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## A .NET Qualification Tool for Pipet Instruments

Automated machine validation with customizable test procedures and statistical feedback



Snapshot qualification tool

```

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  <InitStrategy Id="GRIPPING:X">
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      <InitDependency To="GRIPPING:Z">
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    </InitDependencies>
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        <Speed I/Speed>
          <Acceleration I/Acceleration>
            </MoveAfterInit>
          </Acceleration>
        </Speed>
      </Position>
    </MoveAfterInit>
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</InitStrategy>
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    <TestDescription>
      <TestDependencies></TestDependencies>
      <TestCases>
        <TestCase Id="GRIPPING_FAST_LONG_TERM">
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            <TestProperty Type="distance" Value="3420" />
            <TestProperty Type="speed" Value="1" />
            <TestProperty Type="acceleration" Value="1" />
            <TestProperty Type="deceleration" Value="1" />
            <TestProperty Type="statisticsource" Value="4" />
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    </TestDescription>
  </TestDescriptions>
</TestStrategy>

```

Customized test strategy in XML



**Introduction:** Tecan Schweiz AG produces high-precision instruments and devices to support the daily tasks in a medical laboratory. Many of Tecan's instruments have motor-driven parts which move items (water tubes, tablets of wells etc.) from one station to another. During engineering, numerous motor-control parameters need to be evaluated in order to determine an optimal machine configuration. These motor-control parameters must be validated for their qualification by a process that should ideally be fully automated. In this bachelor thesis, a new qualification tool has been developed for the automated validation of the motor-control parameters on Tecan machines. The system runs long-term tests with customized and complex procedures described by the Tecan validation engineers. During the tests, the system continuously measures the movements performed, collects the measured data and generates statistical reports out of the data. The qualification system is realized as a software tool implemented in C# by using the standard Tecan C# machine control library (Tecan Base SDK).

**Approach/Technologies:** In the first phase of the project, the requirements for the new tool have been analyzed and formally specified. In the second phase, the architecture has been designed and the tool has been implemented. A focus has been set on the design of customizable test procedures. For this purpose, the concept of a test strategy has been introduced, specifying a set of concurrent test runs in XML. Each test run operates on a different motor and is represented as a combination of elementary movement instructions. The tool consequently tests the machine by moving the motors concurrently, where the motors are implicitly synchronized by declared dependency constraints.

**Result:** As a result of the project, a working version of the qualification tool has been realized and successfully applied on machines. The tool will replace the existing validation approach in Tecan, which consists of a number of LUA scripts that neither operate on the product-relevant Tecan SDK nor support automated repeated test runs. Therefore, the new qualification tool will yield more accurate validation results and enable higher productivity for the machine testing in Tecan.