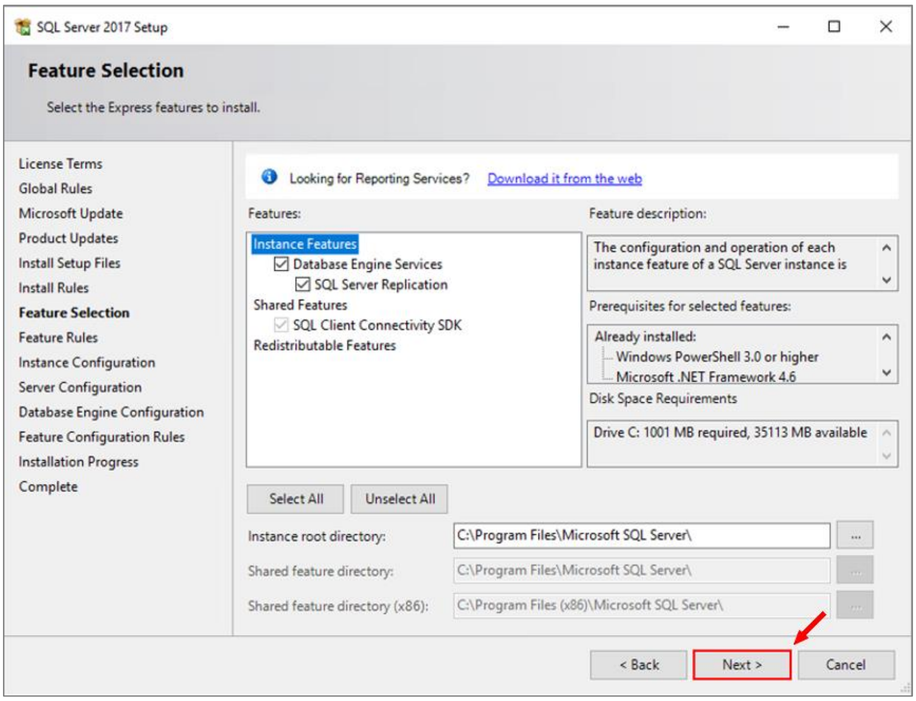
- License Terms
- Global Rules
- Microsoft Update
- Product Updates
- Install Setup Files
- **Install Rules**
- Feature Selection
- Feature Rules
- Instance Configuration
- Server Configuration
- Database Engine Configuration
- Feature Configuration Rules
- Installation Progress
- Complete

Operation completed. Passed: 3. Failed 0. Warning 1. Skipped 0.

	Rule	Status
✓	Fusion Active Template Library (ATL)	Passed
✓	Consistency validation for SQL Server registry keys	Passed
✓	Computer domain controller	Passed
⚠	Windows Firewall	Warning

Click on „**Next**“ (in this case, the Windows Firewall will be set later)

9



SQL Server 2017 Setup

Feature Selection

Select the Express features to install.

Looking for Reporting Services? Download it from the web

Features:

Instance Features
- ☑ Database Engine Services
  - ☑ SQL Server Replication

Shared Features
- ☑ SQL Client Connectivity SDK

Redistributable Features

Feature description:

The configuration and operation of each instance feature of a SQL Server instance is

Prerequisites for selected features:

Already installed:
- Windows PowerShell 3.0 or higher
- Microsoft .NET Framework 4.6

Disk Space Requirements

Drive C: 1001 MB required, 35113 MB available

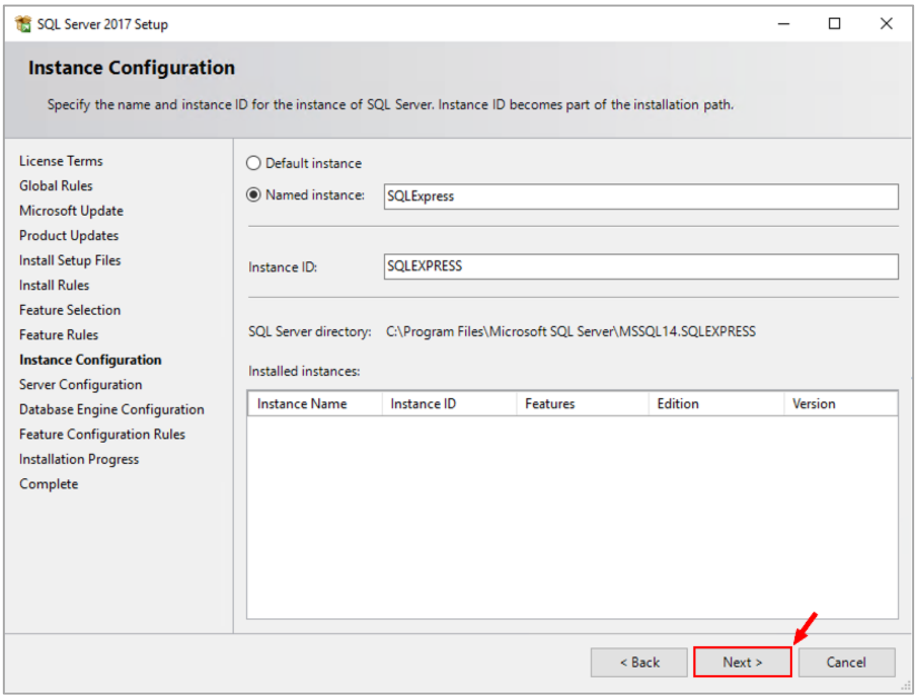
Instance root directory: C:\Program Files\Microsoft SQL Server\

Shared feature directory: C:\Program Files\Microsoft SQL Server\

Shared feature directory (x86): C:\Program Files (x86)\Microsoft SQL Server\

The minimum instance feature what we need to select is „**Database Engine Services**“ but usually all of this selection is chosen. Click on „**Next**“

10



SQL Server 2017 Setup

Instance Configuration

Specify the name and instance ID for the instance of SQL Server. Instance ID becomes part of the installation path.

○ Default instance

● Named instance: SQLExpress

Instance ID: SQLEXPRESS

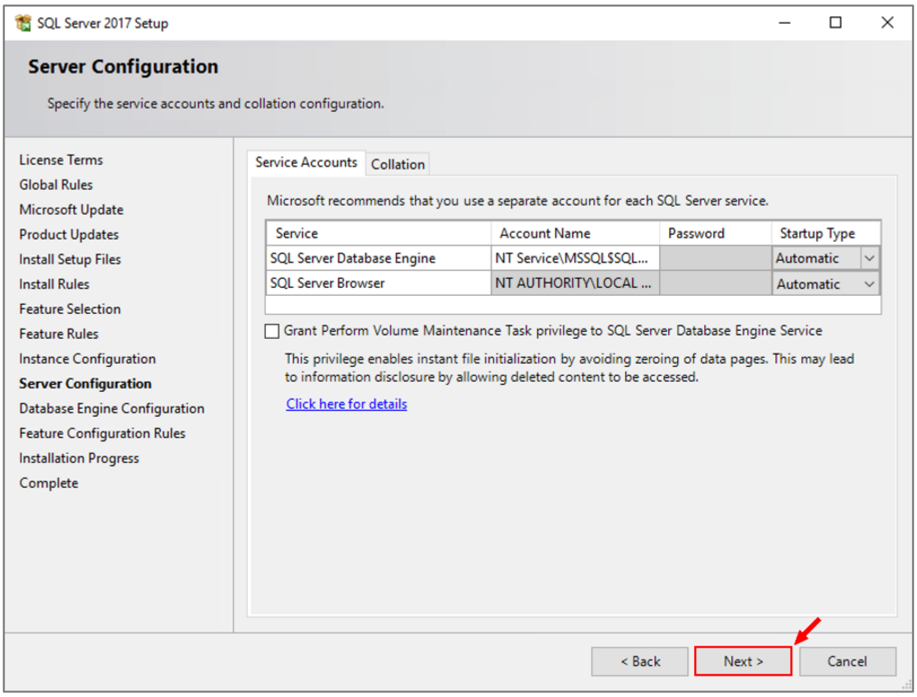
SQL Server directory: C:\Program Files\Microsoft SQL Server\MSSQL14.SQLEXPRESS

Installed instances:

Instance Name	Instance ID	Features	Edition	Version

Keep the name, or make your own name, or just select „Default instance“. Click on „**Next**“

11



SQL Server 2017 Setup

Server Configuration

Specify the service accounts and collation configuration.

Microsoft recommends that you use a separate account for each SQL Server service.

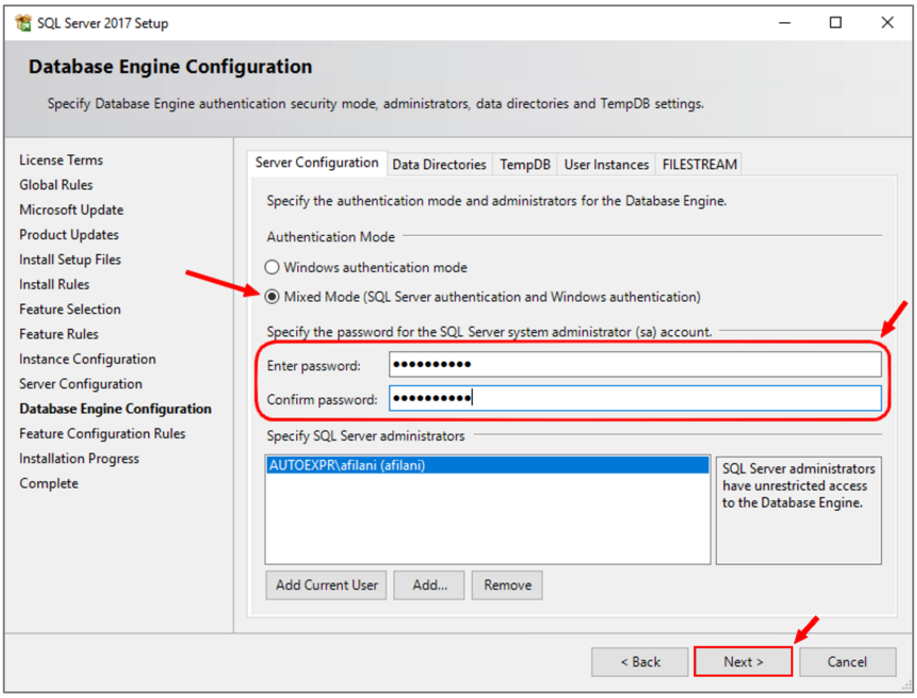
Service	Account Name	Password	Startup Type
SQL Server Database Engine	NT Service\MSSQL$SQL...		Automatic
SQL Server Browser	NT AUTHORITY\LOCAL ...		Automatic

□ Grant Perform Volume Maintenance Task privilege to SQL Server Database Engine Service

This privilege enables instant file initialization by avoiding zeroing of data pages. This may lead to information disclosure by allowing deleted content to be accessed.

Keep default settings, click on **„Next“**

12



SQL Server 2017 Setup

Database Engine Configuration

Specify Database Engine authentication security mode, administrators, data directories and TempDB settings.

Specify the authentication mode and administrators for the Database Engine.

Authentication Mode

○ Windows authentication mode

● Mixed Mode (SQL Server authentication and Windows authentication)

Specify the password for the SQL Server system administrator (sa) account.

Enter password: ••••••••••

Confirm password: ••••••••••

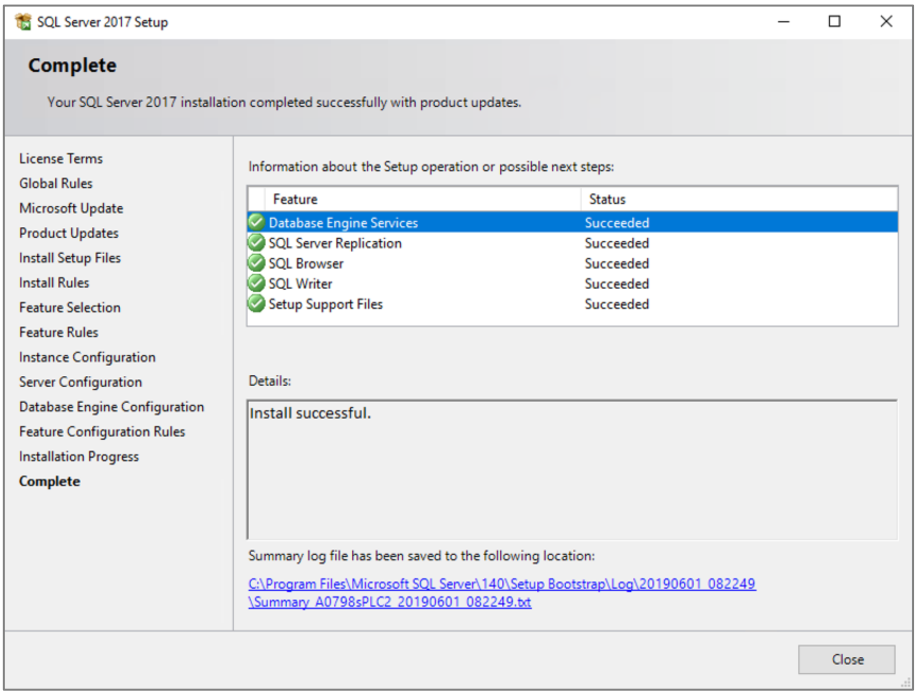
Specify SQL Server administrators

AUTOEXPR\afilani (afilani)

SQL Server administrators have unrestricted access to the Database Engine.

Select **„Mixed Mode“** and specify the password for administrator (**sa**) account, click on **„Next“**

13



SQL Server 2017 Setup

Complete

Your SQL Server 2017 installation completed successfully with product updates.

Information about the Setup operation or possible next steps:

Feature	Status
Database Engine Services	Succeeded
SQL Server Replication	Succeeded
SQL Browser	Succeeded
SQL Writer	Succeeded
Setup Support Files	Succeeded

Details:

Install successful.

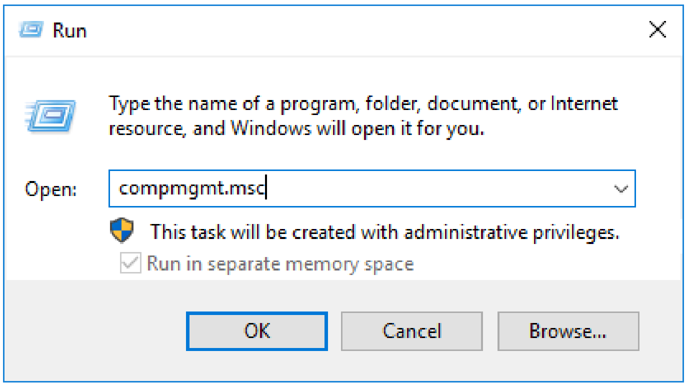
Summary log file has been saved to the following location:

C:\Program Files\Microsoft SQL Server\140\Setup Bootstrap\Log\20190601_082249\Summary_A0798sPLC2_20190601_082249.txt

After some time you should see this screen telling you to successfully install the SQL Server.

2.1.1 Configuration

1



Run

Type the name of a program, folder, document, or Internet resource, and Windows will open it for you.

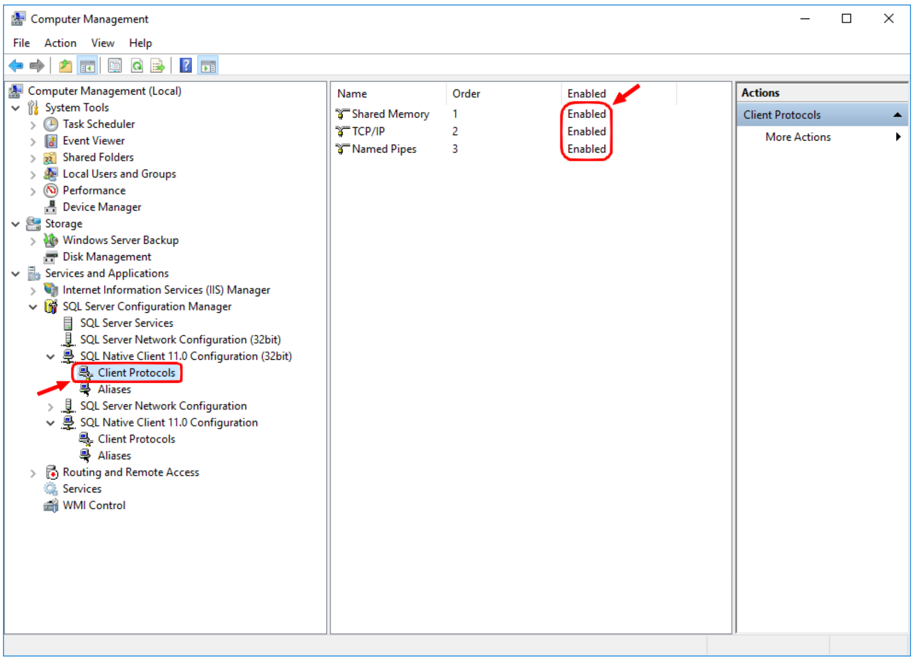
Open: compmgmt.msc

This task will be created with administrative privileges.

☑ Run in separate memory space

Open **Computer Management**. You can do it by executing the **„Run“** (by simply typing the word **„run“** in the windows start menu) and inserting the **„compmgmt.msc“** command.

2

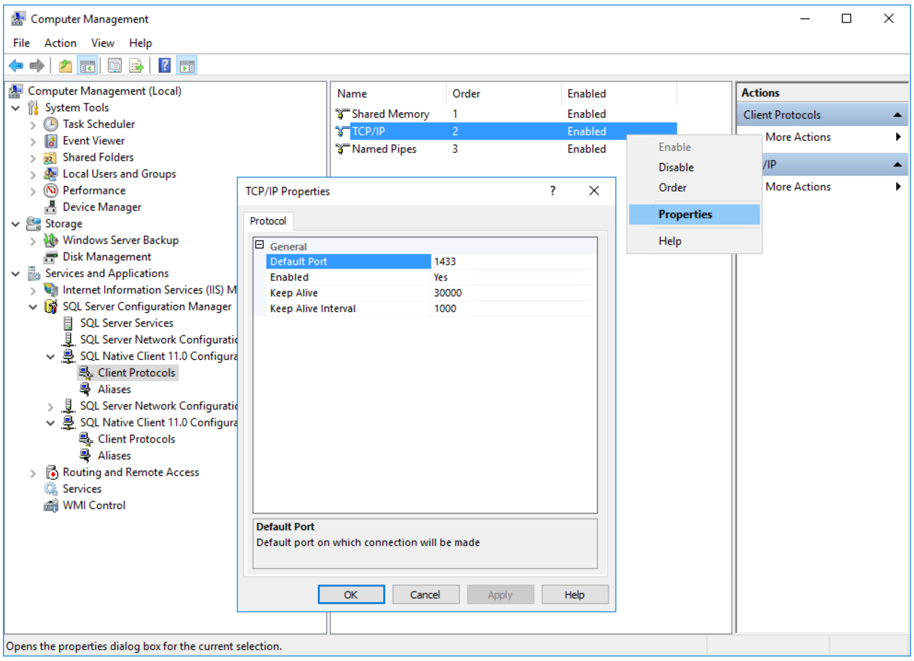

Computer Management
File Action View Help
Computer Management (Local)
System Tools
Task Scheduler
Event Viewer
Shared Folders
Local Users and Groups
Performance
Device Manager
Storage
Windows Server Backup
Disk Management
Services and Applications
Internet Information Services (IIS) Manager
SQL Server Configuration Manager
SQL Server Services
SQL Server Network Configuration (32bit)
SQL Native Client 11.0 Configuration (32bit)
Client Protocols
Aliases
SQL Server Network Configuration
SQL Native Client 11.0 Configuration
Client Protocols
Aliases
Routing and Remote Access
Services
WMI Control
Actions
Client Protocols
More Actions

Name	Order	Enabled
Shared Memory	1	Enabled
TCP/IP	2	Enabled
Named Pipes	3	Enabled

On left side choose **Services and Applications -> SQL Server Configuration Manager -> SQL Native Client 11.0 Configuration -> Client Protocols**. All 3 protocols has to be Enabled.

Note: SQL Native Client 11.0 Configuration naming is different in every version of SQL Server and also version(32 or 64 bits)!!

3



Name	Order	Enabled
Shared Memory	1	Enabled
TCP/IP	2	Enabled
Named Pipes	3	Enabled

General	
Default Port	1433
Enabled	Yes
Keep Alive	30000
Keep Alive Interval	1000

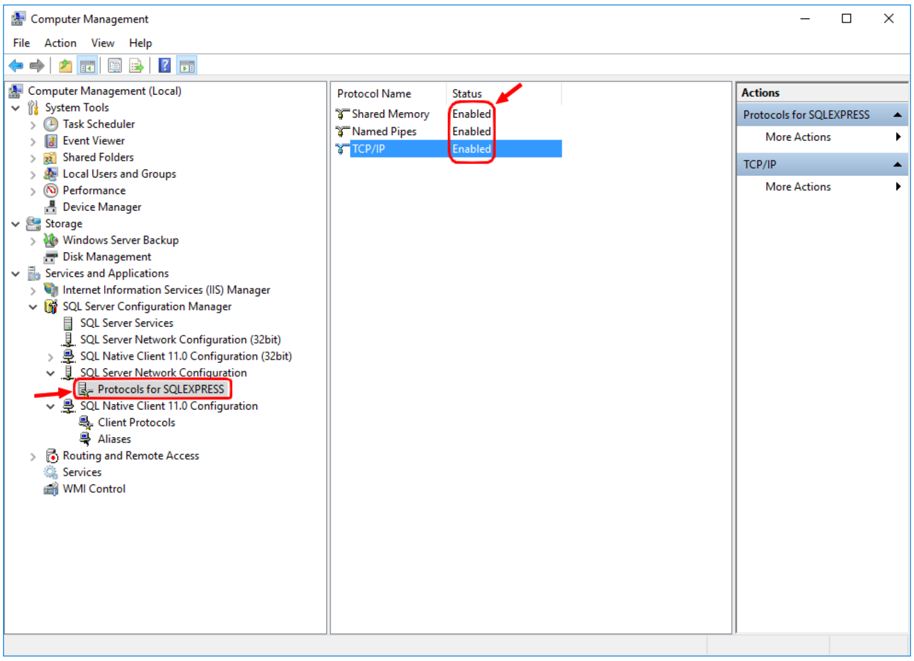
Default Port
Default port on which connection will be made

Opens the properties dialog box for the current selection.

By right click on **TCP/IP** you can edit **Properties**:

- **Default Port -** port on which will be your SQL server reachable across network
- **Enabled** - Enabling of TCP/IP protocol

4

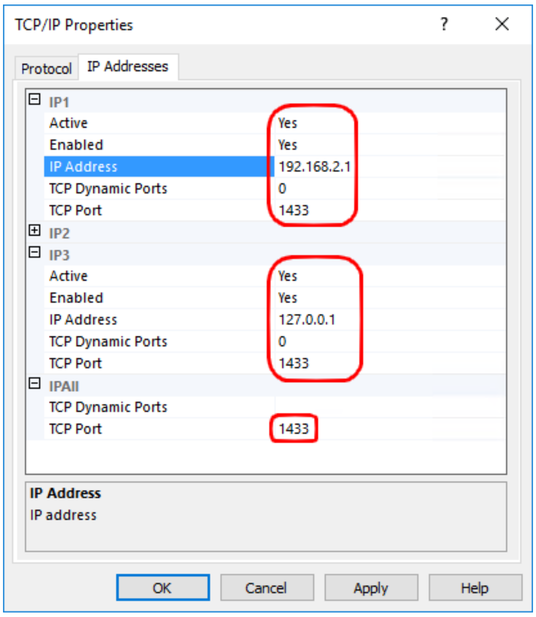


Computer Management (Local)
- System Tools
  - Task Scheduler
  - Event Viewer
  - Shared Folders
  - Local Users and Groups
  - Performance
  - Device Manager
- Storage
  - Windows Server Backup
  - Disk Management
- Services and Applications
  - Internet Information Services (IIS) Manager
  - SQL Server Configuration Manager
    - SQL Server Services
    - SQL Server Network Configuration (32bit)
    - SQL Native Client 11.0 Configuration (32bit)
    - SQL Server Network Configuration
      - Protocols for SQLEXPRESS
    - SQL Native Client 11.0 Configuration
      - Client Protocols
      - Aliases
  - Routing and Remote Access
  - Services
  - WMI Control

Protocol Name	Status
Shared Memory	Enabled
Named Pipes	Enabled
TCP/IP	Enabled

Another settings will be made in **SQL Server Network Configuration**. Click on **Protocols for SQLEXPRESS**. Also all 3 protocols has to be **Enabled**. We need to check if port is set correctly right click on **TCP/IP** and choose tab **IP Addresses.**

5



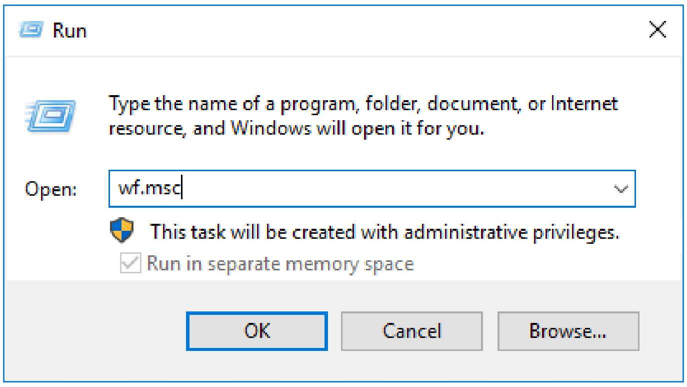
IP1	
Active	Yes
Enabled	Yes
IP Address	192.168.2.1
TCP Dynamic Ports	0
TCP Port	1433
IP2	
IP3	
Active	Yes
Enabled	Yes
IP Address	127.0.0.1
TCP Dynamic Ports	0
TCP Port	1433
IPAll	
TCP Dynamic Ports	
TCP Port	1433

IP Address
IP address

Here is set the default port for **SQL Server** and also all **IP addresses** for connection to the SQL Server. And click yes to parameter **Enabled** on each IP address which you want to have active for SQL. We activated **127.0.0.1**(localhost) and **192.168.2.1** in this example.

2.1.2 Firewall permission

1



Run

Type the name of a program, folder, document, or Internet resource, and Windows will open it for you.

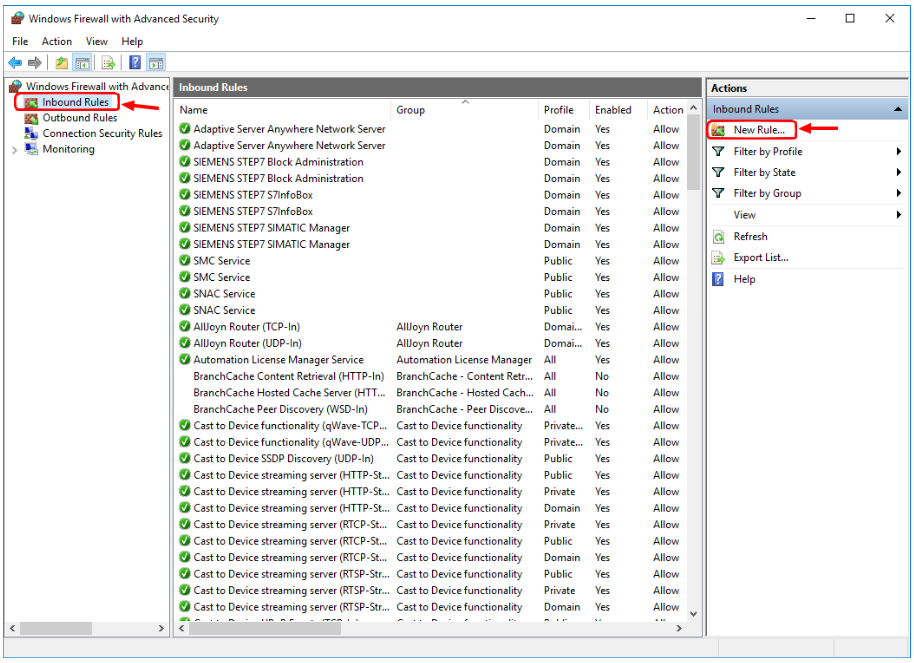
Open: wf.msc

This task will be created with administrative privileges.

☑ Run in separate memory space

Open **Windows Firewall with Advanced security**. You can do it by executing the „**Run**“ (by simply typing the word „**run**“ in the windows start menu) and inserting the „**wf.msc**“ command.

2



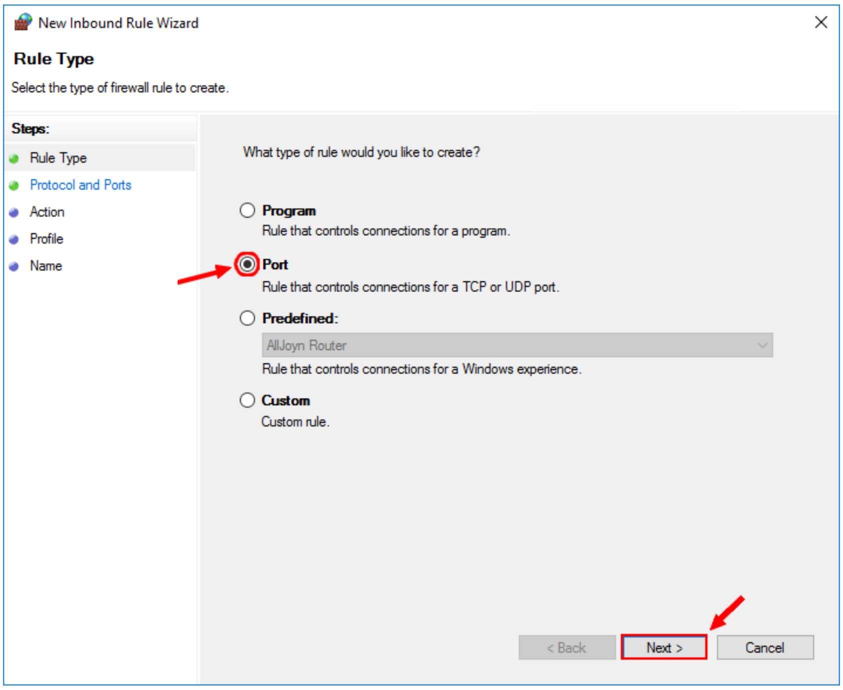
Windows Firewall with Advanced Security

Inbound Rules

Name	Group	Profile	Enabled	Action
Adaptive Server Anywhere Network Server		Domain	Yes	Allow
Adaptive Server Anywhere Network Server		Domain	Yes	Allow
SIEMENS STEP7 Block Administration		Domain	Yes	Allow
SIEMENS STEP7 Block Administration		Domain	Yes	Allow
SIEMENS STEP7 S7InfoBox		Domain	Yes	Allow
SIEMENS STEP7 S7InfoBox		Domain	Yes	Allow
SIEMENS STEP7 SIMATIC Manager		Domain	Yes	Allow
SIEMENS STEP7 SIMATIC Manager		Domain	Yes	Allow
SMC Service		Public	Yes	Allow
SMC Service		Public	Yes	Allow
SNAC Service		Public	Yes	Allow
SNAC Service		Public	Yes	Allow
AllJoyn Router (TCP-In)	AllJoyn Router	Domai...	Yes	Allow
AllJoyn Router (UDP-In)	AllJoyn Router	Domai...	Yes	Allow
Automation License Manager Service	Automation License Manager	All	Yes	Allow
BranchCache Content Retrieval (HTTP-In)	BranchCache - Content Retr...	All	No	Allow
BranchCache Hosted Cache Server (HTT...	BranchCache - Hosted Cach...	All	No	Allow
BranchCache Peer Discovery (WSD-In)	BranchCache - Peer Discove...	All	No	Allow
Cast to Device functionality (qWave-TCP...	Cast to Device functionality	Private...	Yes	Allow
Cast to Device functionality (qWave-UDP...	Cast to Device functionality	Private...	Yes	Allow
Cast to Device SSDP Discovery (UDP-In)	Cast to Device functionality	Public	Yes	Allow
Cast to Device streaming server (HTTP-St...	Cast to Device functionality	Public	Yes	Allow
Cast to Device streaming server (HTTP-St...	Cast to Device functionality	Private	Yes	Allow
Cast to Device streaming server (HTTP-St...	Cast to Device functionality	Domain	Yes	Allow
Cast to Device streaming server (RTCP-St...	Cast to Device functionality	Private	Yes	Allow
Cast to Device streaming server (RTCP-St...	Cast to Device functionality	Public	Yes	Allow
Cast to Device streaming server (RTCP-St...	Cast to Device functionality	Domain	Yes	Allow
Cast to Device streaming server (RTSP-Str...	Cast to Device functionality	Public	Yes	Allow
Cast to Device streaming server (RTSP-Str...	Cast to Device functionality	Private	Yes	Allow
Cast to Device streaming server (RTSP-Str...	Cast to Device functionality	Domain	Yes	Allow

On left side choose „**Inbound Rules**“ by left click. This will open list with all Inbound rules set for your PC. On right side choose „**New Rule**“.

3



New Inbound Rule Wizard

Rule Type

Select the type of firewall rule to create.

Steps:
- Rule Type
- Protocol and Ports
- Action
- Profile
- Name

What type of rule would you like to create?

○ **Program**
Rule that controls connections for a program.

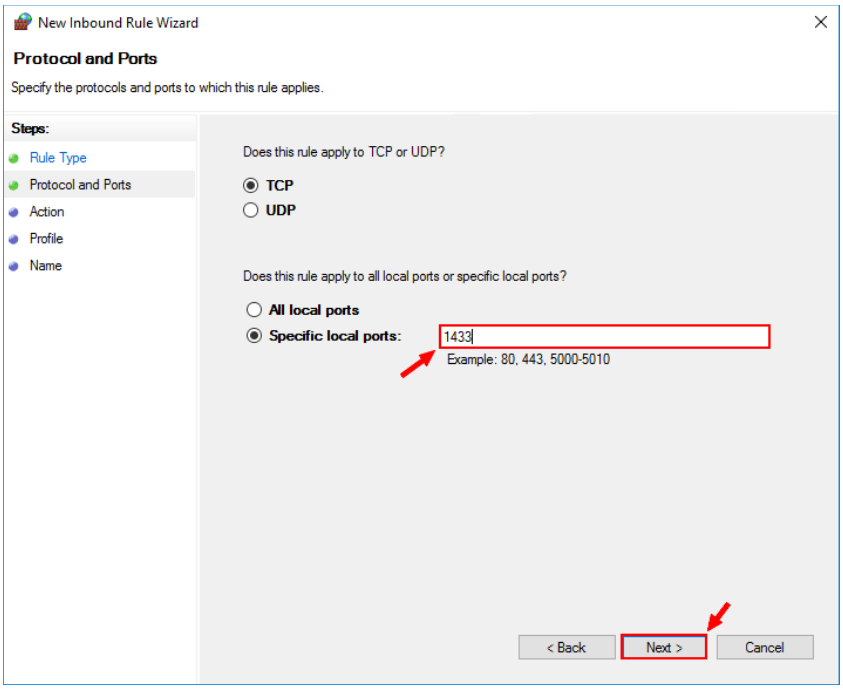
● **Port**
Rule that controls connections for a TCP or UDP port.

○ **Predefined:**
AllJoyn Router
Rule that controls connections for a Windows experience.

○ **Custom**
Custom rule.

This wizard will help us to set correct firewall rule for our PC. First we have to choose **„Port“** and click on **„Next“**.

4



New Inbound Rule Wizard

Protocol and Ports

Specify the protocols and ports to which this rule applies.

Steps:
- Rule Type
- Protocol and Ports
- Action
- Profile
- Name

Does this rule apply to TCP or UDP?

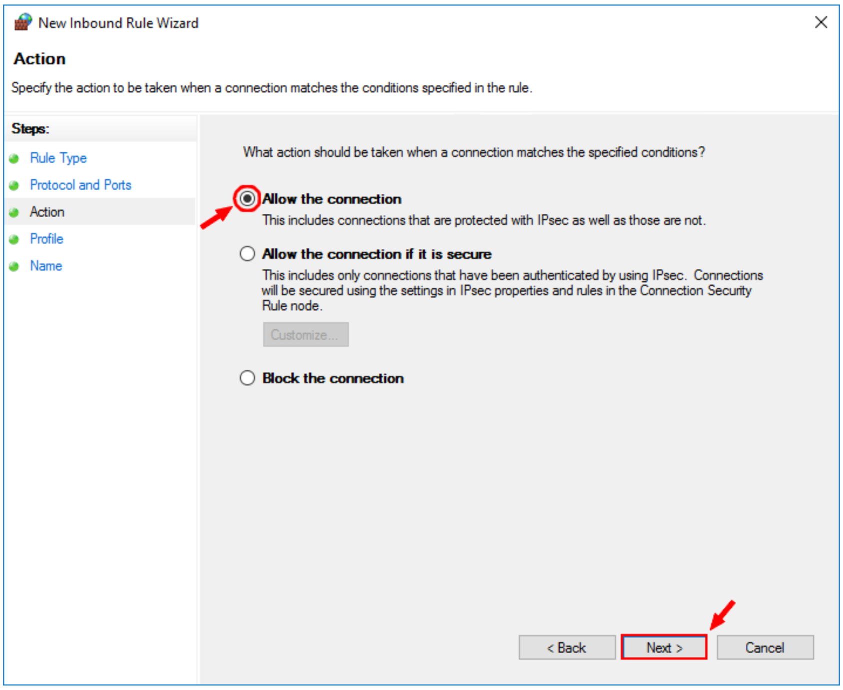
● **TCP**
○ **UDP**

Does this rule apply to all local ports or specific local ports?

○ **All local ports**
● **Specific local ports:** 1433
Example: 80, 443, 5000-5010

Here we will specify on which port is our SQL server running, **default port** is **1433**. It's adjustable in settings of SQL Server. Click on **„Next“**

5



New Inbound Rule Wizard

Action

Specify the action to be taken when a connection matches the conditions specified in the rule.

Steps:
- Rule Type
- Protocol and Ports
- Action
- Profile
- Name

What action should be taken when a connection matches the specified conditions?

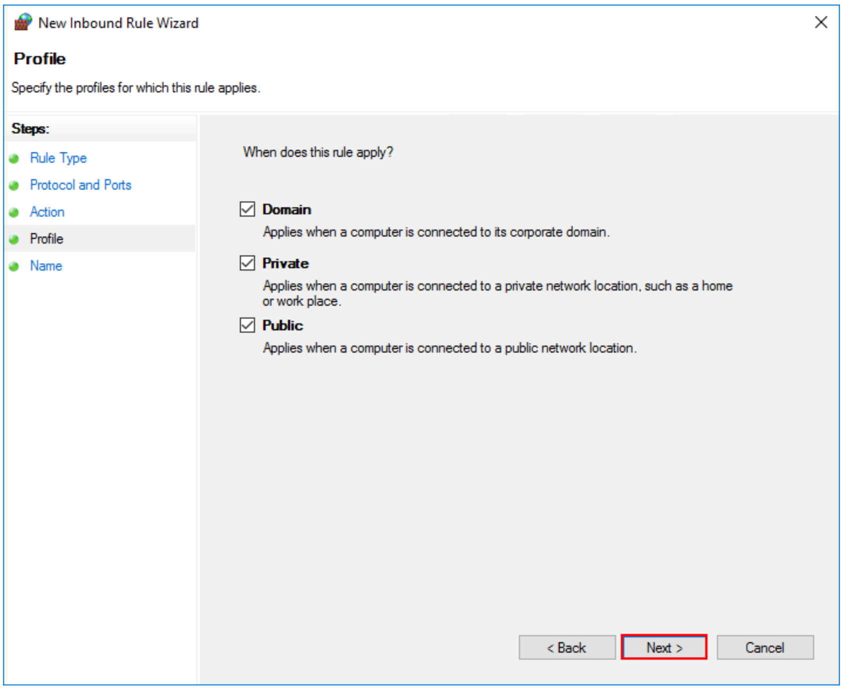
● **Allow the connection**
This includes connections that are protected with IPsec as well as those are not.

○ **Allow the connection if it is secure**
This includes only connections that have been authenticated by using IPsec. Connections will be secured using the settings in IPsec properties and rules in the Connection Security Rule node.

○ **Block the connection**

Just chose **„Allow the connection“** and click on **„Next“**

6



New Inbound Rule Wizard

Profile

Specify the profiles for which this rule applies.

Steps:
- Rule Type
- Protocol and Ports
- Action
- Profile
- Name

When does this rule apply?

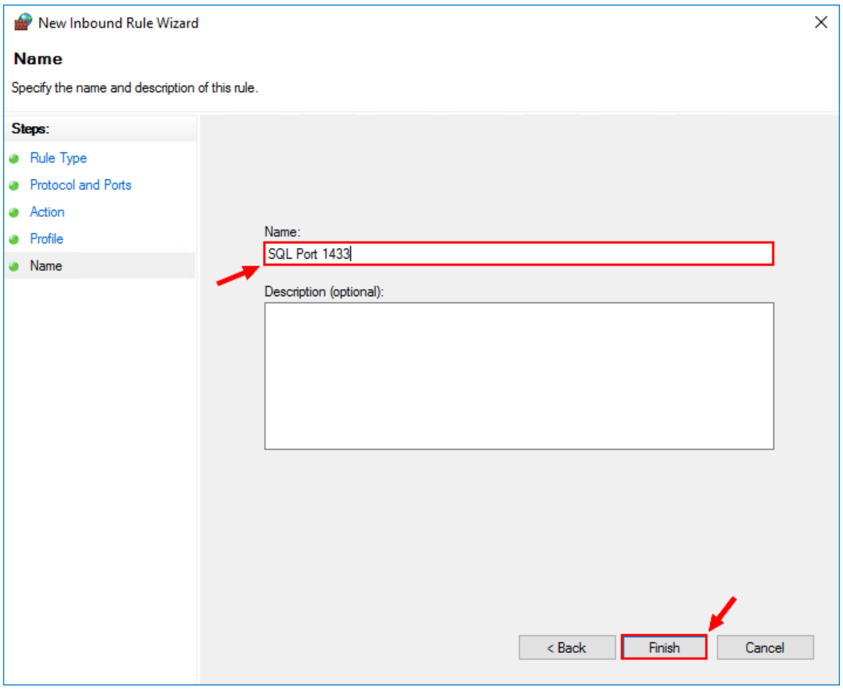
☑ **Domain**
Applies when a computer is connected to its corporate domain.

☑ **Private**
Applies when a computer is connected to a private network location, such as a home or work place.

☑ **Public**
Applies when a computer is connected to a public network location.

This window is selection of profiles when will be rule applied, click on **„Next“**.

7



New Inbound Rule Wizard

Name

Specify the name and description of this rule.

Name: SQL Port 1433

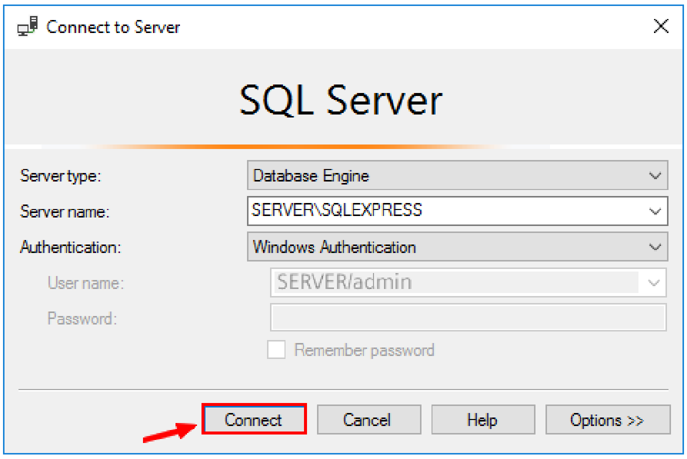
Description (optional):

Insert name of the firewall rule and click on „**Finish**“.

2.1.3 Enable SQL Authentification

If you need to use SQL server that does not have SQL authentication enabled, here's how it is turned on.

1



Connect to Server

SQL Server

Server type: Database Engine

Server name: SERVER\SQLEXPRESS

Authentication: Windows Authentication

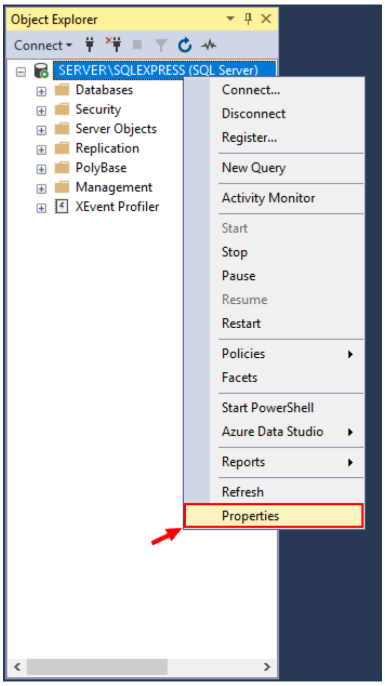
User name: SERVER/admin

Password:

□ Remember password

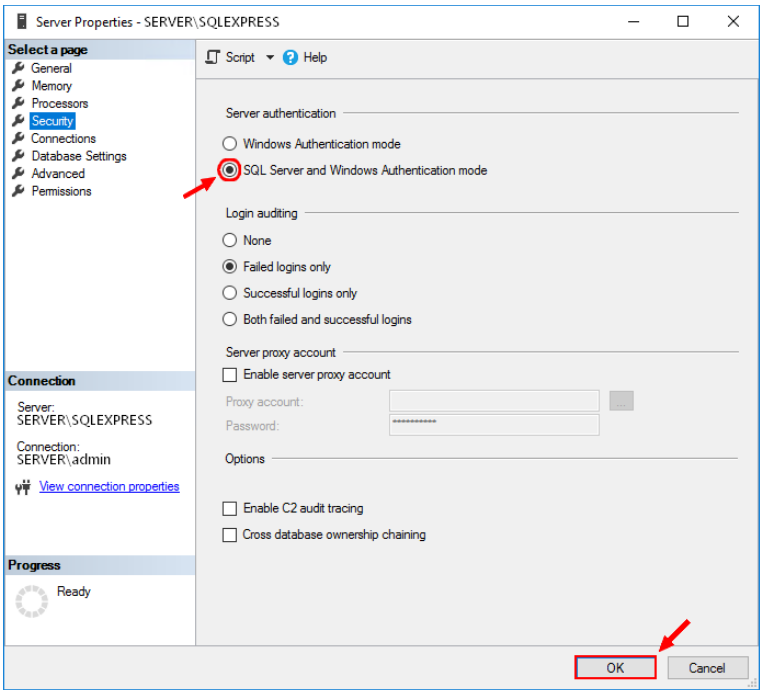
Connect to your database with Microsoft SQL Management Studio. You will login with **Windows authentication**.

2



After successful connection to the SQL Server. Right click on the SQL server icon and choose **Properties**.

3



Server: SERVER\SQLEXPRESS

Connection: SERVER\admin

Server authentication

○ Windows Authentication mode

● SQL Server and Windows Authentication mode

Login auditing

○ None

● Failed logins only

○ Successful logins only

○ Both failed and successful logins

Server proxy account

□ Enable server proxy account

Proxy account:

Password: ***********

Options

□ Enable C2 audit tracing

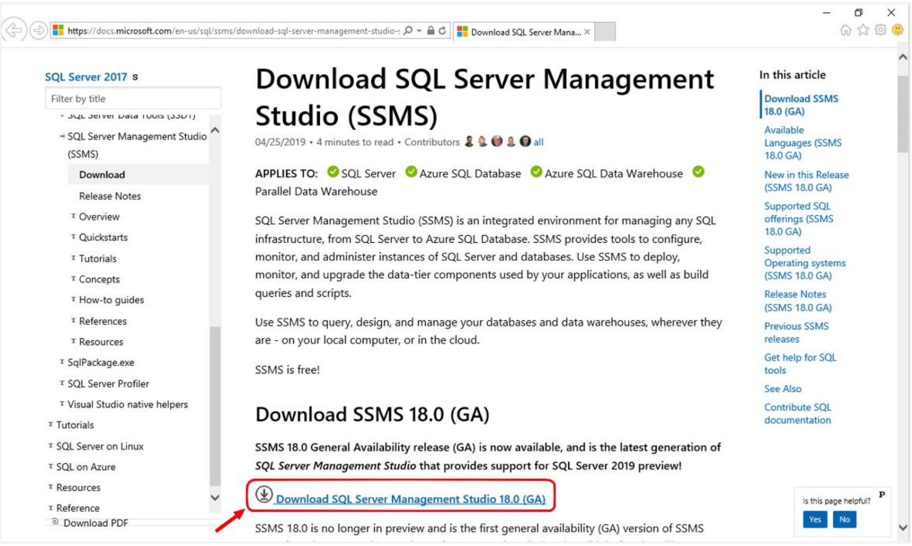
□ Cross database ownership chaining

In Server Properties choose page **Security,** and choose **SQL Server and Windows Authentication mode**. Click on **„OK“**

2.2 Microsoft SQL Server Management Studio (SSMS) 18.0

You will need **Microsoft SQL Management Studio (18.0)** to be able to connect and manage the **SQL Server**. The link to download the instalation package is here -> https://docs.microsoft.com/en-us/sql/ssms/download-sql-server-management-studio-ssms?view=sql-server-2017

1


https://docs.microsoft.com/en-us/sql/ssms/download-sql-server-management-studio-

Download SQL Server Mana...

SQL Server 2017

Filter by title

- SQL Server Management Studio (SSMS)
  - Download
  - Release Notes
  - Overview
  - Quickstarts
  - Tutorials
  - Concepts
  - How-to guides
  - References
  - Resources
- SqlPackage.exe
- SQL Server Profiler
- Visual Studio native helpers
- Tutorials
- SQL Server on Linux
- SQL on Azure
- Resources
- Reference
- Download PDF

Download SQL Server Management Studio (SSMS)

04/25/2019 • 4 minutes to read • Contributors all

APPLIES TO: ✓ SQL Server ✓ Azure SQL Database ✓ Azure SQL Data Warehouse ✓ Parallel Data Warehouse

SQL Server Management Studio (SSMS) is an integrated environment for managing any SQL infrastructure, from SQL Server to Azure SQL Database. SSMS provides tools to configure, monitor, and administer instances of SQL Server and databases. Use SSMS to deploy, monitor, and upgrade the data-tier components used by your applications, as well as build queries and scripts.

Use SSMS to query, design, and manage your databases and data warehouses, wherever they are - on your local computer, or in the cloud.

SSMS is free!

Download SSMS 18.0 (GA)

SSMS 18.0 General Availability release (GA) is now available, and is the latest generation of *SQL Server Management Studio* that provides support for SQL Server 2019 preview!

Download SQL Server Management Studio 18.0 (GA)

SSMS 18.0 is no longer in preview and is the first general availability (GA) version of SSMS

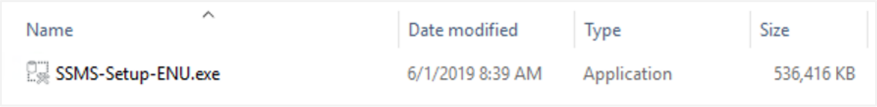
In this article

- Download SSMS 18.0 (GA)
- Available Languages (SSMS 18.0 GA)
- New in this Release (SSMS 18.0 GA)
- Supported SQL offerings (SSMS 18.0 GA)
- Supported Operating systems (SSMS 18.0 GA)
- Release Notes (SSMS 18.0 GA)
- Previous SSMS releases
- Get help for SQL tools
- See Also
- Contribute SQL documentation

Is this page helpful?

Click on the link **„Download SQL Server Management Studio 18.0 (GA)“**

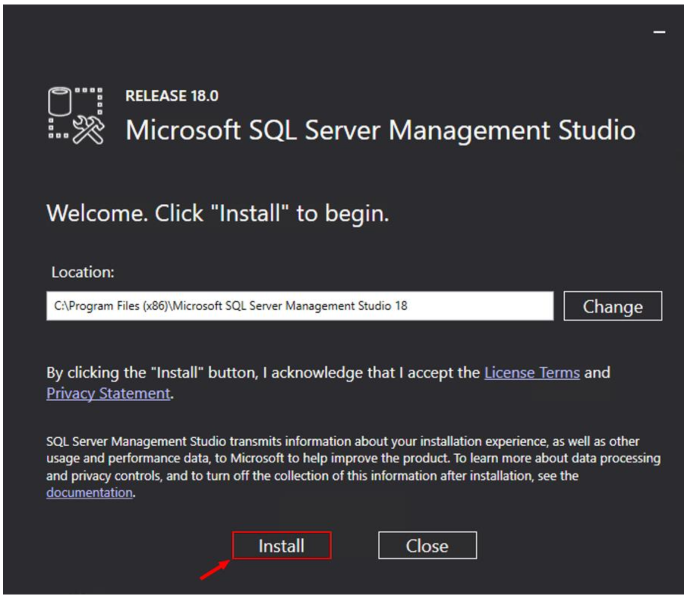
2



Name	Date modified	Type	Size
SSMS-Setup-ENU.exe	6/1/2019 8:39 AM	Application	536,416 KB

The **SSMS-Setup-ENU.exe** will be downloaded in your download directory. Run this file to continue.

3



RELEASE 18.0

Microsoft SQL Server Management Studio

Welcome. Click "Install" to begin.

Location:

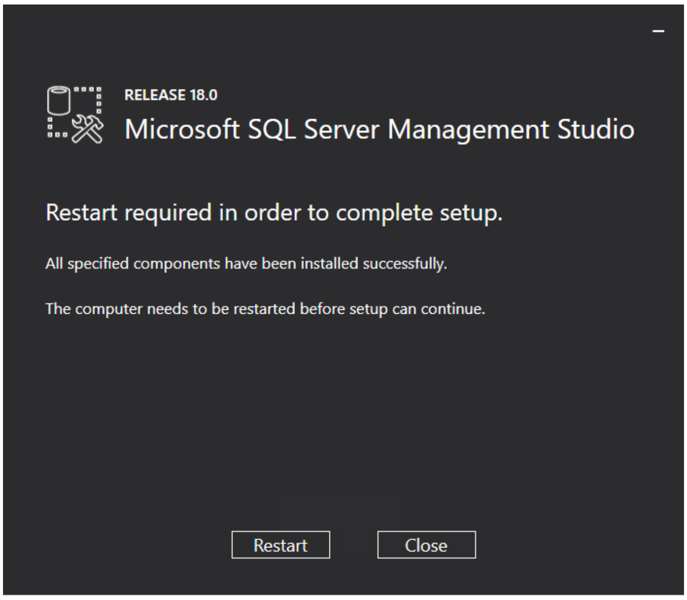
C:\Program Files (x86)\Microsoft SQL Server Management Studio 18

By clicking the "Install" button, I acknowledge that I accept the License Terms and Privacy Statement.

SQL Server Management Studio transmits information about your installation experience, as well as other usage and performance data, to Microsoft to help improve the product. To learn more about data processing and privacy controls, and to turn off the collection of this information after installation, see the documentation.

Keep or change the location and click on **„Install“**

4



RELEASE 18.0

Microsoft SQL Server Management Studio

Restart required in order to complete setup.

All specified components have been installed successfully.

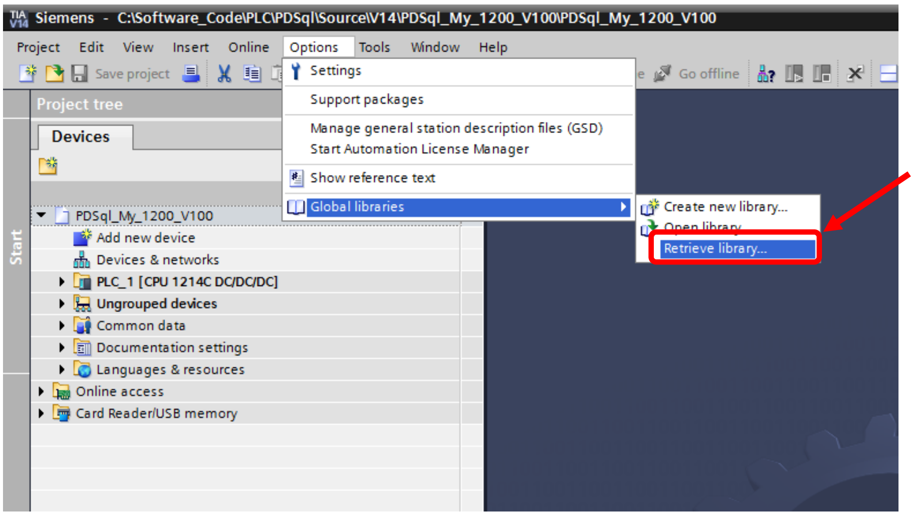
The computer needs to be restarted before setup can continue.

Click on **„Restart“** to complete setup

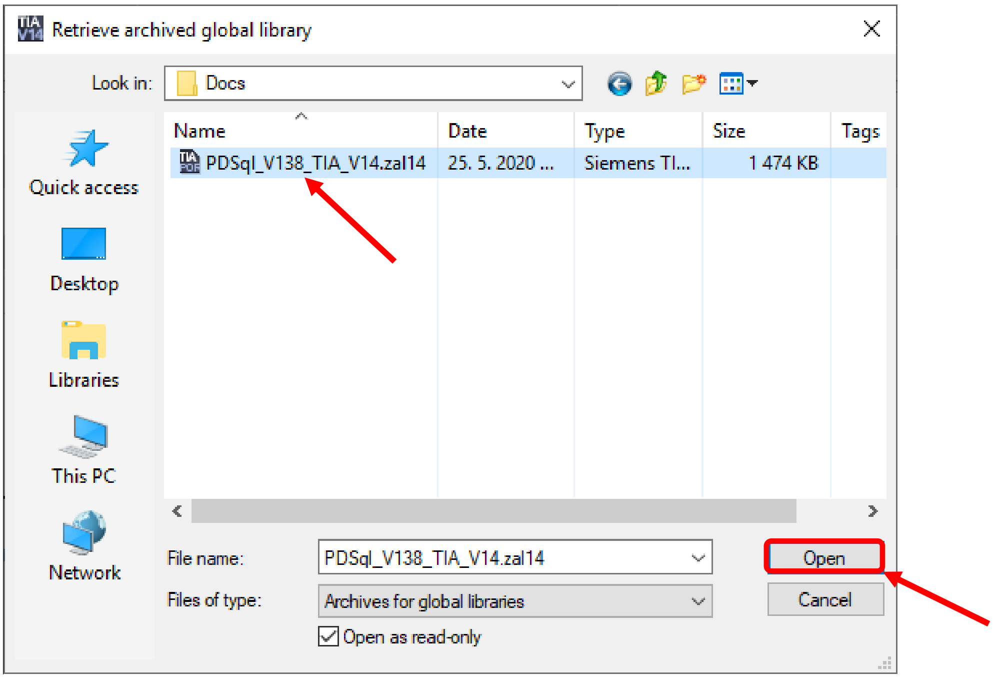
2.3 Instalation PDSql Library to TIA Portal

- Retrive **PDSql Library** from archive.

1



2



Look in: Docs

Name	Date	Type	Size	Tags
PDSql_V138_TIA_V14.zal14	25. 5. 2020 ...	Siemens TI...	1 474 KB	

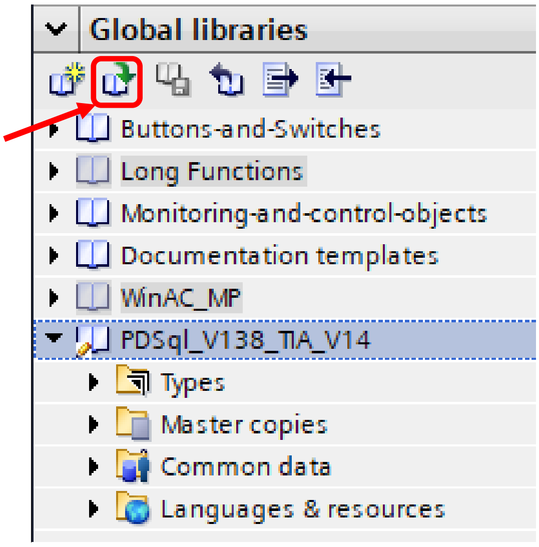
File name: PDSql_V138_TIA_V14.zal14

Files of type: Archives for global libraries

☑ Open as read-only

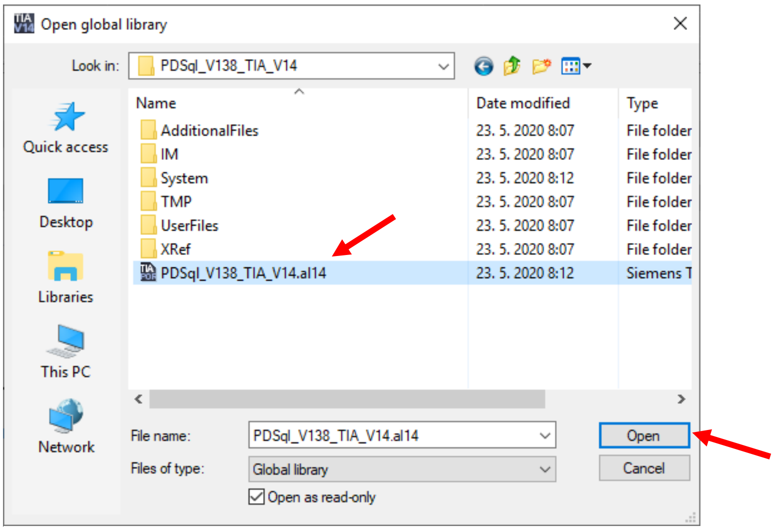
- Open **PDSql Library** in **TIA Portal**.

3



- Select **PDSql Library** file and open.

4



Look in: PDSql_V138_TIA_V14

Name	Date modified	Type
AdditionalFiles	23. 5. 2020 8:07	File folder
IM	23. 5. 2020 8:07	File folder
System	23. 5. 2020 8:12	File folder
TMP	23. 5. 2020 8:07	File folder
UserFiles	23. 5. 2020 8:07	File folder
XRef	23. 5. 2020 8:07	File folder
PDSql_V138_TIA_V14.al14	23. 5. 2020 8:12	Siemens T

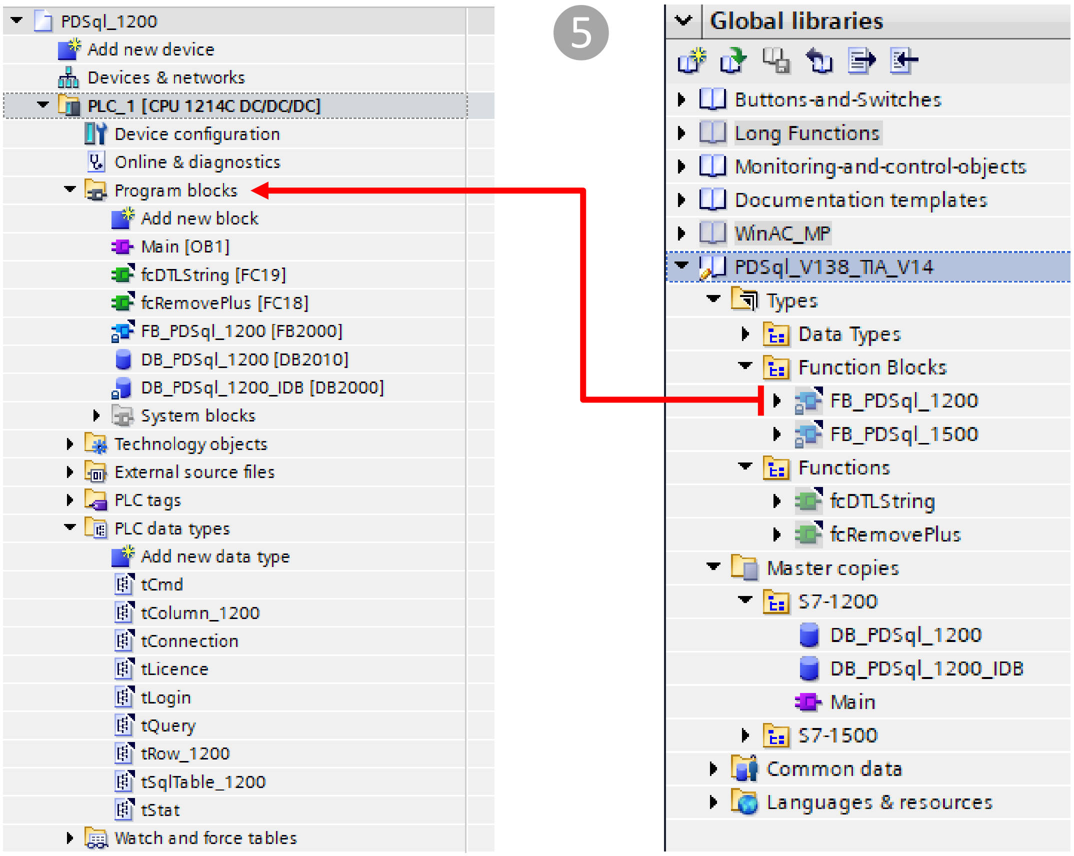
File name: PDSql_V138_TIA_V14.al14

Files of type: Global library

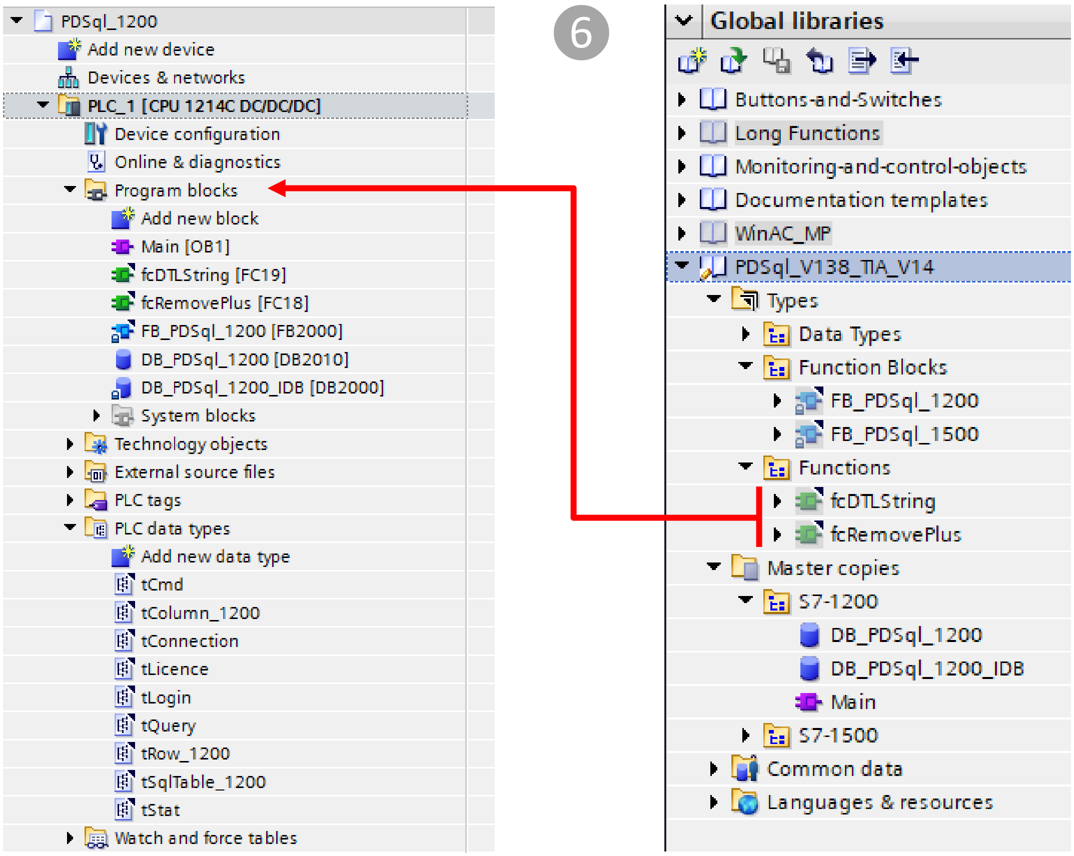
☑ Open as read-only

Example for S7-1200 project

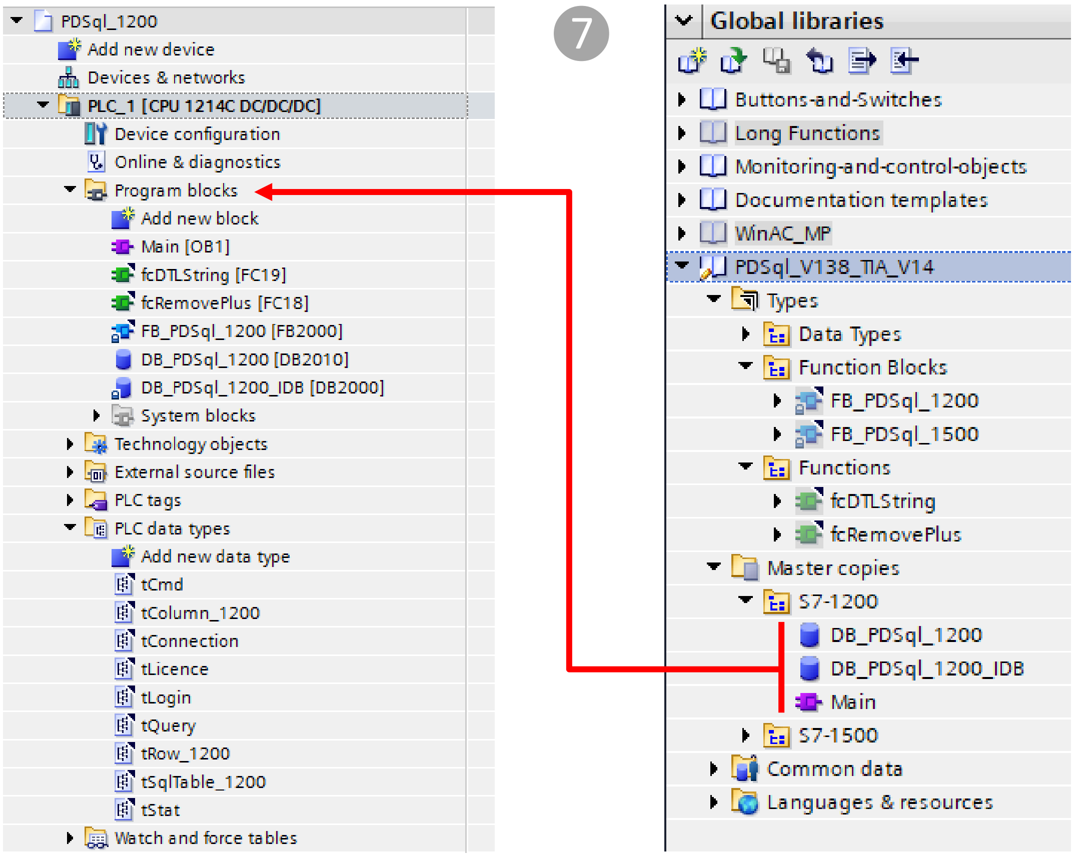
- Drag & Drop **Function Block** from **library** to your **Project / Program blocks**
  *This action will also **automatically** transfer all necessary **data types** from **library** to **Project / PLC data types***



- Drag & Drop **Functions** from **library** to your **Project / Program blocks**



- Drag & Drop **Master copies / S7-1200** data blocks from **library** to your **Project / Program blocks**



3 Examples

In the following examples we will use

- **Microsoft Management Studio**
- **Microsoft SQL Server**
- **PDSql Library**.

3.1 Create a table

Using **Microsoft Management Studio**, first create a table named "**TestTable**" that will be used in the following examples and will contain these columns ->

Column name	Data type	Description
[Id]	**int**	auto increment Id number
[Datetime]	**Datetime**	date and time
[FruitName]	**varchar(20)**	fruit name
[Quantity]	**int**	fruit quantity
[Weight]	**real**	fruit weight
[CitrusType]	**bit**	citrus type [1 – Yes, 0 – No]

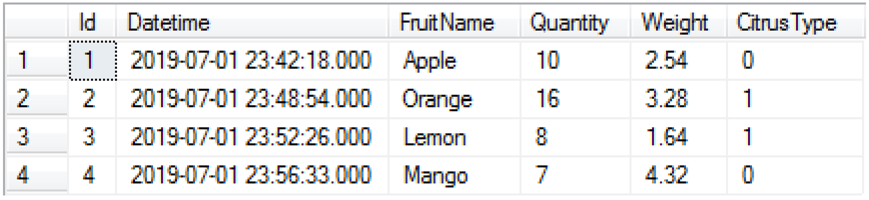
- **SQL statement to create this table**

```
CREATE TABLE [dbo].[TestTable](
      [Id] [int] IDENTITY(1,1) NOT NULL,
      [Datetime] [datetime] NULL,
      [FruitName] [varchar](20) NULL,
      [Quantity] [int] NULL,
      [Weight] [real] NULL,
      [CitrusType] [bit] NULL
) ON [PRIMARY]
```

- **Insert test rows into the table**

```
INSERT INTO [dbo].[TestTable]
(Datetime,FruitName,Quantity,Weight,CitrusType)
VALUES ('2019-07-01 23:42:18','Apple',10,2.54,0),
       ('2019-07-01 23:48:54','Orange',16,3.28,1),
       ('2019-07-01 23:52:26','Lemon',8,1.64,1),
       ('2019-07-01 23:56:33','Mango',7,4.32,0)
```

Table: „TestTable“



	Id	Datetime	FruitName	Quantity	Weight	CitrusType
1	1	2019-07-01 23:42:18.000	Apple	10	2.54	0
2	2	2019-07-01 23:48:54.000	Orange	16	3.28	1
3	3	2019-07-01 23:52:26.000	Lemon	8	1.64	1
4	4	2019-07-01 23:56:33.000	Mango	7	4.32	0

3.2 **SELECT** row from table

- **Read** a **row** from the **table** where **FruitName = "Apple"**

Syntax of the SQL statement in SSMS

```
SELECT * FROM TestTable WHERE FruitName = 'Apple'
```

Syntax of the SQL statement in TIA environment

```
Query[1] := 'SELECT * FROM TestTable WHERE FruitName=$'Apple$'';
Query[2] := '';
```

⚠ In the **TIA environment** you must **add** a **dollar** (**$**) sign **before** each **single quote** in the **query string !**

Execute SQL query with PDSql Library

1. **Execute** SQL query

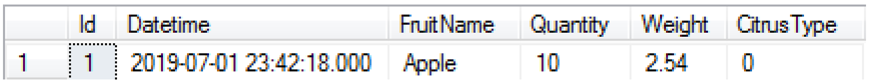
   ```
   Cmd.ExecuteQuery := TRUE;
   ```

   Set `Cmd.ExecuteQuery` on `TRUE` will also automatically connect to SQL server if not connected yet.

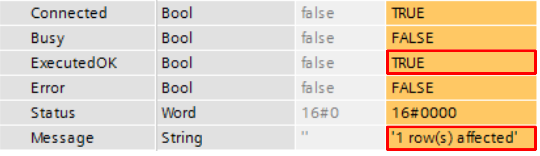
2. **Wait** for the execution of the SQL query

   ```
   (Stat.ExecutedOK OR Stat.Error) = TRUE;
   ```

3. If **ExecutedOK** then result is stored in the **SQLtable**

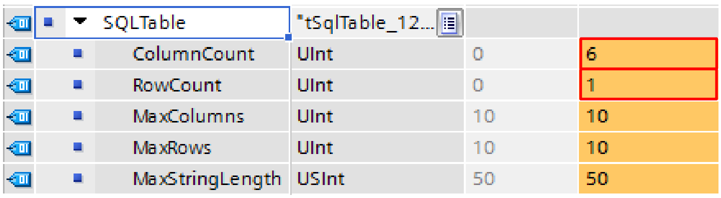


	Id	Datetime	FruitName	Quantity	Weight	CitrusType
1	1	2019-07-01 23:42:18.000	Apple	10	2.54	0



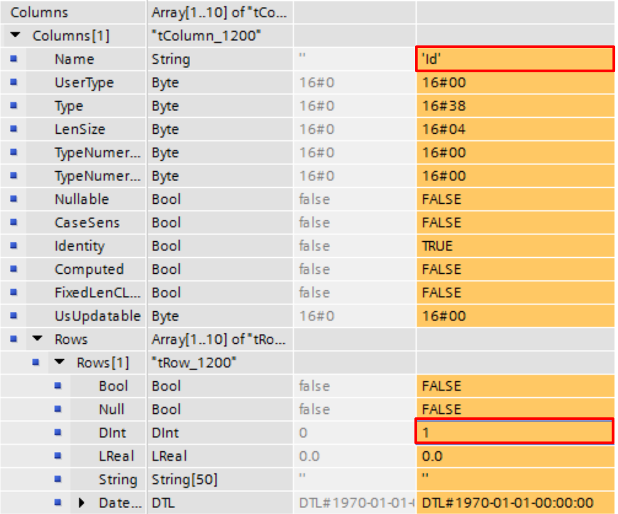
Connected	Bool	false	TRUE
Busy	Bool	false	FALSE
ExecutedOK	Bool	false	TRUE
Error	Bool	false	FALSE
Status	Word	16#0	16#0000
Message	String	''	'1 row(s) affected'

The status after SELECT command



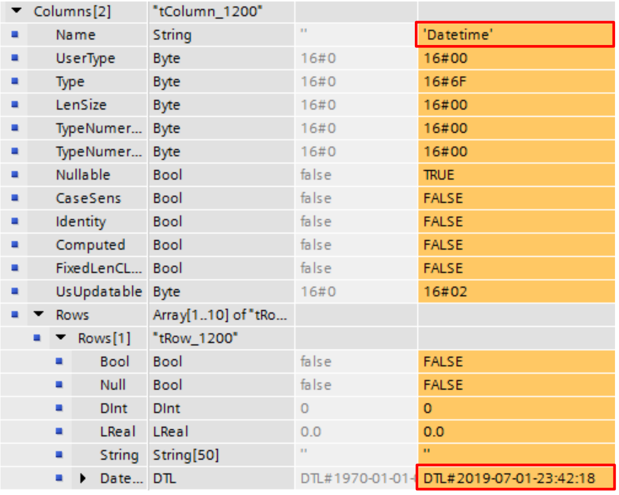
SQLTable	"tSqlTable_12...		
ColumnCount	UInt	0	6
RowCount	UInt	0	1
MaxColumns	UInt	10	10
MaxRows	UInt	10	10
MaxStringLength	USInt	50	50

The number of rows and columns returned after SELECT command



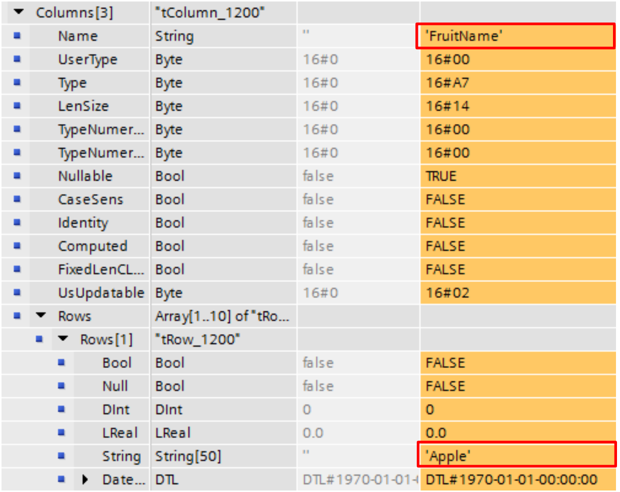
Columns	Array[1..10] of "tCo...		
Columns[1]	"tColumn_1200"		
Name	String	''	'Id'
UserType	Byte	16#0	16#00
Type	Byte	16#0	16#38
LenSize	Byte	16#0	16#04
TypeNumer...	Byte	16#0	16#00
TypeNumer...	Byte	16#0	16#00
Nullable	Bool	false	FALSE
CaseSens	Bool	false	FALSE
Identity	Bool	false	TRUE
Computed	Bool	false	FALSE
FixedLenCL...	Bool	false	FALSE
UsUpdatable	Byte	16#0	16#00
Rows	Array[1..10] of "tRo...		
Rows[1]	"tRow_1200"		
Bool	Bool	false	FALSE
Null	Bool	false	FALSE
DInt	DInt	0	1
LReal	LReal	0.0	0.0
String	String[50]	''	''
Date...	DTL	DTL#1970-01-01-	DTL#1970-01-01-00:00:00

Id = 1



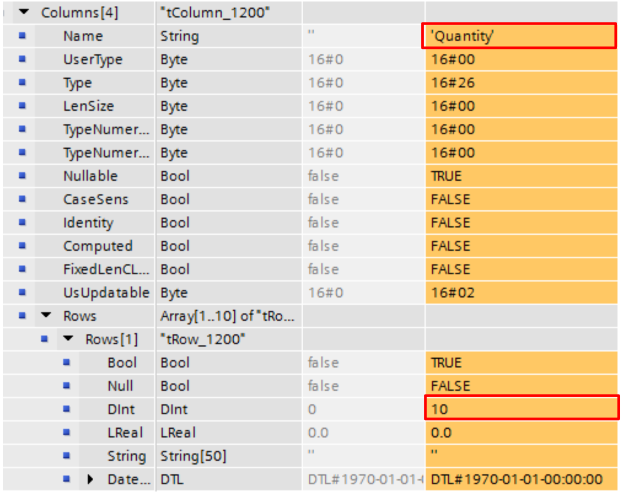
Columns[2]	"tColumn_1200"		
Name	String	''	'Datetime'
UserType	Byte	16#0	16#00
Type	Byte	16#0	16#6F
LenSize	Byte	16#0	16#00
TypeNumer...	Byte	16#0	16#00
TypeNumer...	Byte	16#0	16#00
Nullable	Bool	false	TRUE
CaseSens	Bool	false	FALSE
Identity	Bool	false	FALSE
Computed	Bool	false	FALSE
FixedLenCL...	Bool	false	FALSE
UsUpdatable	Byte	16#0	16#02
Rows	Array[1..10] of "tRo...		
Rows[1]	"tRow_1200"		
Bool	Bool	false	FALSE
Null	Bool	false	FALSE
DInt	DInt	0	0
LReal	LReal	0.0	0.0
String	String[50]	''	''
Date...	DTL	DTL#1970-01-01-	DTL#2019-07-01-23:42:18

Datetime = “**2019-07-01-23:42:18**”



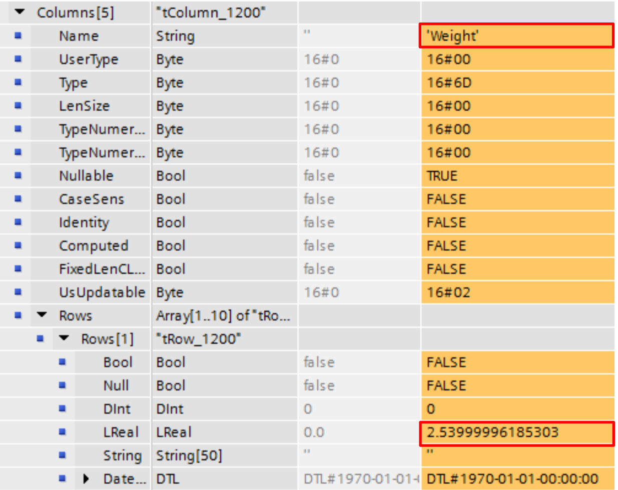
Columns[3]	"tColumn_1200"		
Name	String	''	'FruitName'
UserType	Byte	16#0	16#00
Type	Byte	16#0	16#A7
LenSize	Byte	16#0	16#14
TypeNumer...	Byte	16#0	16#00
TypeNumer...	Byte	16#0	16#00
Nullable	Bool	false	TRUE
CaseSens	Bool	false	FALSE
Identity	Bool	false	FALSE
Computed	Bool	false	FALSE
FixedLenCL...	Bool	false	FALSE
UsUpdatable	Byte	16#0	16#02
Rows	Array[1..10] of "tRo...		
Rows[1]	"tRow_1200"		
Bool	Bool	false	FALSE
Null	Bool	false	FALSE
DInt	DInt	0	0
LReal	LReal	0.0	0.0
String	String[50]	''	'Apple'
Date...	DTL	DTL#1970-01-01-	DTL#1970-01-01-00:00:00

FruitName = "**Apple**"



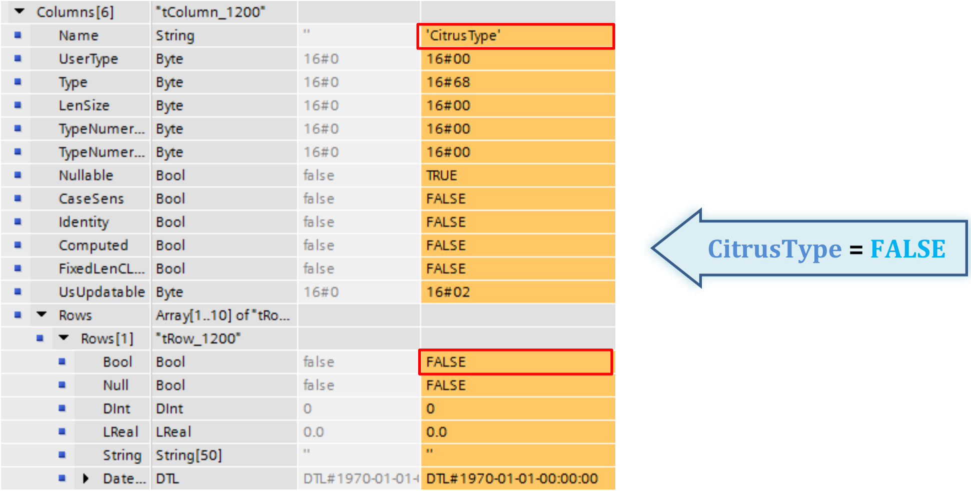
Columns[4]	"tColumn_1200"		
Name	String	''	'Quantity'
UserType	Byte	16#0	16#00
Type	Byte	16#0	16#26
LenSize	Byte	16#0	16#00
TypeNumer...	Byte	16#0	16#00
TypeNumer...	Byte	16#0	16#00
Nullable	Bool	false	TRUE
CaseSens	Bool	false	FALSE
Identity	Bool	false	FALSE
Computed	Bool	false	FALSE
FixedLenCL...	Bool	false	FALSE
UsUpdatable	Byte	16#0	16#02
Rows	Array[1..10] of "tRo...		
Rows[1]	"tRow_1200"		
Bool	Bool	false	TRUE
Null	Bool	false	FALSE
DInt	DInt	0	10
LReal	LReal	0.0	0.0
String	String[50]	''	''
Date...	DTL	DTL#1970-01-01-	DTL#1970-01-01-00:00:00

Quantity = **10**



Columns[5]	"tColumn_1200"		
Name	String	''	'Weight'
UserType	Byte	16#0	16#00
Type	Byte	16#0	16#6D
LenSize	Byte	16#0	16#00
TypeNumer...	Byte	16#0	16#00
TypeNumer...	Byte	16#0	16#00
Nullable	Bool	false	TRUE
CaseSens	Bool	false	FALSE
Identity	Bool	false	FALSE
Computed	Bool	false	FALSE
FixedLenCL...	Bool	false	FALSE
UsUpdatable	Byte	16#0	16#02
Rows	Array[1..10] of "tRo...		
Rows[1]	"tRow_1200"		
Bool	Bool	false	FALSE
Null	Bool	false	FALSE
DInt	DInt	0	0
LReal	LReal	0.0	2.53999996185303
String	String[50]	''	''
Date...	DTL	DTL#1970-01-01-	DTL#1970-01-01-00:00:00

Weight = **2.54**



Columns[6]	"tColumn_1200"		
Name	String	''	'CitrusType'
UserType	Byte	16#0	16#00
Type	Byte	16#0	16#68
LenSize	Byte	16#0	16#00
TypeNumer...	Byte	16#0	16#00
TypeNumer...	Byte	16#0	16#00
Nullable	Bool	false	TRUE
CaseSens	Bool	false	FALSE
Identity	Bool	false	FALSE
Computed	Bool	false	FALSE
FixedLenCL...	Bool	false	FALSE
UsUpdatable	Byte	16#0	16#02
Rows	Array[1..10] of "tRo...		
Rows[1]	"tRow_1200"		
Bool	Bool	false	FALSE
Null	Bool	false	FALSE
DInt	DInt	0	0
LReal	LReal	0.0	0.0
String	String[50]	''	''
Date...	DTL	DTL#1970-01-01-	DTL#1970-01-01-00:00:00

CitrusType = FALSE

4. If **Error** then `Stat.Status` contains an **error code** and `Stat.Message` contains an **error message**

3.3 **INSERT** row to the table

- **Write** a **new row** into the **table**

Syntax of the SQL statement in <u>SSMS</u>

```
INSERT INTO TestTable (Datetime,FruitName,Quantity,Weight,CitrusType)
VALUES ('2019-07-02 10:42:56','Banana',24,8.48,0)
```

Syntax of the SQL statement in <u>TIA environment</u>

```
Query[1] := 'INSERT INTO TestTable
(Datetime,FruitName,Quantity,Weight,CitrusType) VALUES ($'2019-07-02
10:42:56$',$'Banana$',24,8.48,0)';
Query[2] := '';
```

⚠ In the **TIA environment** you must **add** a **dollar ($)** sign **before** each **single quote** in the **query string !**

Compose INSERT string from input variables (SCL language)

```
#dtlDateTime := '2019-07-02 10:42:56';
#sFruitName := 'Banana';
#iQuantity := 24;
#rWeight := 8.48;
#bCitrusType := FALSE;

#str := 'INSERT INTO TestTable(Datetime,FruitName,Quantity,Weight,CitrusType) VALUES($'';
#str := CONCAT(IN1 := #str, IN2 := "fcDTLString"(#dtlDateTime));
#str := CONCAT(IN1 := #str, IN2 := '$',$'');
#str := CONCAT(IN1 := #str, IN2 := #sFruitName);
#str := CONCAT(IN1 := #str, IN2 := '$',');
#str := CONCAT(IN1 := #str, IN2 := INT_TO_STRING(#iQuantity));
#str := CONCAT(IN1 := #str, IN2 := ',');
#str := CONCAT(IN1 := #str, IN2 := REAL_TO_STRING(#rWeight));
#str := CONCAT(IN1 := #str, IN2 := ',');
#str := CONCAT(IN1 := #str, IN2 := INT_TO_STRING(BOOL_TO_BYTE(#bCitrusType)));
#str := CONCAT(IN1 := #str, IN2 := ')');

"DB_PDSql_1200".Query.Query[1] := #str;
"DB_PDSql_1200".Query.Query[2] := '';
```

Execute SQL query with PDSql Library

1. **Execute** SQL query

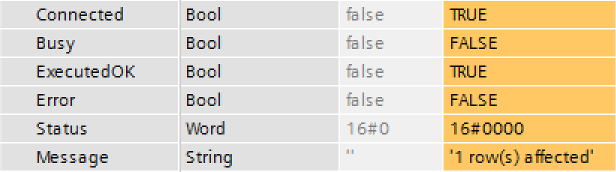
   ```
   Cmd.ExecuteQuery := TRUE;
   ```

   Set Cmd.ExecuteQuery on TRUE will also automatically connect to SQL server if not connected yet.

2. **Wait** for the execution of the SQL query

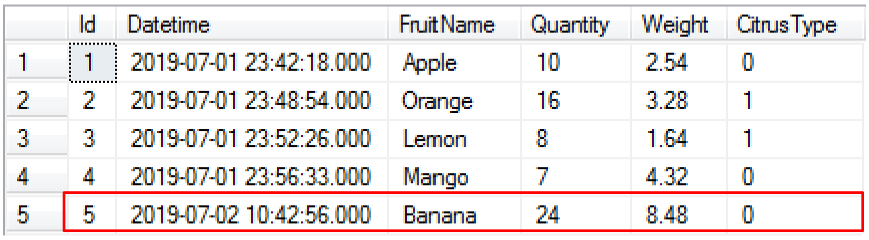
   ```
   (Stat.ExecutedOK OR Stat.Error) = TRUE;
   ```

3. If **ExecutedOK** then a row was inserted successfully



Connected	Bool	false	TRUE
Busy	Bool	false	FALSE
ExecutedOK	Bool	false	TRUE
Error	Bool	false	FALSE
Status	Word	16#0	16#0000
Message	String	''	'1 row(s) affected'

“**TestTable**” after executing the **INSERT** command



	Id	Datetime	FruitName	Quantity	Weight	CitrusType
1	1	2019-07-01 23:42:18.000	Apple	10	2.54	0
2	2	2019-07-01 23:48:54.000	Orange	16	3.28	1
3	3	2019-07-01 23:52:26.000	Lemon	8	1.64	1
4	4	2019-07-01 23:56:33.000	Mango	7	4.32	0
5	5	2019-07-02 10:42:56.000	Banana	24	8.48	0

4. If **Error** then `Stat.Status` contains an **error code** and `Stat.Message` contains an **error message**

3.4 **UPDATE** row in table

- **Update** an existing **row** in the **table** where **FruitName = “Mango”**

Syntax of the SQL statement in SSMS

```
UPDATE TestTable SET Quantity = 32, Weight = 12.68 WHERE FruitName =
'Mango'
```

Syntax of the SQL statement in TIA environment

```
Query[1] := UPDATE TestTable SET Quantity=32, Weight=12.68 WHERE
FruitName = $'Mango$'';
Query[2] := '';
```

⚠ In the **TIA environment** you must **add** a **dollar** (**$**) sign **before** each **single quote** in the **query string !**

Compose UPDATE string from input variables (SCL language)

```
#sFruitName := 'Mango';
#iQuantity := 32;
#rWeight := 12.68;

#str := 'UPDATE TestTable SET Quantity=';
#str := CONCAT(IN1 := #str, IN2 := INT_TO_STRING(#iQuantity));
#str := CONCAT(IN1 := #str, IN2 := ',Weight=');
#str := CONCAT(IN1 := #str, IN2 := REAL_TO_STRING(#rWeight));
#str := CONCAT(IN1 := #str, IN2 := ' WHERE FruitName=$''');
#str := CONCAT(IN1 := #str, IN2 := #sFruitName);
#str := CONCAT(IN1 := #str, IN2 := '$''');

"DB_PDSql_1200".Query.Query[1] := #str;
"DB_PDSql_1200".Query.Query[2] := '';
```

Execute SQL query with PDSql Library

1. **Execute** SQL query

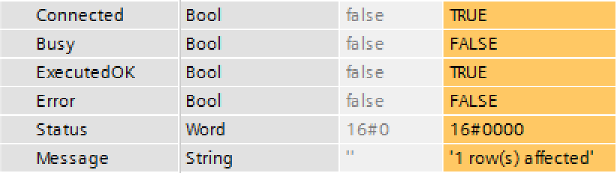
   `Cmd.ExecuteQuery := TRUE;`

   Set `Cmd.ExecuteQuery` on `TRUE` will also automatically connect to SQL server if not connected yet.

2. **Wait** for the execution of the SQL query

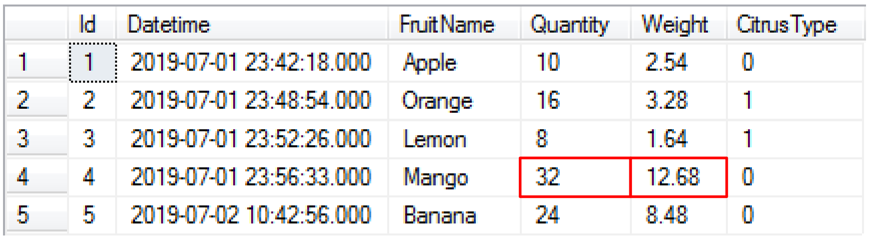
   `(Stat.ExecutedOK OR Stat.Error) = TRUE;`

3. If **ExecutedOK** then a row was updated successfully



Connected	Bool	false	TRUE
Busy	Bool	false	FALSE
ExecutedOK	Bool	false	TRUE
Error	Bool	false	FALSE
Status	Word	16#0	16#0000
Message	String	''	'1 row(s) affected'

“**TestTable**” after executing the **UPDATE** command



	Id	Datetime	FruitName	Quantity	Weight	CitrusType
1	1	2019-07-01 23:42:18.000	Apple	10	2.54	0
2	2	2019-07-01 23:48:54.000	Orange	16	3.28	1
3	3	2019-07-01 23:52:26.000	Lemon	8	1.64	1
4	4	2019-07-01 23:56:33.000	Mango	32	12.68	0
5	5	2019-07-02 10:42:56.000	Banana	24	8.48	0

4. If **Error** then `Stat.Status` contains an **error code** and
   `Stat.Message` contains an **error message**

3.5 **DELETE** row from table

➢ **Delete** an existing **row** from the **table** where **FruitName = “Lemon”**

Syntax of the SQL statement in SSMS

```
DELETE FROM TestTable WHERE FruitName = 'Lemon'
```

Syntax of the SQL statement in TIA environment

```
Query[1] := 'DELETE FROM TestTable WHERE FruitName=$'Lemon$'';
Query[2] := '';
```

⚠ In the **TIA environment** you must **add** a **dollar ($)** sign **before** each **single quote** in the **query string !**

Compose DELETE string from input variables (SCL language)

```
#sFruitName := 'Lemon';

#str := 'DELETE FROM TestTable WHERE FruitName=$'';
#str := CONCAT(IN1 := #str, IN2 := #sFruitName);
#str := CONCAT(IN1 := #str, IN2 := '$'');

"DB_PDSql_1200".Query.Query[1] := #str;
"DB_PDSql_1200".Query.Query[2] := '';
```

Execute SQL query with PDSql Library

1. **Execute** SQL query

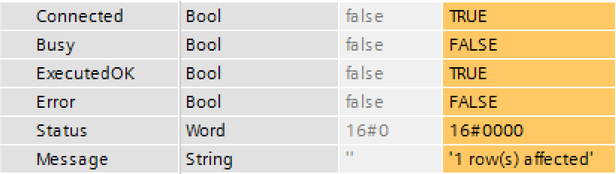
   `Cmd.ExecuteQuery := TRUE;`

   Set `Cmd.ExecuteQuery` on `TRUE` will also automatically connect to SQL server if not connected yet.

2. **Wait** for the execution of the SQL query

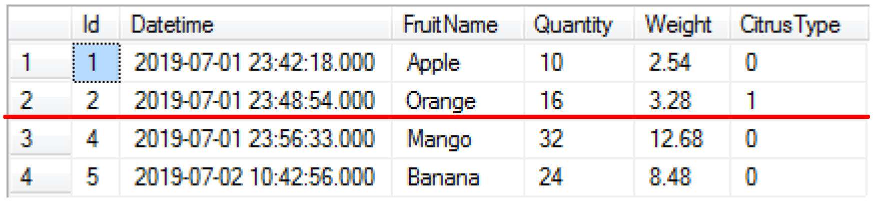
   `(Stat.ExecutedOK OR Stat.Error) = TRUE;`

3. If **ExecutedOK** then the existing row was deleted successfully



Connected	Bool	false	TRUE
Busy	Bool	false	FALSE
ExecutedOK	Bool	false	TRUE
Error	Bool	false	FALSE
Status	Word	16#0	16#0000
Message	String	''	'1 row(s) affected'

“**TestTable**” after executing the **DELETE** command



	Id	Datetime	FruitName	Quantity	Weight	CitrusType
1	1	2019-07-01 23:42:18.000	Apple	10	2.54	0
2	2	2019-07-01 23:48:54.000	Orange	16	3.28	1
3	4	2019-07-01 23:56:33.000	Mango	32	12.68	0
4	5	2019-07-02 10:42:56.000	Banana	24	8.48	0

4. If **Error** then `Stat.Status` contains an **error code** and `Stat.Message` contains an **error message**