

APPLICATION EXAMPLE

AC500 MSSQL ACCESS

MSSQL FUNCTION BLOCK LIBRARY



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2 Introduction

2.1 Scope of the document

This document describes an example to communicate with Microsoft SQL database (MSSQL), where AC500 acts as Client. The advantage is to increase security by establishing communication only from plant side (AC500). Only the IP address of the server is fixed, which benefit in the mobile networks where standard IP addresses frequently change.

SQL communication, where an AC500 acts as a Client. The advantage is an increased security by establishing communication only from plant side (AC500), that also all further communication actions are under control of the plant and that only the IP address of the server must be a fixed one, which is a benefit in mobile networks where standard IP addresses frequently change. Another security reason is that the port for communication is only opened when the port is required. If the Function block is not enabled, there is no port open to listen.

2.2 Compatibility

The application example explained in this document have been used with the below engineering system versions. They should also work with newer versions; nevertheless, some small adaptations may be necessary, for future versions.

- AC500 V3 PLC
- Automation Builder 2.2.0 or newer

3 Communication

3.1 Generally

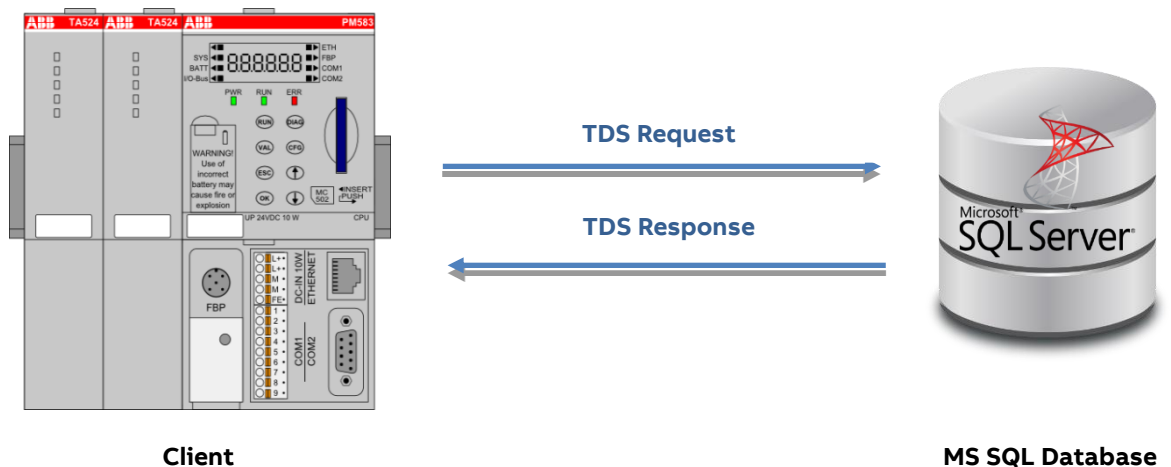
A typical SQL session open a TCP/IP connection to the server where the database is stored. Actually, it is more correct to say that clients and SQL Server use Tabular Data Stream (TDS), but TDS actually sits on top of TCP.

MS SQL Server listens for incoming connections on a particular port. The default port for MS SQL Server is 1433.

When the client establishes a TCP/IP connection, a two-way handshake takes place. The client opens a source port and sends traffic to a destination port, which is 1433 by default. The client source port in use is random but is greater than 1024.

The server (in this case, MS SQL Server) then communicates to the client by sending traffic from 1433 back to the port that the client established.

After that, the client sends a TDS Login request to the server. The server answers with the ACK OK or an error code if something wrong.



4 Function Blocks

4.1 Overview

The following function blocks are provided by the AC500 MsSql library. More information's about inputs and outputs can be find in the library itself.

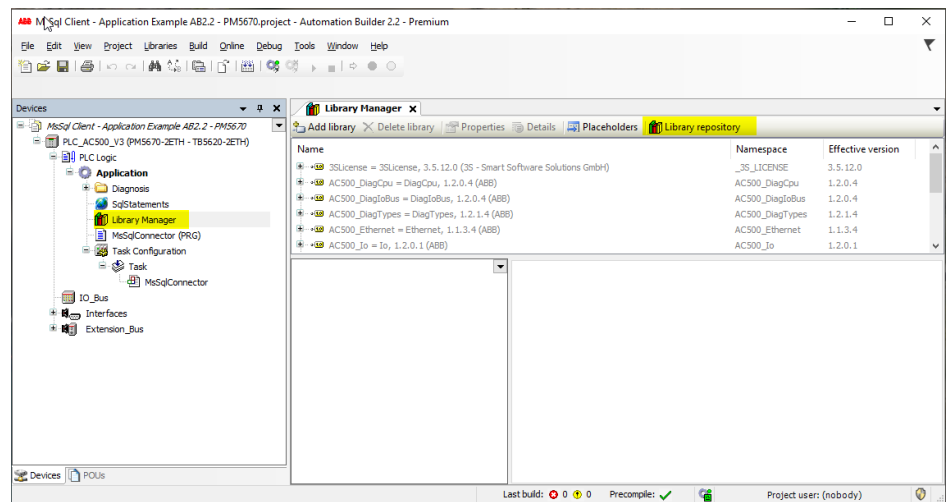
- **MsSqlConnect(Fb)** Establish a connection to the MSSQK server via TCP/IP. The communication is using Tabulator-Data-Stream (TDS) protocol.
- **MsSqlExecute(Fb)** Executes the SQL statement and returns the ResultSet generated by the query or the OK Packet from a non-Query statement.
- **MsSqlGetValue(Fb)** Returns the value of the ResultSet at the given position (Column, Row).
- **MsSqlDisconnect(Fb)** Releases the connection to the given database.

5 Example Project

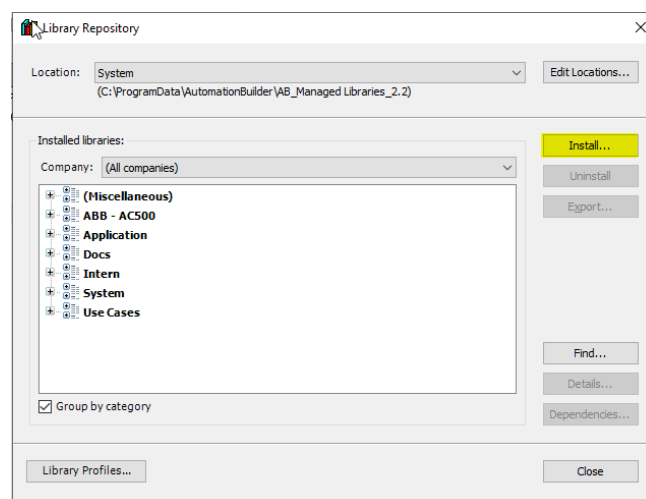
Attached is the Automation Builder Project to use the different function blocks.
It provides an example program for each function block.

5.1 How to install the MsSql library

1. After opened the application example
2. Navigate to the **Library Manger**

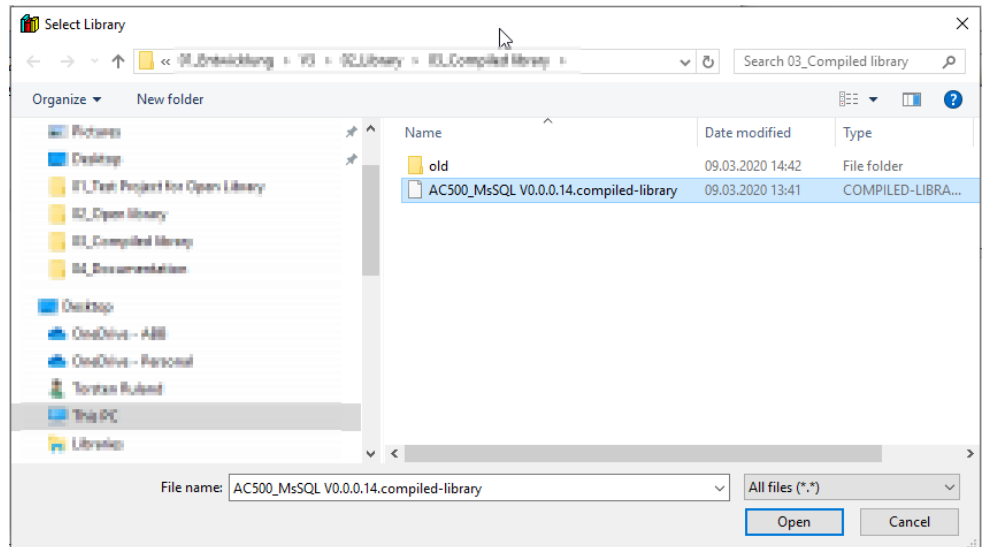


3. Select **“Library repository”**
4. The following window will be shown

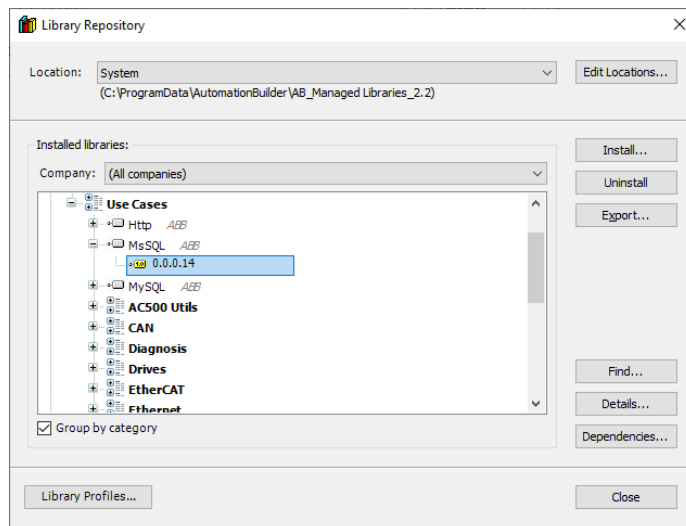


5. Select **“Install...”**

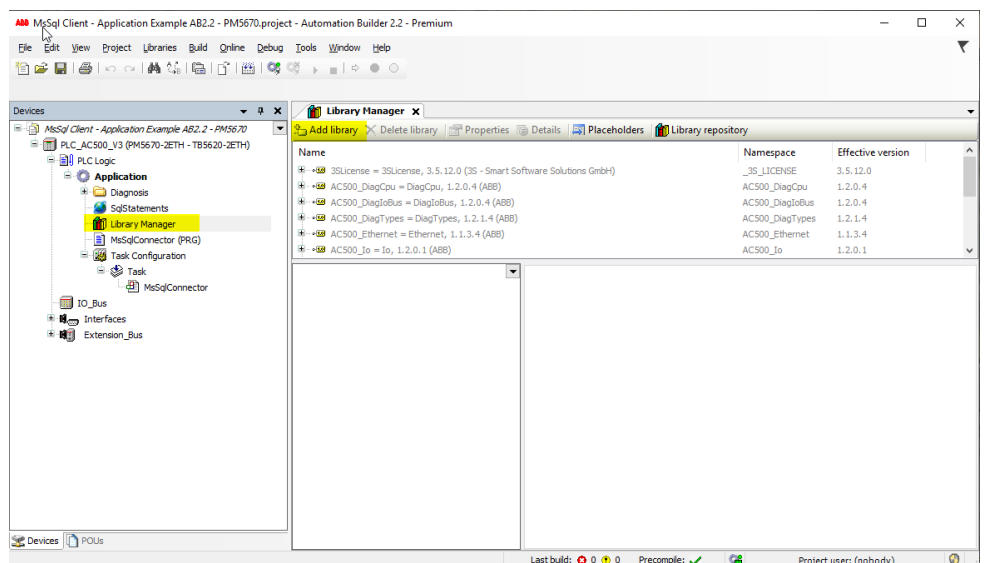
6. Choose your location where the compiled library is stored



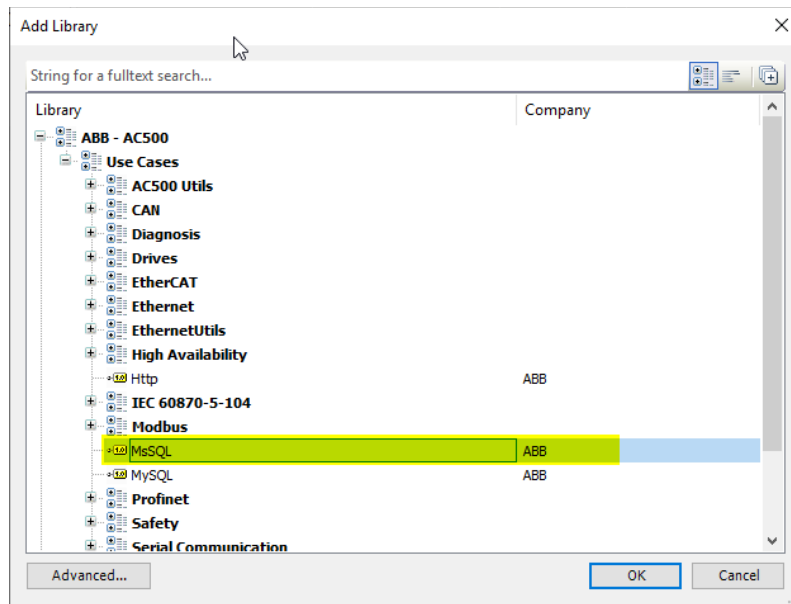
7. The library will be installed now. You can find the installed library under the section: **ABB – AC500 → Use Cases → MsSql**



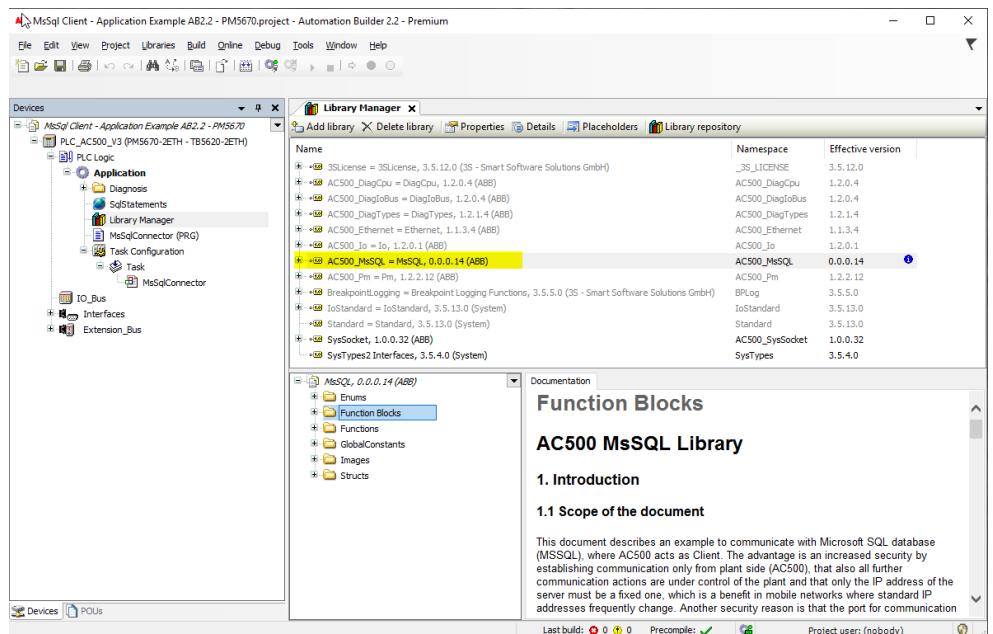
8. Now, we need to “Add library” into the project.



9. Select the path (**ABB – AC500 → Use Cases → MsSQL**) where we have installed the library before.



10. Now, the library is added into the project



11. Library documentation can be found inside the library as you can see.

12. **Attention:** If some libraries are missing: Please click on “**Download Missing Libraries**” in the Library Manager to download these. The libraries will be installed automatically and added to the project.

5.2 Additional Information's



Note: If it is required to use more than one Instance of the “MSSQL_CONNECT” function block, each instance need his own unique port number to run in parallel.

It is not allowed to use the same unique port for two “MSSQL_CONNECT” instances.

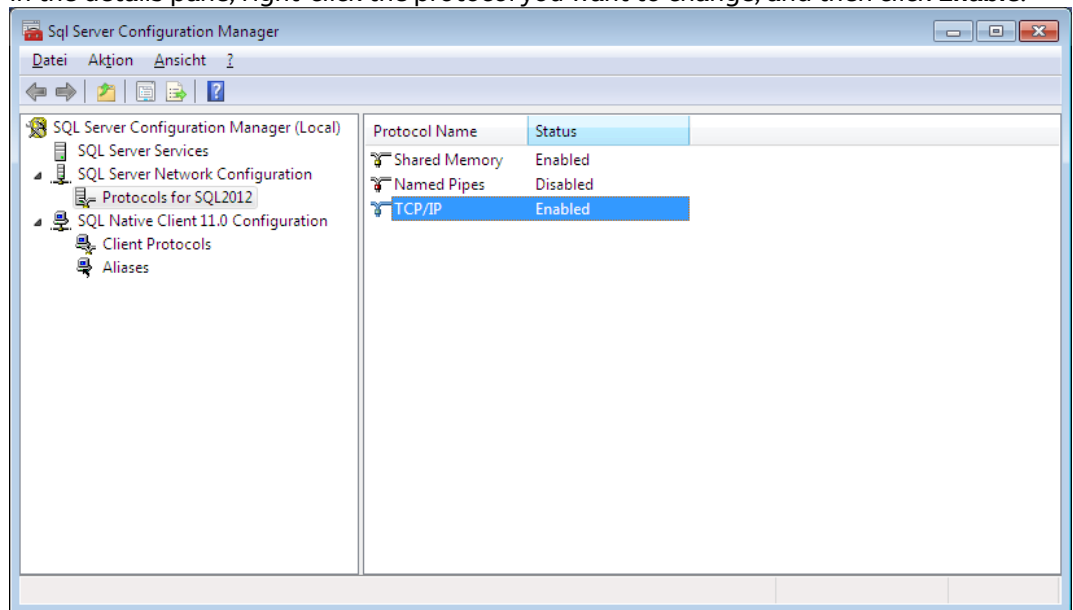
6 Setup Microsoft SQL database

6.1 Setup the database

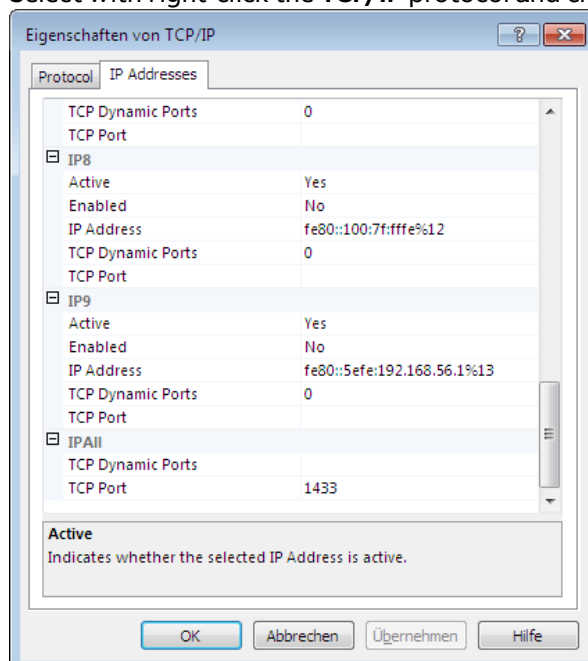
Please navigate to the “**SQL Server Configuration Manager**”. You can find them in:

Start->All Programs-> Microsoft SQL Server 20xx->Configuration Tools

1. In SQL Server Configuration Manager, click on **SQL Server Network Configuration** on the left panel, then right click on each protocol and click on Enable.
2. In the console pane, click **Protocols for <instance name>**.
3. In the details pane, right-click the protocol you want to change, and then click **Enable**.



4. Select with right-click the **TCP/IP** protocol and choose **Properties**



5. Select the **IP Addresses** tab and scroll down.

6. Insert port “1433” in the **TCP Port** box. This is the default port MS SQL. You can also adapt this one.
7. Apply with OK
8. In the console pane, click **SQL Server Services**.
9. In the details pane, right-click **SQL Server** (<instance name>), and then click **Restart**, to stop and restart the SQL Server service.

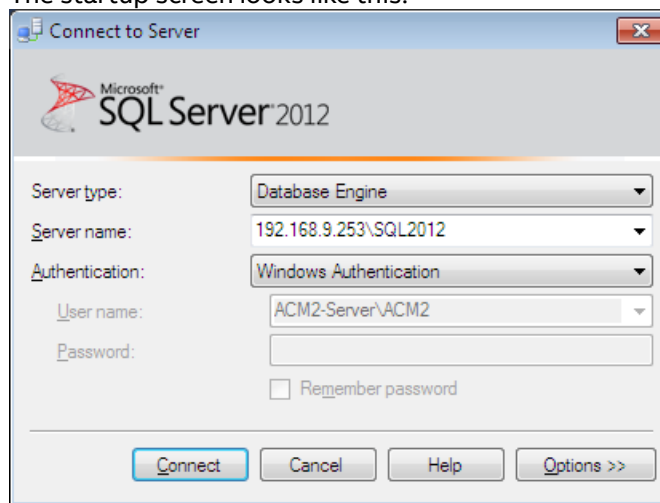
6.2 Configure the database

This chapter will guide you on how to configure the database.

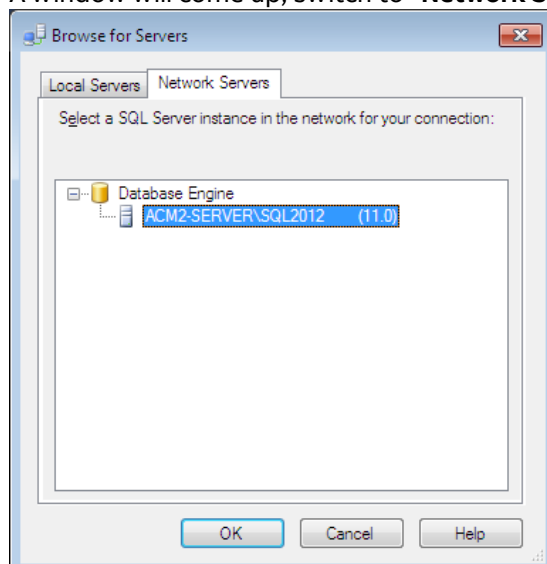
Please navigate to the “**SQL Server Management Studio**”. You can find them in:

Start->All Programs-> **Microsoft SQL Server 20xx**

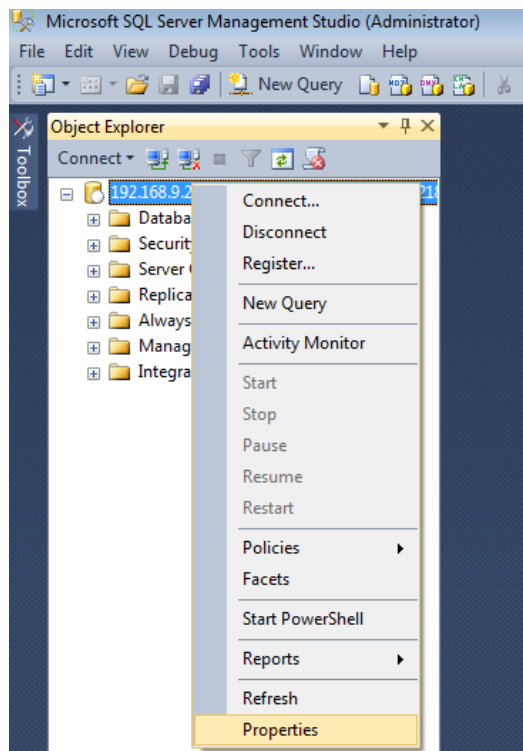
1. The startup screen looks like this:



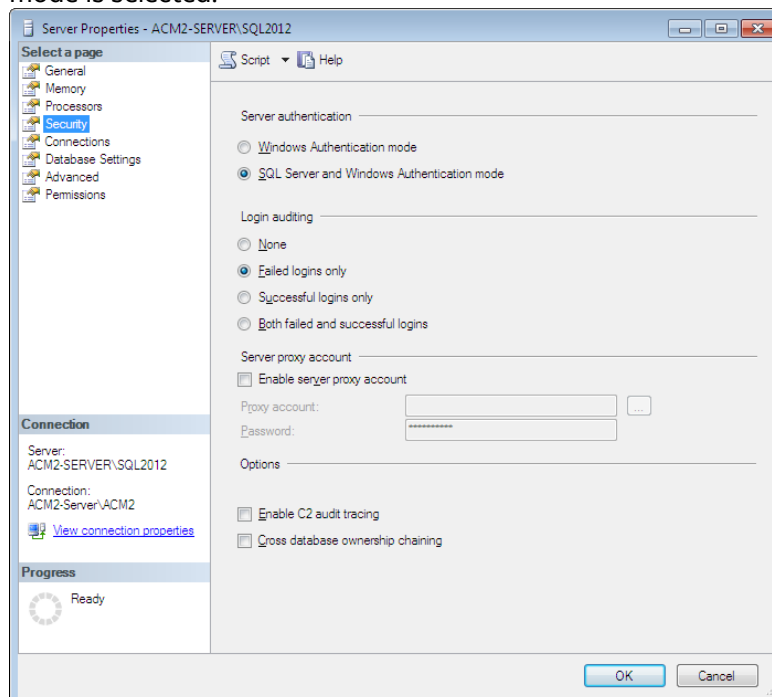
2. If the Server name is empty, please select **<Browse for more...>**
3. A window will come up, switch to “**Network Servers**” tab and select your instance.



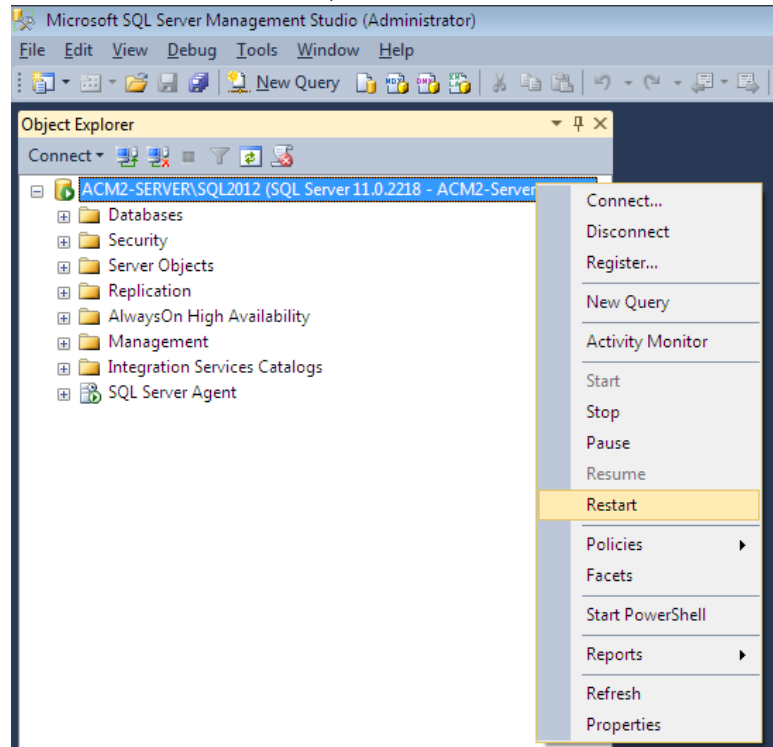
4. Keep as Authentication method the: **Windows Authentication** and click **Connect** button
5. Now, you are logged in.
6. In the next step we want to check the Server authentication. For that right-click at Server Instance and select **Properties**.



7. Select the **Security** register and check if the **SQL Server** and **Windows Authentication** mode is selected.

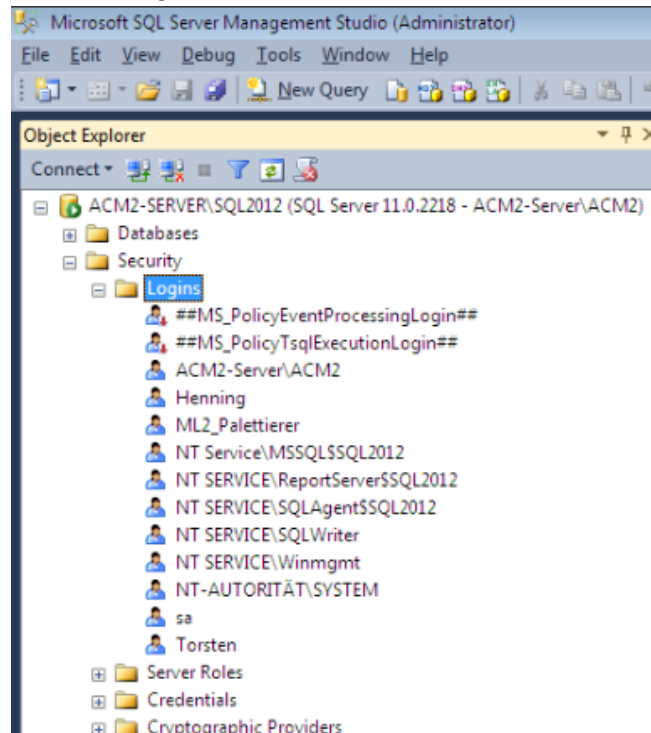


8. Click OK and restart the SQL server.

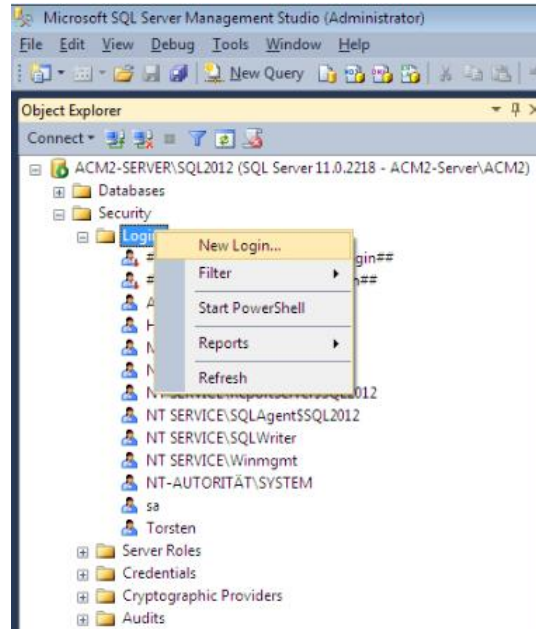


6.3 Add a new user

1. Navigate in the Object Explorer to the **Security** folder and select **Logins**. Here is a list of all existing Microsoft SQL users.



2. With a right-click on the **Logins** folder, we can select **New Login...**



3. A new window appears, where we can set a **Login name** and a **password** for the new user. In this case the **username: ac500** and **password: mssql**

The screenshot shows the 'Login - New' dialog box with the following fields and settings:

- Login name:** ac500
- Password:** mssql
- Confirm password:** (empty)
- Authentication:** SQL Server authentication (selected)
- Default database:** master
- Default language:** <default>
- Connection:** Server: ACM2-SERVER\SQL2012, Connection: ACM2-Server\ACM2
- Progress:** Ready

Please set all other parameters as you can see in this screen.

7 FAQs

Q: What V3 PLC types are supported by the MsSql library?

A: PM5630, PM5650, PM5670, PM5675

Q: Do we have any diagnose possibilities for this library?

A: Yes, we have. If something wrong with the database or a statement, we will receive the message in clear text and MsSql error numbers.

Q: Can we use this library together with CM577 and CM597?

A: No, both couplers do not support the TDS protocol

Q: Does the library supports dynamic ports?

A: No, the port must be static. Please use static port 1433

Q: Are secure connections supported for example, connection to Azure?

A: No, secure connections are not supported.

Q: What SQL Server versions are supported?

A: SQL Server 2012, SQL Server 2016, SQL Server 2019 are successfully tested

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