

Moog Valve and Pump Configuration Tool connect via EtherCAT using the example of the TwinCAT Masters

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1 Introduction

This function enables the Moog Valve and Pump Configuration Tool (MoVaPuCo) to access Moog valves and pumps as soon as they are connected to the EtherCAT master (e.g. TwinCAT) in an EtherCAT network.

You can use this connection with the MoVaPuCo to perform the same configuration steps as can be performed with a direct connection via the service interface (X10) of the valve. This eliminates the need for a direct connection via the X10 interface of a valve. Operation via EtherCAT is somewhat slower than with direct connection via X10.

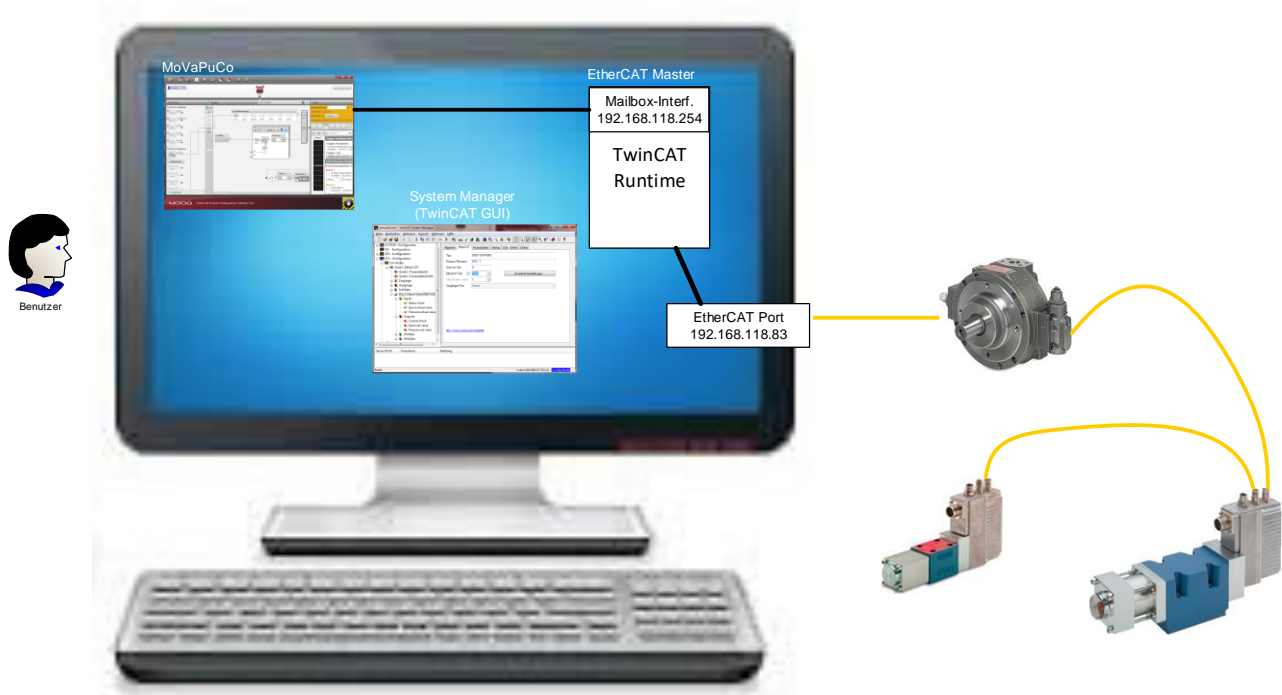
Information: A simultaneous connection via the service interface X10 and the EtherCAT Master is possible in principle, but is not recommended.

Preconditions:

- MoVaPuCo Version 3.3 or higher (Version 2.3, 3.1 and 3.2 also support EtherCAT in principle)
- TwinCAT® Master from version V 2.10.0 (Build 1340) with mailbox gateway support
Note: Smaller master controllers may not support a mailbox gateway.
- If MoVaPuCo and TwinCAT Master are installed on the same PC, this simplifies IP/network configuration. Remote maintenance from a remote PC is also possible.
- The EtherCAT network on which the valves are located must be fully operational (nodes reach the network status "Pre-Operational").

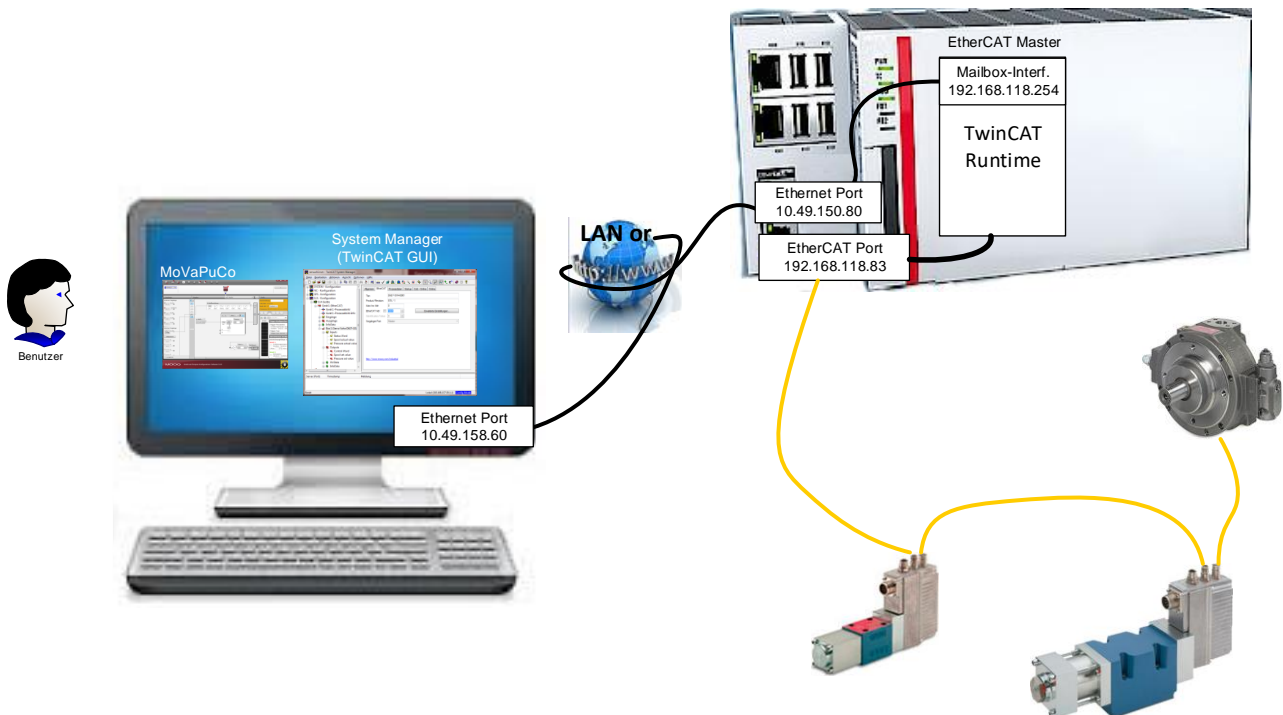
The IP addresses given here are only examples. Make sure with your network administrator that the IP addresses you want to use are not already assigned. If necessary fixed IP addresses should be used.

1.1 Variant 1: MoVaPuCo runs on the same PC as the TwinCAT Runtime

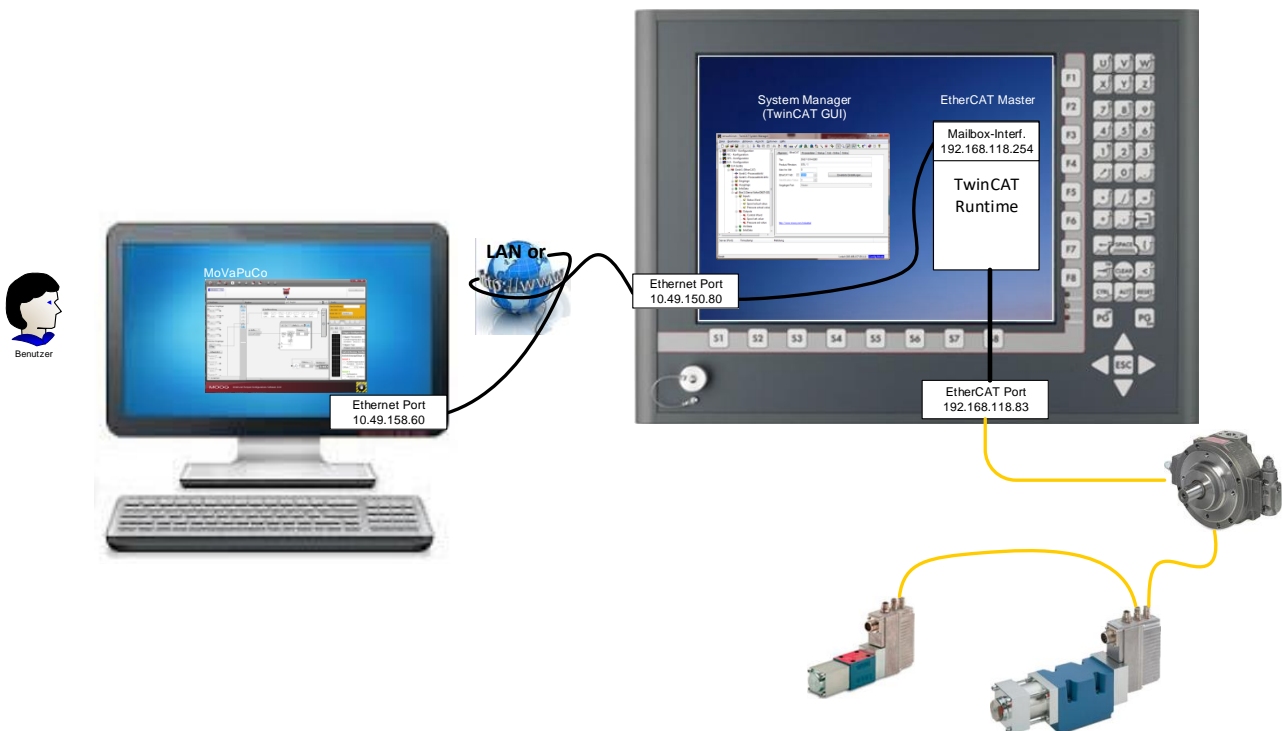


1.2 Variant 2: MoVaPuCo and TwinCAT run on a separate PC

The MoVaPuCo and the TwinCAT Runtime are each installed on a separate PC.
The computers are connected via LAN/Internet.



or (the configuration for the Movapuco connection is the same)



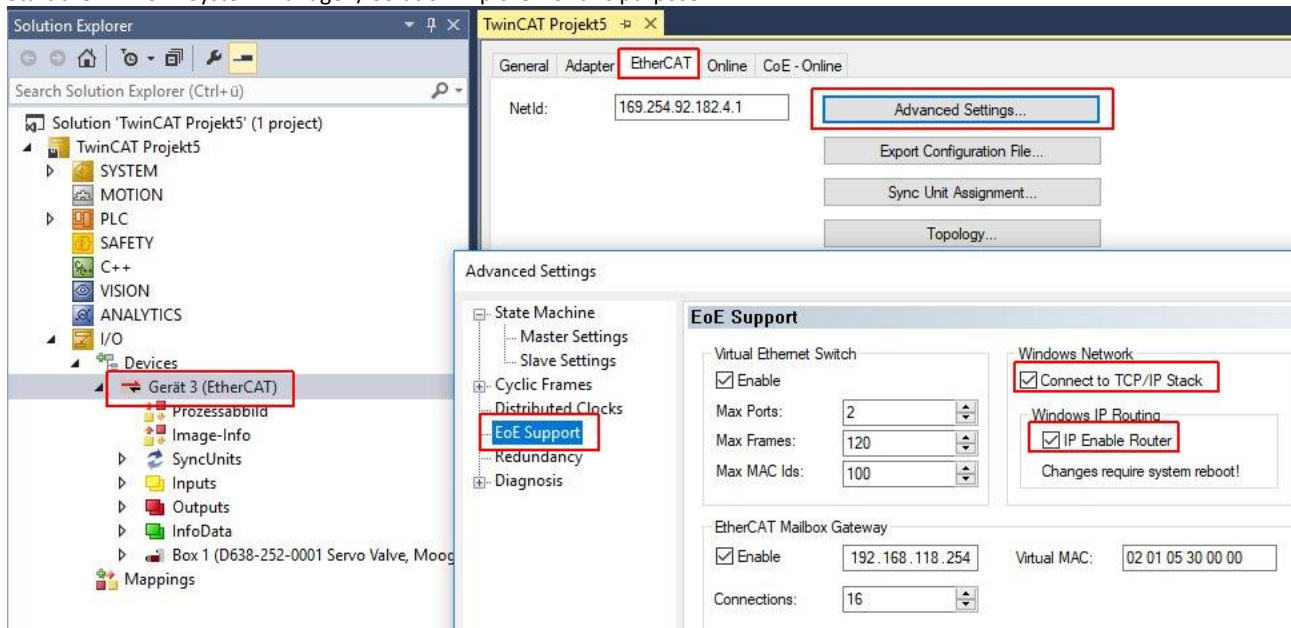
2 Configuration of TwinCAT for variants 1 and 2

The IP address must be determined from the correctly configured EtherCAT network card (see chapter 6.1 'Configuration of the EtherCAT network card'). In the example here 192.168.118.83. Now you can configure and activate the EoE support with the mailbox gateway in TwinCAT.

Hint: IP routing is not available in small controllers such as the Beckhoff CX9080. This means that a connection with the service tool (MoVaPuCo) cannot be established via these controllers.

Hint: Make sure that during your work with MoVaPuCo no simultaneous access (mailbox, CoE/SDO) of a control program to valve parameters is executed.

Start the TwinCAT System Manager / Solution Explorer for this purpose.



1. In TwinCAT project view, select the EtherCAT-Master, in this example *Gerät 3 (EtherCAT)*.
2. Select the tab *EtherCAT*
3. Click the Advanced Settings button.
4. Select the setting *EoE Support*
5. Activate the function Virtual Ethernet Switch: ☒ Enable
6. Activate the function windows network: ☒ Connect to TCP/IP Stack
7. Activate the function Windows IP-Routing: ☒ IP Enable Router. (For small controllers, e.g. CX9080, this is not available and is therefore greyed out. A connection with MoVaPuCo is therefore not possible!)
8. Activate the function Ethernet Mailbox Gateway: ☒ Enable
9. Enter the IP address of the mailbox gateway if not already suggested automatically. This results from the address of the EtherCAT port (in the above example 192.168.118.83), where you replace the last number with 254.: 192.168.118.254
10. Enter a number in the Connections field that is equal to or greater than the number of valves to be reached with MoVaPuCo via EtherCAT.
11. Note the IP address of the mailbox gateway for later entry in MoVaPuCo. (here 192.168.118.254)
12. Activate the new TwinCAT configuration (Menu: Actions | Start/Restart TwinCAT in Run mode) to activate the Mailbox Gateway.
13. Save these settings.

3 Routings Configuration

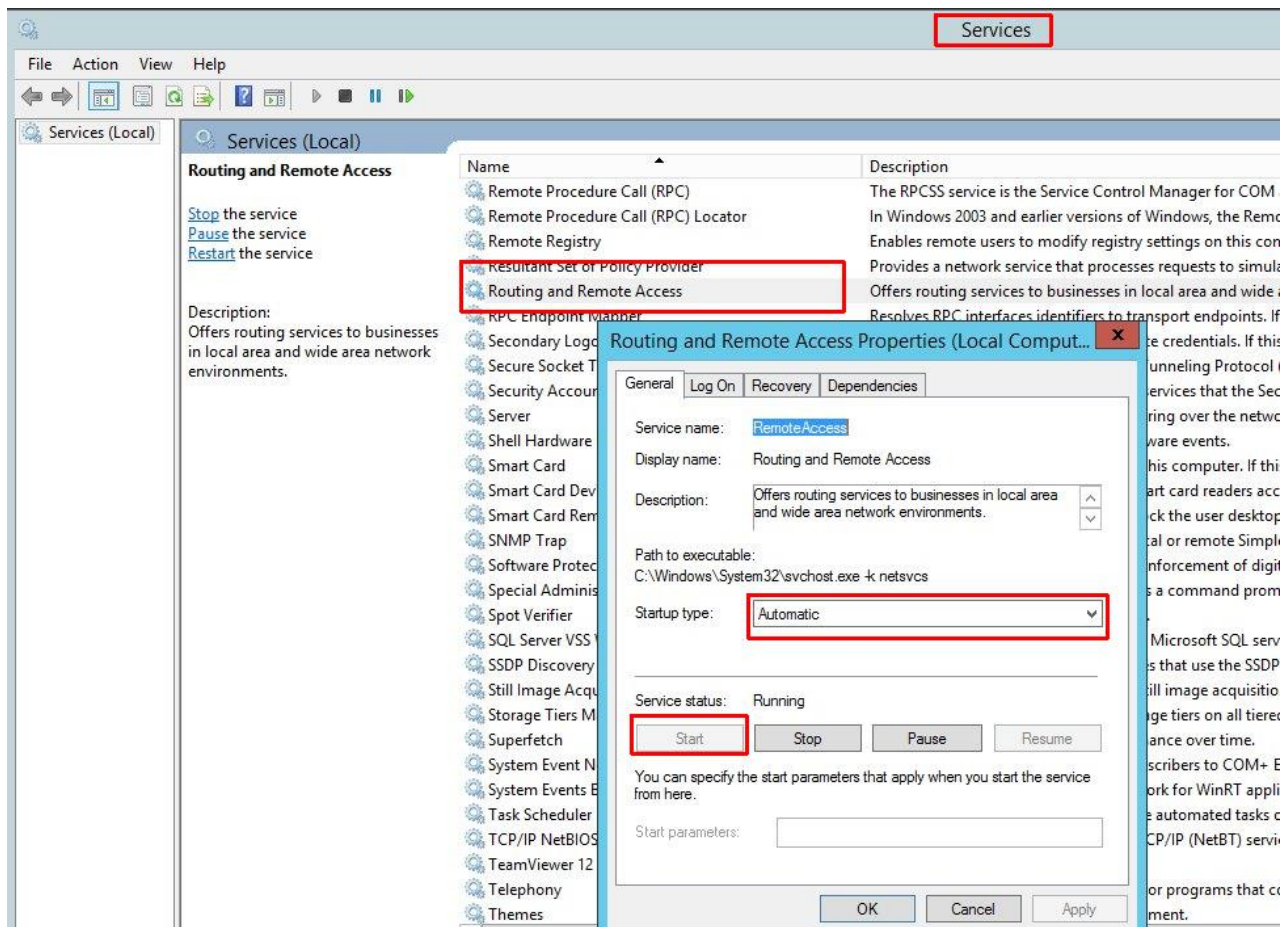
This step is only necessary if MoVaPuCo and TwinCAT run on different PCs (variant 2).

If the MoVaPuCo is located on the same PC as the TwinCAT Runtime, this chapter can be skipped and the configuration can be continued with chapter 4.

3.1 Starting Routing and RAS Service

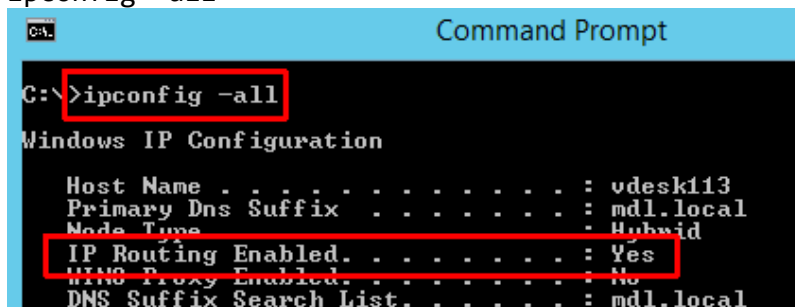
The routing service must be activated on the system on which the TwinCAT runtime is running.

In the Windows services configuration window, locate the Routing and RAS(RemoteAccess), and set the startup type to "Automatic" and start it.



This can be checked with the command:

```
ipconfig -all
```



Check if the ping replies to the mailbox. Example:

```
ping 192.168.118.254
```


3.2 Switching on routing

The MoVaPuCo-PC must be told where to find the mailbox interface. This is done with the route command.

Attention: wrong route commands can confuse the network or the PC. Consult a network administrator!

Hint: IP addresses 169.254.0.0 to 169.254.255.255 (Zeroconf or Zero Configuration Networking) are not routed! A connection with this is not possible.

Example here: Mailbox IP: 192.168.118.254, IP of the TwinCAT Runtime PC: 10.49.150.80

```
route add 192.168.118.254 Mask 255.255.255.255 10.49.150.80
```

Tells the PC that the IP address of the mailbox interface (192.168.118.254) can be found on the computer with IP 10.49.150.80.

```
route -4 print
```

Lists the IPv4 route table

```

Administrator: Eingabeaufforderung
C:\>route add 192.168.118.254 Mask 255.255.255.255 10.49.150.80
OK!

C:\>route -4 print
=====
Schnittstellenliste
17...54 06 8d de 3d 09 .....Check Point Virtual Network Adapter For Endpoint UPN Client
16...00 11 6b 67 e2 9f .....ASIX AX88179 USB 3.0 to Gigabit Ethernet Adapter
15...3c a9 f4 89 6d 71 .....Microsoft Virtual WiFi Miniport Adapter #2
14...3c a9 f4 89 6d 71 .....Microsoft Virtual WiFi Miniport Adapter
13...3c a9 f4 89 6d 70 .....Intel(R) Centrino(R) Ultimate-N 6300 AGN
12...34 e6 d7 77 0c 35 .....Intel(R) Ethernet Connection I217-LM
1.....Software Loopback Interface 1
=====

IPv4-Routentabelle
=====
Aktive Routen:
   Netzwerkziel   Netzwerkmaske   Gateway   Schnittstelle   Metrik
   -----
   0.0.0.0        0.0.0.0        10.49.230.1  10.49.156.16    10
   10.49.0.0      255.255.0.0    Auf Verbindung  10.49.156.16    266
   10.49.156.16   255.255.255.255 Auf Verbindung  10.49.156.16    266
   10.49.255.255  255.255.255.255 Auf Verbindung  10.49.156.16    266
   127.0.0.0      255.0.0.0      Auf Verbindung  127.0.0.1       306
   127.0.0.1      255.255.255.255 Auf Verbindung  127.0.0.1       306
   127.255.255.255 255.255.255.255 Auf Verbindung  127.0.0.1       306
   192.168.118.254 255.255.255.255 10.49.150.80  10.49.156.16    11
   224.0.0.0      240.0.0.0      Auf Verbindung  127.0.0.1       306
   224.0.0.0      240.0.0.0      Auf Verbindung  10.49.156.16    266
   255.255.255.255 255.255.255.255 Auf Verbindung  127.0.0.1       306
   255.255.255.255 255.255.255.255 Auf Verbindung  10.49.156.16    266
=====
Ständige Routen:
Keine

C:\>

```

To undo this:

```
route delete 192.168.118.254 Mask 255.255.255.255 10.49.150.80
```

Deletes the entry from the routing table.

```
route -p add 192.168.118.254 Mask 255.255.255.255 10.49.150.80
```

Parameter -p makes the routing permanently valid.

3.3 Checking whether the EoE-Mailbox interface is accessible

This is used to check whether the EoE interface of the EtherCAT master can be reached from the PC on which MoVaPuCo is installed.

To do this, start the command prompt on the MoVaPuCo-PC.

Example:

ping 10.49.150.80 → IP of the PC on which the TwinCAT Runtime System is running is available
(Network connection exists)

ping 192.168.118.254 → Mailbox gateway in the TwinCAT system can be reached
(Routing works and mailbox is active)

```

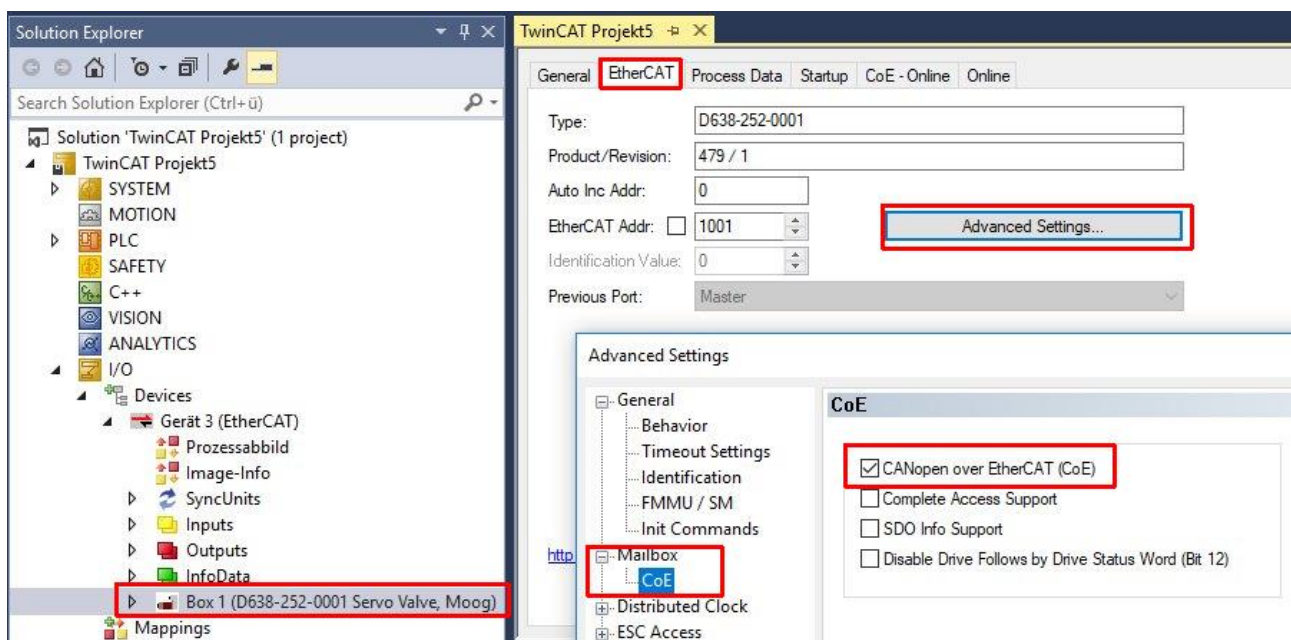
C:\>ping 192.168.118.254

Pinging 192.168.118.254 with 32 bytes of data:
Reply from 192.168.118.254: bytes=32 time=3ms TTL=128
Reply from 192.168.118.254: bytes=32 time=2ms TTL=128
  
```

4 Setting the Slave Nodes

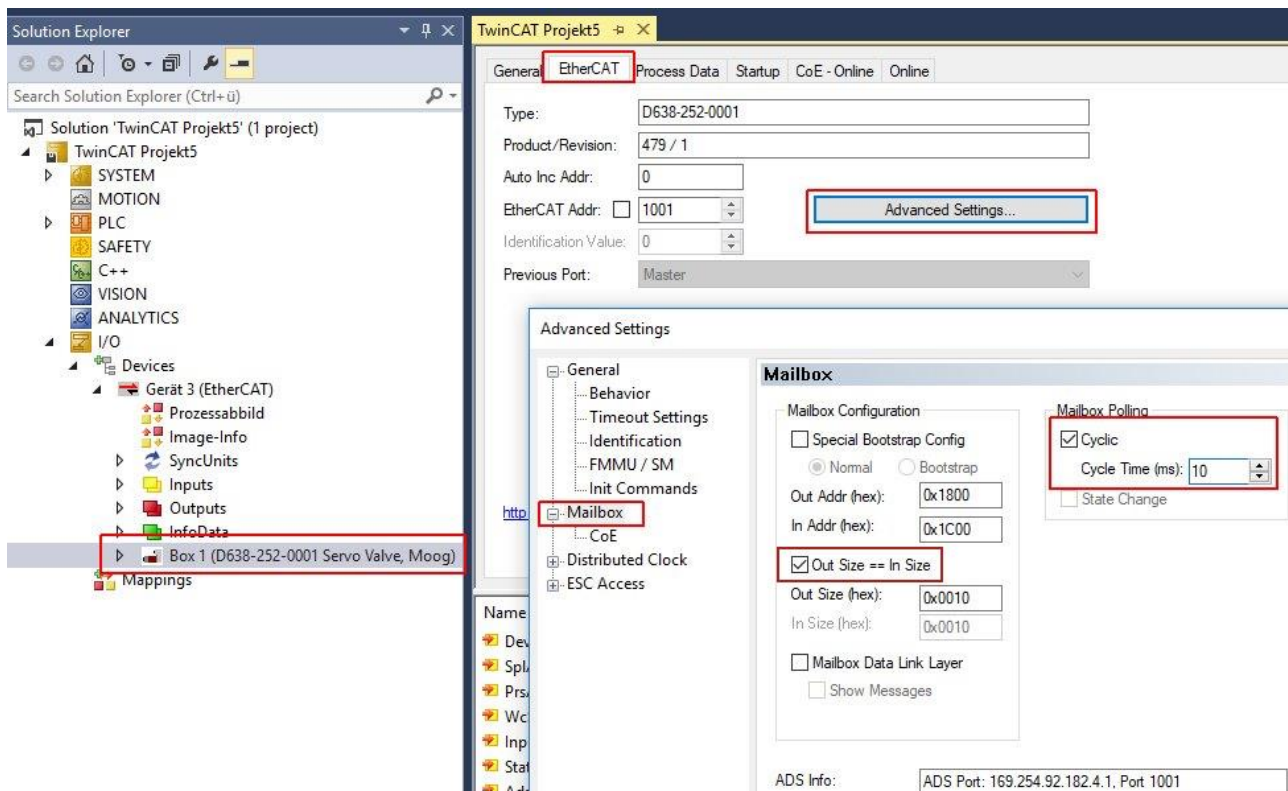
Now the mailbox interface has to be activated for each EtherCAT Slave node and the timing has to be set.

The following settings must be made for each slave node/box (valve) that is to be accessed with the service tool (mailbox protocol).



1. Click in the TwinCAT System Manager in the project view on the slave node (Box/Valve) to be configured, in this example Box 1. (*D638-252-0001 Servo Valve, Moog*).
2. Select the EtherCAT tab on the right.
3. Click the Advanced Settings button.

4. Select the setting *Mailbox - CoE*
5. Activate the function ☒ *CANopen over EtherCAT (CoE)*



1. In the project view of the TwinCAT System Manager, click on the slave node (box/valve) to be configured in this example Box1 (*D638-252-0001 Servo Valve, Moog*).
2. Select the tab EtherCAT.
3. Click the Advanced Settings button.
4. Select the setting *Mailbox*.
5. Set a short cycle time for the mailbox data exchange. ☒ *Cyclic*. *Cycle Time (ms): 10 ms*.
This setting is decisive for the timing of the transmission to the service tool.
6. Activate the new TwinCAT configuration to activate the new settings.
7. Make sure ☒ *Out Size == In Size* is selected.

Important: The high cycle time enables fast communication with the service tool, but also generates a high bus load. It is therefore strongly recommended to reset this time to the original value (20-50ms) after termination of the connection to the service tool.

Important: Make sure that during your work with MoVaPuCo no simultaneous access (mailbox, CoE/SDO) of a control program to valve parameters takes place in order to avoid competing accesses.

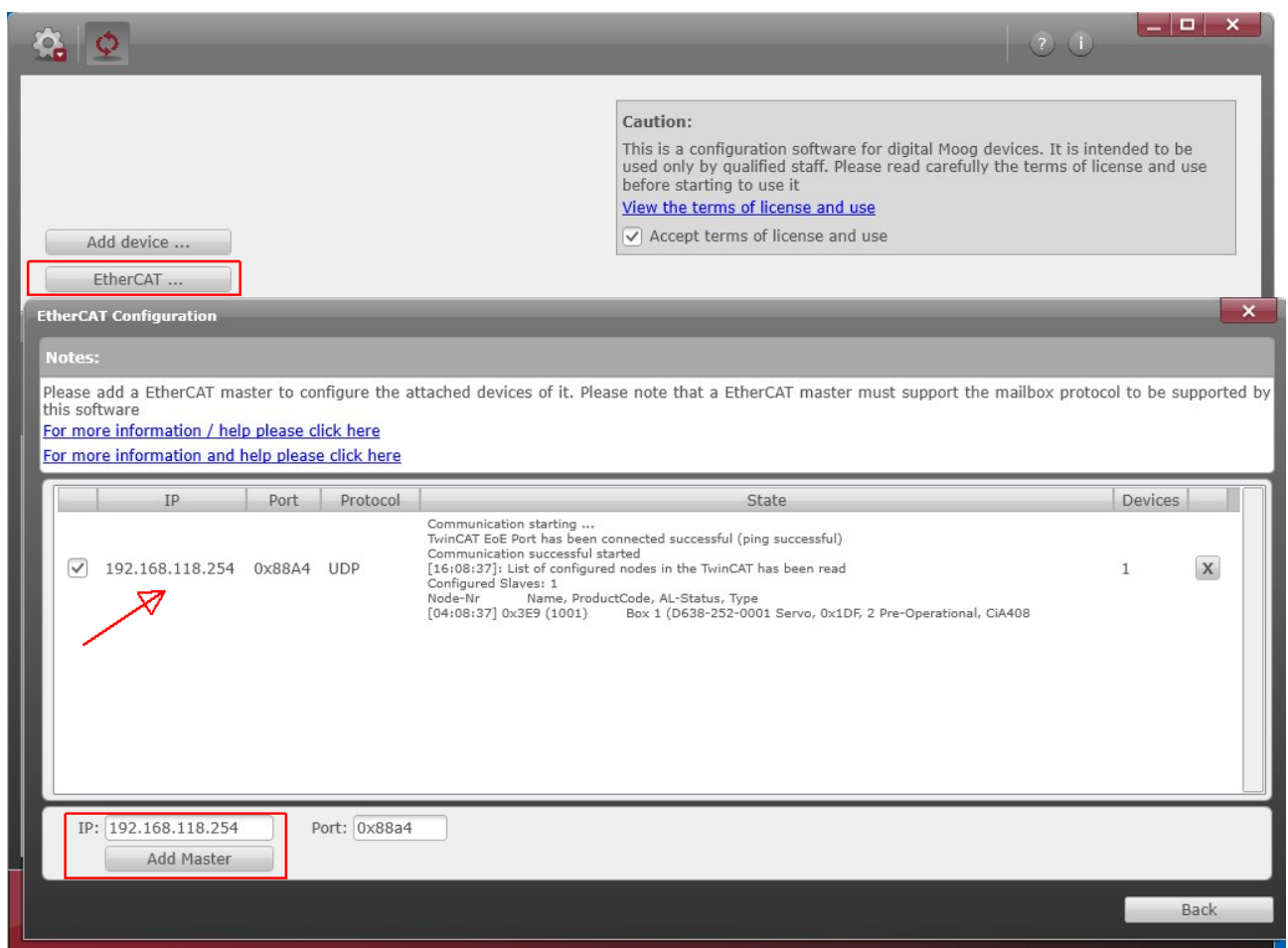
For this:

- Switch the EtherCAT network to the Pre-Operational state.
- Stop the PLC application program on the controller (TwinCAT-PLC).

5 Configure the connection to the EtherCAT Master in the MoVaPuCo

Warning: Make sure you select the correct device before making any changes to the configuration. Possible mix-ups can lead to incorrect functions in the system!

1. Make sure that the EtherCAT Master is running and the nodes are in Pre-Operational or "higher" state.
2. Make sure that the mailbox gateway can be connected using ping xxx.xxx.xxx.254 (see "Checking whether the e-mail mailbox interface can be addressed").
3. Start the MoVaPuCo.
4. Click on the "EtherCAT ..." button to set the connection. The following configuration window appears.
5. Enter under "IP:" the IP address of the Mailbox Gateway of the TwinCAT Runtime System, which you have noted in the EtherCAT Master when activating the Gateway and confirm the entry by a mouse click on "Add Master". Now the MoVaPuCo establishes the connection to the EtherCAT Master.



The search can be triggered again by activating the checkbox. If the mailbox gateway is not found, check the notes in the state field.

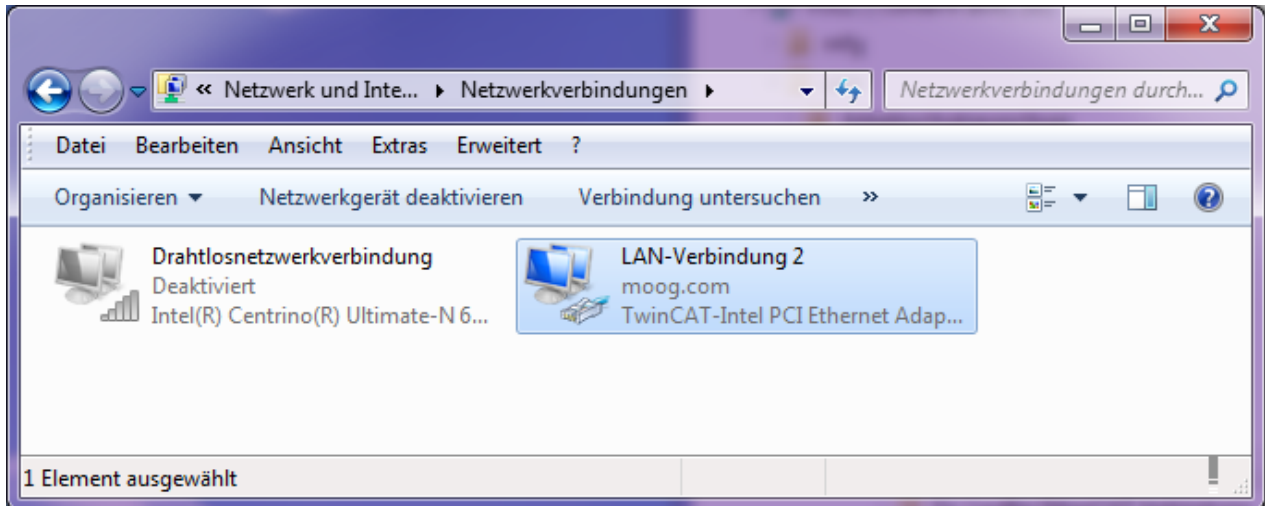
6. Now you can leave the window pressing "Back". MoVaPuCo automatically reads a list of the connected valves from the mailbox gateway and displays it in the main window.
7. In the start window select the valve you want to configure.
8. Now you can configure the selected valve in the usual way. If a valve is connected for the first time, loading may take up to 3 minutes, depending on the network and variant of the connection.

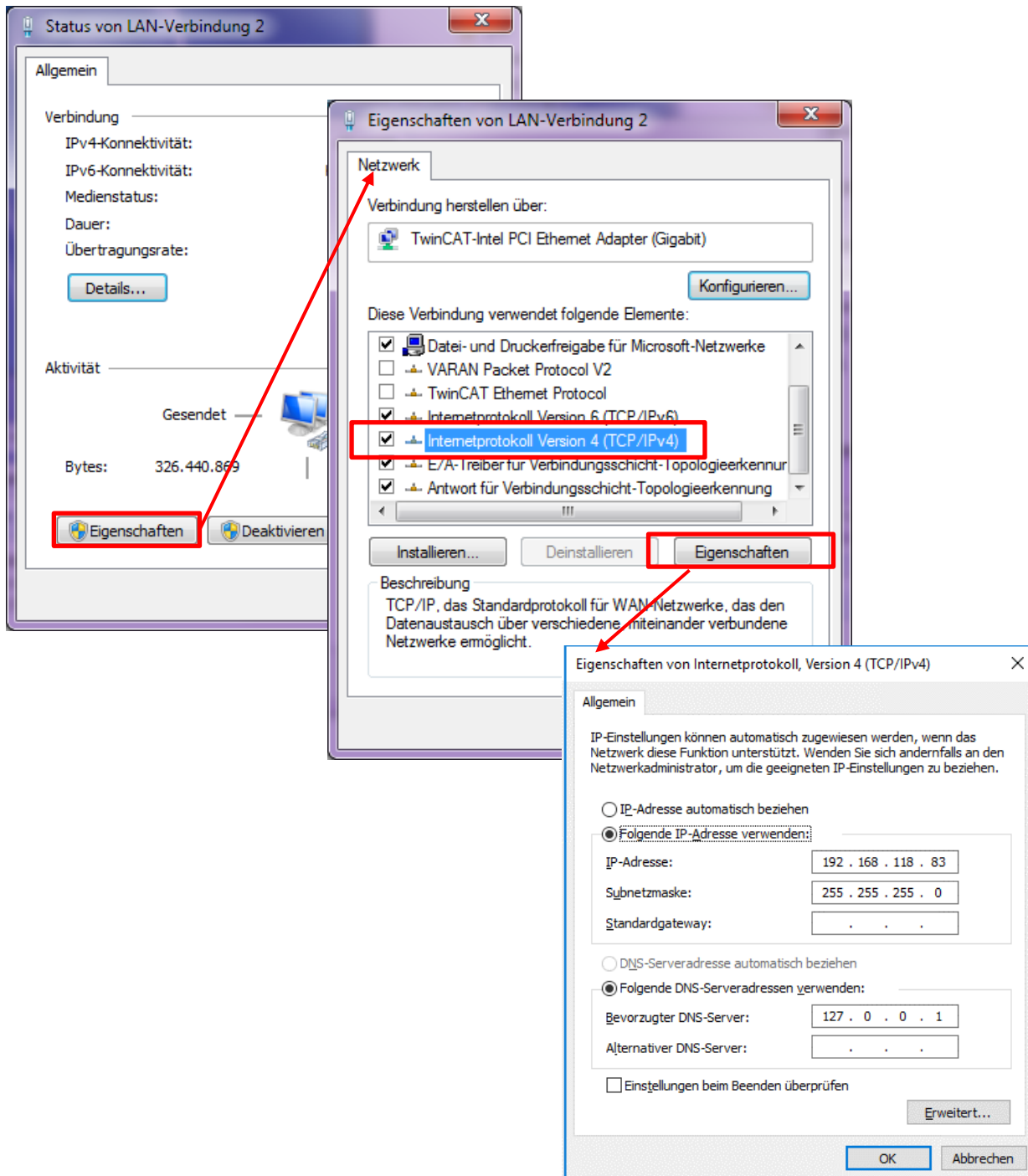
6 Appendix

6.1 Configuration of the EtherCAT network card

This IP address must be configured in the IPv4 protocol of the network card used for EtherCAT communication. In this example the IP will be configured fix to 192.168.118.83.

Open the Windows Control Panel to open the network configuration:





Important: Make sure that only one network card is configured for one subnet at a time.

For all network cards used, limit the range of possible network addresses via the respective subnet mask (e.g. by entering the subnet mask: 255.255.255.0. In this example, the first part of the IP address "192.168.118.*" must not be used for another network card).

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