



# IP S7 LINK SDK for .NET

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Just ask our support (via [support@traeger.de](mailto:support@traeger.de)) or let us consult you directly and clarify open questions with our developers!

### Update Information

- starting from v2.2 a new license key is required!
- starting from v2.2 some classes with the prefix “Siemens” were renamed to “Simatic”!

### **IP S7 LINK .NET SDK** – Evaluation Package<sup>1)</sup>

[Download ZIP Archive of IPS7LnkNet.Advanced](#) (Version: 2.3.0.0 – 2021-05-21)

[Download NuGet Package of IPS7LnkNet.Advanced](#) (Version: 2.3.0.0 – 2021-05-21)

[S7 Watch](#) (Version: 2.3.0.0 – 2021-05-21)

Ein kostenloser und einfacher, aber professioneller S7 Daten Monitor für den Datenzugriff auf S7 Steuerungen.

[Version History - The list of improvements in each version](#)

## Preview Download

There are currently no preview versions available. In case you're interested in some feature the SDK may not fulfill in the latest version: **Do not hesitate and just contact us via [support@traeger.de](mailto:support@traeger.de)!**

## IP S7 LINK

[Development Guide](#)

### Example Code: Monitoring the Operating Temperature

- [C#](#)
- [VB](#)

```

namespace App
{
    using System;
    using System.Threading;

    using IPS7Lnk.Advanced;

    public class Program
    {
        public static void Main()
        {
            var device = new SimaticDevice("192.168.0.80");

            using (var connection = device.CreateConnection()) {
                connection.Open();

                while (true) {
                    var temperature = connection.ReadDouble("DB10.DBD 20");
                    Console.WriteLine($"Current Temperature is {0} °C", temperature);

                    Thread.Sleep(1000);
                }
            }
        }
    }
}

```

```

Imports System
Imports System.Threading

Imports IPS7Lnk.Advanced

Namespace App
    Public Class Program
        Public Shared Sub Main()
            Dim device = New SimaticDevice("192.168.0.80")

            Using connection = device.CreateConnection()
                connection.Open()

                While True
                    Dim temperature = connection.ReadDouble("DB10.DBD 20")
                    Console.WriteLine("Current Temperature is {0} °C", temperature)

                    Thread.Sleep(1000)
                End While
            End Using
        End Sub
    End Class
End Namespace

```

<sup>1)</sup> Your “License Code” turns the package into a productive full version.

<sup>2)</sup> Not recommended for productive use.



# Development Introduction

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# Addressing

## Operands

The framework supports addressing of Inputs, Periphery Input, Outputs, Periphery Output, Flags, Data Blocks, Counters and Timers. Which of the components just mentioned is to be accessed is described via the operand portion of the PLC data address. The following table describes the different abbreviations, which are referred to as operands:

Name	Term (Siemens, DE)	Term (IEC)
Input	E	I
Periphery Input	PE	PI
Output	A	Q
Periphery Output	PA	PQ
Flag	M	M
Data Block	DB	DB
Counter	Z	C
Timer	T	T

In the case of a data block, the operand is followed by the number of the data block. This is followed by a period and repeats the abbreviation for the operand for data blocks.

The backus-aur form of an operand is defined as follows:

- `<Data-Block-Number> ::= 0-65535`
- `<Siemens-Operand> ::= E | PE | A | PA | M | DB<Data-Block-Number>.DB | Z | T`
- `<IEC-Operand> ::= I | PI | Q | PQ | M | DB<Data-Block-Number>.DB | C | T`

## Offsets

The actual addressing part of the PLC address comes after the operand and is divided into the data type identifier (in raw data format) and the offset for the byte to be addressed as well as the bit to be addressed if necessary (separated by a dot). The supported data type identifiers and their valid terms (for the raw data types) are described in the following table:

Datatype	Term	Bits	Value Range	Description	Array
BOOL	X	1	0 to 1	A single Bit to represent true (1) or false (0)	yes
BYTE	B	8	0 to 255	Unsigned 8-Bit Integer	yes
WORD	W	16	0 to 65.535	Unsigned 16-Bit Integer (Word)	yes
DWORD	D	32	0 to $2^{32}-1$	Unsigned 32-Bit Integer (Double Word)	yes
CHAR	B	8	A+00 to A+ff	Unsigned 8-Bit Zeichen as ASCII-Code	yes
INT	W	16	-32.768 to 32.767	Signed 16-Bit Integer	yes
DINT	D	32	$-2^{31}$ to $2^{31}-1$	Signed 32-Bit Integer	yes
REAL	D	32	+ $-1.5e-45$ to + $-3.4e38$	32-Bit Floating point number with single precision (according to IEEE754)	yes
S5TIME	W	16	00.00:00:00.100 to 00.02:46:30.000	Binary Coded Decimal-Number (BCD), representing a span of time	
TIME	D	32	00.00:00:00.000 to 24.20:31:23.647	Signed 16-Bit Integer, representing a span of time in milliseconds	

Datatype	Term	Bits	Value Range	Description	Array
TIME_OF_DAY	D	32	00.00:00:00.000 to 00.23:59:59.999	Unsigned 16-Bit Integer, representing a span of time in milliesconds	
DATE	W	16	01.01.1990 to 31.12.2168	Unsigned 16-Bit Integer, representing a date in days	
DATE_AND_TIME	D	64	00:00:00.000 01.01.1990 to 23:59:59.999 31.12.2089	Binary Coded Decimal-Number (BCD), representing a date and time	
S7STRING	B	-	A+00 to A+ff	A ASCII-Code encoded String of 254 Bytes maximum	

## Raw Data Types

The term stands for:

- X = Bit, to address a single bit (*when addressing a bit, the X is optional*)
- B = Byte, to address 8 Bits
- W = Word, to address 16 Bits
- D = Double Word (short DWord), to address 32 Bits

If the operand part and the data type identifiers just mentioned are put together, the following Backus-Naur form results:

```
<Operand with data type identifier> ::= (<Siemens-Operand> | <IEC-Operand>) [ X ] | B | W | D
```

## Examples

If you add the offset information to the PLC address, the address is complete and can look like this:

Example	Datatype	PLC Address (Siemens, DE)	PLC Address (IEC)
First Bit in first Byte in Input	BOOL	E 1.0	I 1.0
Seventh Bit in first Byte in Output	BOOL	A 1.7	Q 1.7
First Bit in tenth Byte in Flag	BOOL	M 10.1	M 10.1
Zero Bit in first Byte in Data Block with number 1	BOOL	DB1.DBX 1.0	DB1.DBX 1.0
First byte in Input	BYTE	EB 1	IB 1
Thenth Byte in Output	BYTE	AB 10	QB 10
Hundres of Byte in Flag	BYTE	MB 100	MB 100
Zero Byte in Periphery Input	BYTE	PEB 0	PIB 0
First Byte in Periphery Output	BYTE	PAB 1	PQB 1
First Byte in Data Block with number 2	BYTE	DB2.DBB 1	DB2.DBB 1
Zero Double Word in Periphery Input	DWORD	PED 0	PID 0

With the Backus-Naur form for the byte and bit offset, the complete PLC address is as follows:

- <Byte Offset> ::= 0-65535
- <Bit Offset> ::= 0-7
- <PLC Address> ::= <Operand with data type identifier> <Byte Offset> [. <Bit Offset> ]

# The connection to the PLC

## Open

This happens when you call 'Open':

1. It is checked whether an **end point has been set** (EndPoint property).
2. The connection changes its status (**PlcDeviceConnection.State** property) to the value **Opening**.
3. The connection **checks its configuration** for validity and coherence.
4. The connection then prepares for the first communication with the PLC.
5. The connection changes its status (**PlcDeviceConnection.State** property) to the value **Opened**.

## Connect

This happens when calling 'Connect':

1. It is checked whether the connection has already been opened (state property).
2. The connection changes its status (**PlcDeviceConnection.State** property) to the value **Connecting**.
3. The connection establishes a physical connection for the PLC and now occupies one of the maximum possible connections to the PLC.
4. Then, precautions are taken for **monitoring the connection**:
  1. "KeepAlive-Tracking" for the detection of dropped connections
  2. "Notification-Tracking" to receive notifications
5. The connection changes its status (**PlcDeviceConnection.State** property) to the value **Connected**.

## Close

This happens when you call 'Close':

1. The connection changes its status (**PlcDeviceConnection.State** property) to the value **Closing**.
2. The connection **releases all acquired resources**
3. **Completes** the monitoring of the physical connection
4. Any physical **connection to the PLC that has been established is terminated** and is thus available to other participants.
5. The socket created during connect is **closed and discarded**.
6. The connection changes its status (**PlcDeviceConnection.State** property) to the value **Closed**.

## BreakDetection

The "BreakDetection" designates the mechanism that is responsible for the detection of connection aborts. The KeepAlive process is used to **recognize** a timeout of the connection to the PLC. If the timeout occurs, the framework **automatically tries to re-establish a connection to the PLC**. While KeepAlive messages are sent to the PLC at regular intervals in order to "test" and "maintain" the connection, if the response times are too long (= timeout reached?) to receive a KeepAlive message it is assumed that the connection is interrupted. If this is the case, another KeepAlive message is sent at ever greater intervals. If these remain unanswered, a broken connection is assumed and the previously described mechanism for re-establishing the connection comes into effect. The termination detection, which is not activated by default, is activated via the **PlcDeviceConnection.UseBreakDetection** property.

## Connection Parameters

The correct parameters must be set so that a connection to the PLC can be established. **Generally the IP address of the PLC (IPDeviceEndPoint.Address property) is required**, under which it can be reached. The endpoint instance expected from the **SiemensDevice** setups the connection with all the information that is primarily necessary to connect to the PLC. Instead of the static IP address, the DNS name of the PLC can also be used, so "plc\_man\_drill\_001" could be used instead of "192.168.0.80". In addition to the IP address of the PLC, the end point requires the **number of the rack** (the position of the mounting rail) and the **number of the slot** of the CPU. If no rack or slot number is configured at the end point, the framework **automatically tries to set the appropriate numbers**. Which number has to be entered manually in the individual case always depends on the setup of the system / control cabinet. The rack number (starting at 0) defines the position of the mounting rail on which the PLC was attached in the body. The slot number (starting at 1) defines the position of the CPU in the setup of the modules of the PLC. An S7-300 mounted on the first top hat rail therefore has rack number 0.

The arrangement of the modules (on the mounting rail) corresponds to the diagram:

1. "Power Supply (SP)" Modul
2. "CPU" Modul
3. "Interface" Modul (IM)
4. "Signal" Modul 1 (SM)
5. "Signal" Modul 2 (SM)
6. "Signal" Modul 3 (SM)
7. ...

Then slot number 2 applies to this PLC because the CPU was positioned at this position.





# Development Guide

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C# | VB

# The App Frame

## A S7 App

1. Add reference to the **IPS7LnkNet.Advanced** Namespace:

```
using IPS7Lnk.Advanced;
```

2. Create an instance of the SimaticDevice class with the address of the controller:

```
var device = new SimaticDevice("192.168.0.80");
```

3. Build and open a connection to the controller:

```
var connection = device.CreateConnection();  
connection.Open();
```

4. Your code to interact with the controller:

```
// Your code to interact with the controller.
```

5. Close the connection before closing the application:

```
connection.Close();
```

6. Using the using block this looks as follows:

```
using (var connection = device.CreateConnection()) {  
    connection.Open();  
    // Your code to interact with the controller.  
}
```

## Process Data

### Addressing

The following types are used: [PlcAddress](#), [PlcRawType](#), [PlcOperand](#) and [PlcOperandType](#).

Regardless of the type of access, it must be described which data area you want to access. The **PlcAddress** of the data area determines where the data to be accessed is located in the controller. It is possible to construct the **PlcAddress** as a simple string (according to know addressing in the PLC) or via the API of the SDK. The paired examples below show how a **PlcAddress** can be created to address the same data in different ways.

- Fifth data word in the tenth data block:

```
var a = PlcAddress.Parse("DB10.DBW 5");  
var b = new PlcAddress(PlcOperand.DataBlock(10), PlcRawType.Word, 12);
```

- First bit in the fifth byte of the tenth data block:

```
var a = PlcAddress.Parse("DB10.DBX 5.1");
var b = new PlcAddress(PlcOperand.DataBlock(10), PlcRawType.Bit, 5, 1);
```

- Eighth byte in the input:

```
var a = PlcAddress.Parse("E8");
var b = new PlcAddress(PlcOperand.Input, PlcRawType.Byte, 8);
```

- Third bit in the ninth byte of the flag:

```
var a = PlcAddress.Parse("M9.3");
var b = new PlcAddress(PlcOperand.Flag, PlcRawType.Bit, 9, 3);
```

To define the `PlcAddress` using the `Parse`-method or one of the constructors, the addressing can also be done using the implicant cast operator of the class. Here the Siemens or IEC-specific addressing is also supported.

```
PlcAddress address = "DB3.DBB 10";
PlcAddress address = "MB 5";
PlcAddress address = "AW 2";
PlcAddress address = "QW 2";
```

The character string of the PLC data address on which a `PlcAddress` is based on can be called up using the `ToString` method of the `PlcAddress` class. It is possible to specify the desired operand standard (Siemens or IEC).

If no special standard is specified, the Siemens standard is always used.

```
PlcAddress address = "DB3.DBB 10";
Console.WriteLine(address.ToString()); // output: DB3.DBB 10

PlcAddress address = "MB 5";
Console.WriteLine(address.ToString()); // output: MB 5

PlcAddress address = "AW 2";
Console.WriteLine(address.ToString()); // output: AW 2
Console.WriteLine(address.ToString(PlcOperandStandard.IEC)); // output: QW 2
Console.WriteLine(address.ToString(PlcOperandStandard.Siemens)); // output: AW 2

PlcAddress address = "QW 2";
Console.WriteLine(address.ToString()); // output: AW 2
Console.WriteLine(address.ToString(PlcOperandStandard.IEC)); // output: QW 2
Console.WriteLine(address.ToString(PlcOperandStandard.Siemens)); // output: AW 2
```

The procedure shown here will be used in all other code sections for the sake of simplicity. Depending on the application, the desired addressing form can be used.

## Reading Values

The following types are used: [SimaticDevice](#), [PlcDeviceConnection](#) and [PlcAddress](#).

One of the data type-specific read methods of the

[PlcDeviceConnection](#)

1. Read a sequence of three `Int32`-values:

```
int[] values = connection.ReadInt32("DB1.DBD 1", 3);
```

Depending on the format of the PlcAddress and the PLC data type to be read, many bytes are read accordingly. The read PLC data type is then converted into the form of the desired PC data type. </panel>

## Writing Values

The following types are used: [SimaticDevice](#), [PlcDeviceConnection](#) and [PlcAddress](#).

To write one or more values (= an array) into a specific data area, coded in the format of the corresponding PLC data type, one of the data type-specific write methods of the

### [PlcDeviceConnection](#)

is used. If an array is passed instead of a single value during writing, all values in the array are written in the same order from the specified address.

- Write a single [Int32](#)-value:

```
connection.WriteInt32("DB1.DBD 1", 123);
```

- Write a sequence of three [Int32](#)-values:

```
connection.WriteInt32("DB1.DBD 1", 123, 456, 789);
```

## Values as PLC variables

The following types are used: [SimaticDevice](#), [PlcDeviceConnection](#), [PlcAddress](#), [PlcInt32](#), [PlcInt32Array](#), [PlcBoolean](#), [PlcBooleanArray](#) and [PlcString](#).

Often a certain data area has to be read or written several times and at different points in the program flow. If the data in which the value is stored in die PLC then changes, the entire source code must be searched for the old address and adapted accordingly to the new one. In addition, it is not always clear what value is hidden behind a PLC address of a certain data area. With the help of PlcValue objects, PLC variables can be defined one in the source code and uniquely addressed in any time.

- Define and read a single [Int32](#)-variable:

```
var speedVariable = new PlcInt32("DB1.DBD 1");
var speed = connection.ReadValue(speedVariable);
```

- Define and read an [Int32](#)-array variable:

```
var coordinatesVariable = new PlcInt32Array("DB1.DBD 1", 3);
var coordinates = connection.ReadValue(coordinatesVariable);
```

- Define and write a single [Int32](#)-variable:

```
var speedVariable = new PlcInt32("DB1.DBD 1", 123);
connection.WriteValue(speedVariable);

speedVariable.Value = 1200;
connection.WriteValue(speedVariable);
```

- Define and write an [Int32](#)-array variable:

```
var coordinatesVariable = new PlcInt32Array("DB1.DBD 1", 123, 456, 789);
connection.WriteValue(coordinatesVariable);

coordinatesVariable.Value[] = 10;
coordinatesVariable.Value[1] = 20;
coordinatesVariable.Value[2] = 30;
connection.WriteValue(coordinatesVariable);
```

Depending on the format of the PlcAddress and the PLC data type to be written, many bytes are written accordingly. The PC data type to be written is first converted into the desired PLC data type.

Since the consistency of the read or written data is particularly important, it is also possible to read or write several PLC variables at the same time. At this point, the mix of different PlcValue instances works exactly as if you were only using instances of a certain PlcValue type. Assuming, for example, the following process image, the corresponding read / write accesses look as follows.

```
var speedVariable = new PlcInt32("DB1.DBD 1");
var coordinatesVariable = new PlcInt32Array("DB2.DBD 1", 3);
var jobIsActiveVariable = new PlcBoolean("DB3.DBX 1.0");
var toolSetupVariable = new PlcBooleanArray("DB4.DBX 1.0", 5);
var operatorNameVariable = new PlcString("DB5.DBB 1", 32);
```

Reading the process image could look like this:

```
connection.ReadValues(
    speedVariable,
    coordinatesVariable,
    jobIsActiveVariable,
    toolSetupVariable,
    operatorNameVariable);

Console.WriteLine($"Speed: {speedVariable.Value}");
Console.WriteLine($"Coordinates: {string.Join(",", coordinatesVariable.Value)}");
Console.WriteLine($"Job is Active: {jobIsActiveVariable.Value}");
Console.WriteLine($"Tool Setup: {string.Join(",", toolSetupVariable.Value)}");
Console.WriteLine($"Operator Name: {operatorNameVariable.Value}");
```

The process image could be written as follows:

```
speedVariable.Value += 100;
coordinatesVariable.Value = new[] { 10, 20, 30 };
jobIsActiveVariable.Value = true;
toolSetupVariable.Value = new[] { false, true, true };
operatorNameVariable.Value = Environment.UserName;

connection.WriteValues(
    speedVariable,
    coordinatesVariable,
    jobIsActiveVariable,
    toolSetupVariable,
    operatorNameVariable);
```

The value of the value property of the PLC variable can be set using the constructor of the PlcValue class and changed using the value property. The value that is passed in the constructor can then be understood as a initial value. If the value property is changed, the new value is not automatically transferred to the controller - it must be carried out via an explicit WriteValue call.

# Structured data

The following sections **assume that** there is a process image in the controller that corresponds to the **(fictitious) data type “MillJob”**. The structure of the data type is defined as follows:

```
MillJob
  .Input : int
  .Number : string
  .Output : int
  .RotationSpeed : int
  .ToolDiameter : float
```

## Define Structure

The following types are used: [PlcObject](#), [PlcMemberAttribute](#) and [PlcMember](#).

The PlcObject class is derived to define the structure for access to structured data. In the derivation, corresponding fields and / or properties are then defined for all data areas to be addressed. The PlcMemberAttribute must then be set on each member that represents a value in the controller. The associated data area is then addressed via the attribute. If it is an array or a string value, the attribute also specifies the number of elements or the length of the string.

For the previously fictionally defined structure for example, the following implementation results as a PlcObjekt:

```
public class MillJob : PlcObject
{
    [PlcMember("DB1.DBD 20")]
    public int Input;

    [PlcMember("DB1.DBB 1", Length = 16)]
    public string Number;

    [PlcMember("DB1.DBD 25")]
    public int Output;

    [PlcMember("DB1.DBD 30")]
    public int RotationSpeed;

    [PlcMember("DB1.DBW 40")]
    public float ToolDiameter;
}
```

By combining the addressing of the process data via fields and properties, non-POCOs can be implemented:

```
public class MachineData : PlcObject
{
    [PlcMember("DB1.DBX 100.0", Length = 7)]
    private bool[] toolConfigurations;

    public MachineData()
        : base()
    {
    }

    [PlcMember("DB1.DBB 120")]
    public DateTime EstimatedFinishDate { get; set; }

    [PlcMember("DB1.DBB 1", Length = 16)]
    public string JobNumber { get; set; }

    [PlcMember("DB1.DBD 100")]
    public int Speed { get; set; }

    [PlcMember("DB1.DBW 50")]
    public float Temperature { get; set; }

    [PlcMember("DB1.DBX 100.0")]
    public bool UseCuttingTool { get; set; }

    public bool IsToolConfigured(int toolIndex)
    {
        return this.toolConfigurations[toolIndex];
    }
}
```

The information required for the definition can either be obtained from the controller manual or from the responsible PLC developer.

## Read Structure

The following types are used: [SimaticDevice](#), [PlcDeviceConnection](#) and [PlcObject](#).

The ReadObject method of the connection is used to read structured data via a previously defined structure:

```
MillJob job = connection.ReadObject<MillJob>();

Console.WriteLine("Input: {0}", job.Input);
Console.WriteLine("Number: {0}", job.Number);
Console.WriteLine("Output: {0}", job.Output);
Console.WriteLine("Rotation Speed: {0}", job.RotationSpeed);
Console.WriteLine("Total Diameter: {0}", job.ToolDiameter);
```

The fields / properties defined in the structure are read 1:1 in the order in which they were defined.

## Write Structure

The following types are used: [SimaticDevice](#), [PlcDeviceConnection](#) and [PlcObject](#).

The WriteObject method of the connection is used to write structured data via a previously defined structure:

```
MillJob job = new MillJob();
job.Input = 1;
job.Number = "MJ:100012";
job.RotationSpeed = 3500;
job.ToolDiameter = 12.8f;
job.Output = 3;

connection.WriteObject(job);
```

The values contained in the structure at the time of the call are written 1:1 in the order in which the fields / properties were defined.

## Notifications

### Connection(s) status

The following types are used: [PlcDeviceConnection](#), [PlcDeviceConnectionState](#), [PlcStatus](#) and [PlcNotifications](#).

The management of the connections to the individual controllers presupposes that the status of each connection is known at all times. To monitor the status of a connection, the events Opening, Opened, Connecting, Connected, Disconnected, Closing, Closed and Faulted can be handled. In summary, the StateChanged event can also be handled for all of these events.

```
connection.StateChanged += HandleConnectionStateChanged;

private static void HandleConnectionStateChanged(
    object sender,
    PlcDeviceConnectionStateChangedEventArgs e)
{
    if (connection.State == PlcDeviceConnectionState.Connected) {
        // ...
    }
}
```

Further information about the status of the connection can be queried via the status property of the connection. Part of this information is primarily the result of the last operation performed (such as the last addressed PLC data type). Here the change in status can be also treated accordingly.

```
PlcStatus status = connection.Status;
status.Changed += HandleConnectionStatusChanged;
```

In the appropriate EventHandler, the status information can then be used for user-defined logging or extended evaluation of the connection status.



```
private static void HandleConnectionStatusChanged(object sender, EventArgs e)
{
    var status = (PlcStatus)sender;

    Console.WriteLine(status.TimeStamp);
    Console.WriteLine("- Code={0}", status.Code);
    Console.WriteLine("- Text={0}", status.Text);
    Console.WriteLine("- Exception={0}", status.Exception?.Message ?? "<none>");
}
```

In addition to the instance-related events, all connections can also be monitored globally. Furthermore to the already mentioned events, this also includes a `ConnectionCreated` event which enables the dynamic addition of further event handlers.

```
PlcNotifications.ConnectionCreated += HandleNotificationsConnectionCreated;

...

private static void HandleNotificationsConnectionCreated(
    object sender,
    PlcNotifications.PlcDeviceConnectionEventArgs e)
{
    var connection = e.Connection;

    if (...) {
        // ...
    }
}
```

## Access Status

The following types are used: [PlcDeviceConnection](#), [PlcNotifications](#) and [PlcStatus](#).

Access to a certain data area can fail for several reasons. While an area either no longer exists, the start address may also be valid, but the end of data no longer corresponds to the expected end. Other situations like that are valid data, since no initial value may have been set. The cause of problems when accessing the data areas can be quickly found out using appropriate status codes.

If `PlcValue` instances are used for access, the status can be checked for each PLC variable.

```
var speedVariable = new PlcInt32("DB1.DBD 1");
connection.ReadValue(speedVariable);

if (speedVariable.Status.Code == PlcStatusCode.NoError) {
    // ...
}
```

In addition, the status can be checked down to the level of the PLC data type. Therefore the `GetStatus`-method is used. There is also the possibility to take the evaluation of an operation into your own hands. This makes it possible to evaluate a failed operation, which can also lead to an exception, yourself and to declare it as "OK". This is useful, for example, when developing a standard application for the controls of a system, but these do not have the same data areas, which is why a non-addressable data area can also be ignored.

For user-defined evaluation, a user-defined method must be entered in the static `PlcNotifications` class.

```
PlcNotifications.EvaluateStatus = EvaluateStatus;

...

private static bool EvaluateStatus(IPlcStatusProvider provider)
{
    if (provider is PlcDeviceConnection connection) {
        // ...
    }
    else if (provider is IPlcValue value) {
        // ...
    }

    // Fallback to "everything is okay".
    return true;
}
```

## Device Data

The following types are used: [SimaticDevice](#), [IPlcDeviceInfo](#), [PlcBlockInfo](#) and [PlcOperand](#).

Occasionally the device information of the controller is crucial to find out whether you are working with the right controller and where it is exactly. An instance of the [IPlcDeviceInfo](#) interface can be called up using the `GetInfo` method of the `PlcDevice` class to call up the device data available for this. The instance then contains all the device data provided.

```
var device = new SimaticDevice("192.168.0.80");
var deviceInfo = device.GetInfo();

if (deviceInfo.HasName)
    Console.WriteLine($"Name:      {deviceInfo.Name}");

if (deviceInfo.HasLocation)
    Console.WriteLine($"Location:   {deviceInfo.Location}");

if (deviceInfo.HasModuleName)
    Console.WriteLine($"Modul Name:  {deviceInfo.ModuleName}");

if (deviceInfo.HasModuleType)
    Console.WriteLine($"Modul Type:  {deviceInfo.ModuleType}");

if (deviceInfo.HasModuleSerial)
    Console.WriteLine($"Modul Serial: {deviceInfo.ModuleSerial}");

if (deviceInfo.HasPlantId)
    Console.WriteLine($"Plant ID:   {deviceInfo.PlantId}");

if (deviceInfo.HasTime)
    Console.WriteLine($"Time:      {deviceInfo.Time}");

if (deviceInfo.HasCopyright)
    Console.WriteLine($"Copyright:  {deviceInfo.Copyright}");
```

It should be noted that not every controller provides all of the device information shown here. To check whether information is available, one of the `has`-properties can be used.

# Settings

## General

The following types are used: [PlcDevice](#) and [PlcDeviceConnection](#).

The class `PlcDevice` and `PlcDeviceConnection` are used as base classes of `SimaticDevice` and `SimaticDeviceConnection`. As a result, the `SimaticDevice` class inherits, for example, the `EndPoint` property for configuring the endpoint via which the controller is to be connected. The `PlcDeviceConnection` also provides various properties. Part of these are properties for controlling the timeout behavior and termination detection.

Further specific settings depend on the provider used (= `PlcDevice` derivative) and can be configured accordingly after a cast to the `PlcDeviceConnections` specific types.

## Device Types

The following types are used: [SimaticDevice](#), [SimaticDeviceType](#) and [SimaticChannelType](#).

The framework generally tries to automatically determine the device types and the appropriate channels type for the controller. Depending on the type of control used and the structure of the network, it may be necessary to define the device types or the channel type manually.

```
var device = new SimaticDevice("192.168.0.80");
device.Type = SimaticDeviceType.S71200;
device.ChannelType = SiemensChannelType.ProgrammerDevice;
```

## Endpoints

The following types are used: [SimaticDevice](#), [IPDeviceEndPoint](#) and [SimaticDeviceType](#).

Generally, either the DNS-name or the IP address of the controller is sufficient for access. Depending on the type of control and setup of the network, the rack and slot number of the control may also have to be specified.

```
var device = new SimaticDevice();
device.Type = SimaticDeviceType.S71500;
device.ChannelType = SiemensChannelType.OperationPanel;
device.EndPoint = new IPDeviceEndPoint("192.168.0.80", rack: , slot: 2);
```

## Licensing

The IP S7 LINK SDK comes with an **evaluation license which can be used unlimited for each application run for 30 minutes**. If this restriction limits your evaluation options, you can request another evaluation license from us.

Just ask our support (via [support@traeger.de](mailto:support@traeger.de)) or let us consult you directly and clarify open questions with our developers!

After receiving your personalized **license key for IP S7 LINK development** it has to be committed to

the framework. Hereto insert the following code line into your application **before** accessing the **SimaticDeviceConnection class** for the first time. Replace *<insert your license code here>* with the license key you received from us.

```
IPS7LnkNet.Advanced.Licenser.LicenseKey = "<insert your license code here>";
```

Additionally you receive information about the license currently used by the framework via the *LicenseInfo* property of the **IPS7Lnk.Advanced.Licenser class**. This works as follows:

```
ILicenseInfo license = IPS7LnkNet.Advanced.Licenser.LicenseInfo;  
  
if (license.IsExpired)  
    Console.WriteLine("The IP S7 LINK SDK license is expired!");
```

In the course of development/evaluation, it is mostly irrelevant whether the test license or the license already purchased is being used. However, as soon as the application goes into productive use, it is annoying if the application stops working during execution due to an invalid license. For this reason, we recommend implementing the following code snippet in the application and at least executing it when the application is started:

```
#if DEBUG  
    IPS7LnkNet.Advanced.Licenser.FailIfUnlicensed();  
#else  
    IPS7LnkNet.Advanced.Licenser.ThrowIfUnlicensed();  
#endif
```

You can receive further information about licensing, purchase or other questions directly on our product page at: [www.traeger.de](http://www.traeger.de).

# Table of Contents

<b>Tested? You want it?</b>	1
<b>Development Guides</b>	2
<b>Download</b>	2
<b>Preview Download</b>	2
<b>IP S7 LINK</b>	2
Example Code: Monitoring the Operating Temperature	2
<b>Tested? You want it?</b>	4
<b>Addressing</b>	5
Operands	5
Offsets	5
Raw Data Types	6
Examples	6
<b>The connection to the PLC</b>	7
Open	7
Connect	7
Close	7
BreakDetection	7
Connection Parameters	8
<b>Tested? You want it?</b>	9
<b>The App Frame</b>	10
A S7 App	10
<b>Process Data</b>	10
Addressing	10
Reading Values	11
Writing Values	12
Values as PLC variables	12
<b>Structured data</b>	14
Define Structure	14
Read Structure	15
Write Structure	15
<b>Notifications</b>	16
Connection(s) status	16
Access Status	17
<b>Device Data</b>	18
<b>Settings</b>	19
General	19
Device Types	19
Endpoints	19
Licensing	19

