



# MAT.CrossCheck

Simulation-based Quality Analysis  
for Traffic Light Control

# Simulation-based Quality Analysis of Traffic Light Control Operations

## Introduction

MAT.CrossCheck is a traffic analysis tool to assess the quality of traffic light control operations. The tool is an add-on application for the micro-simulation software package VISSIM. It extends the default VISSIM functionality towards a process of automated generation, implementation and statistical evaluation of simulation runs. Thus enabling a systematic, comprehensive and convenient method to undertake a quality analysis of traffic light control operations (already in the planning phase).

The tool determines relevant performance and service indices according to Highway Capacity Manual references. Potential improvements to the signal control operations are identified by analysing traffic and process data extracted from the VISSIM simulations.

In particular, MAT.CrossCheck finds certain system or traffic states which identify existing errors or potential improvements of the signal control operations. MAT.CrossCheck also fully supports the iterative process of programming and configuring the signal controllers and the simulation tests. MAT.CrossCheck definitely helps to make the development of traffic light control more efficient.

The results of the VISSIM simulation runs are evaluated in a test-specific manner. The evaluation results are displayed in configurable tables and charts, and summarized in reports. Reports are generated in Microsoft-Office format. The reports complement existing planning documents and can be used as official quality certifications.

## Tests and Report Instances

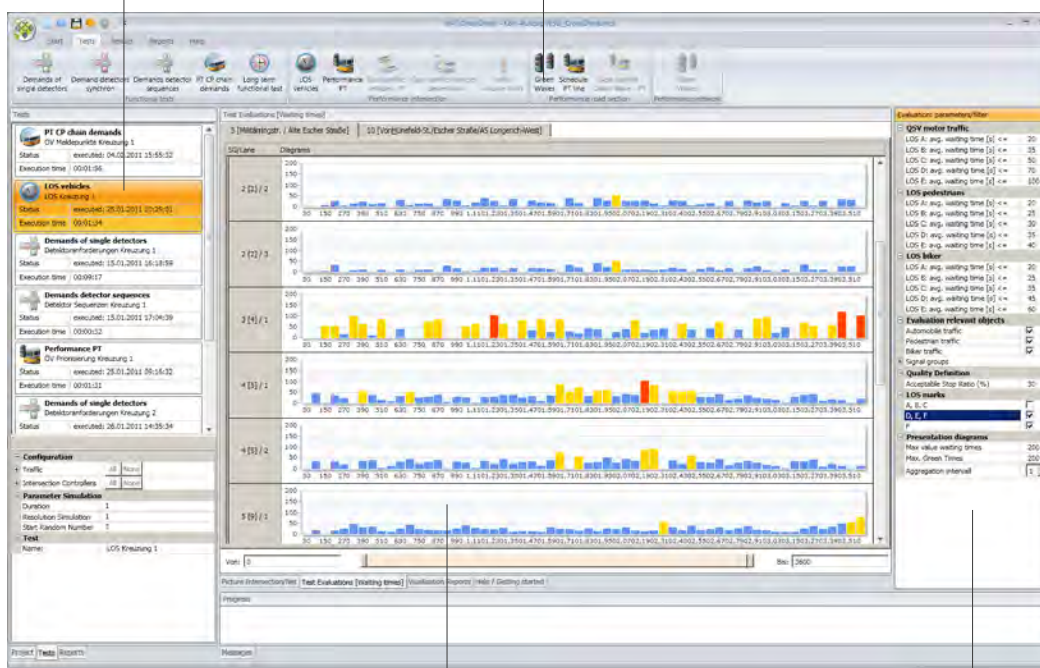
In the upper part of this window all instantiated tests and reports are shown. The selection of these tests and reports defines the actual editor context. The lower part of the window shows the configuration parameters of the selected test or report.

## Why MAT.CrossCheck?

- 1 Data consistency checks
- 2 Automated tests for detector and PT calling point demands, capacity determination for MIT and PT, green waves and PT schedules
- 3 Minor parameterisation efforts
- 4 Automated generation of necessary evaluation nodes, data collection points and travel time measurements for VISSIM
- 5 Generation of comprehensive traffic statistics as per the HCM manual
- 6 Error diagnostics support (debugging functionality for VISSIM)
- 7 Professional reports

## Ribbon

The ribbon contains several groups that comprise the available test, evaluation and report objects as well as the corresponding functions (e.g. run, delete). The ribbon groups are automatically switched according to the editor context.



## Evaluations, Report Preview

According to the active editor context this window either shows the tables or diagrams of the corresponding evaluation of tests or the preview of generated report documents.

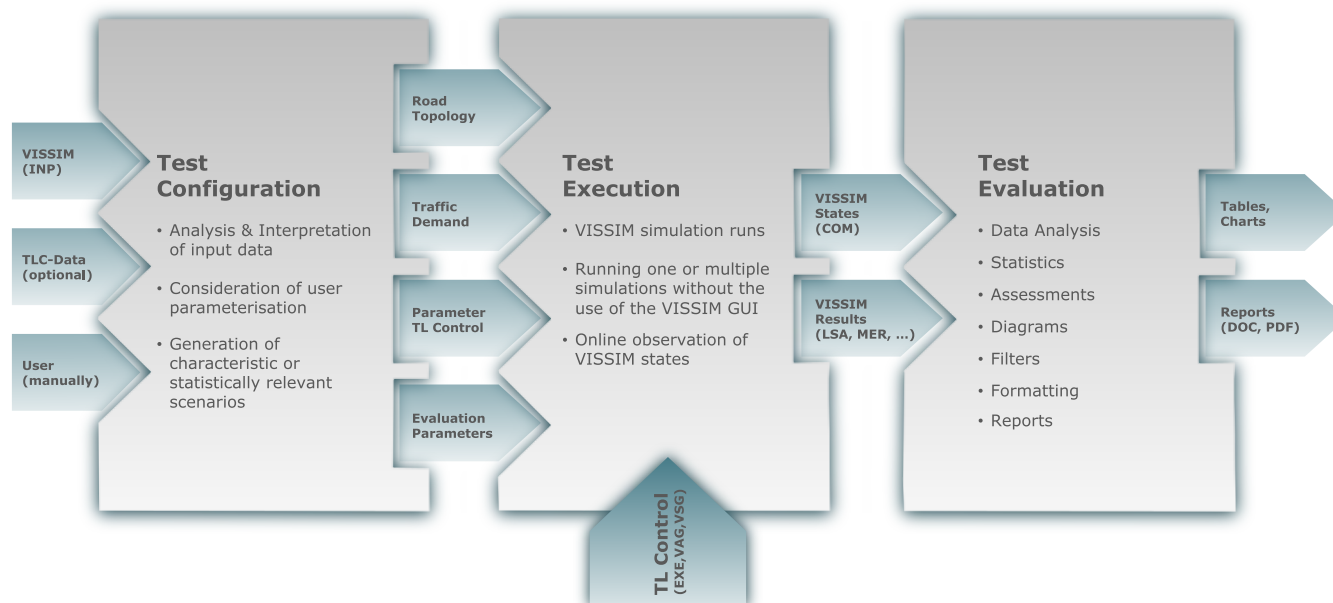
## Evaluations Parameters

The size and format of tables and diagrams can be changed by means of evaluation parameters. The set of parameters are test-specific. The following parameter classes are predefined:

- 1] Diagram format (scale, colour, etc.)
- 2] Filter (exclusion of objects)
- 3] Assessment parameters (definition of quality levels)
- 4] Aggregation intervals (statistical evaluations).

## Processing Steps

Extracting relevant traffic data from multiple sources (VISSIM, OCIT-VD, COCON, etc.), predefinition of test runs, automated execution of traffic simulations (VISSIM), traffic analysis and the preparation of evaluations standards (including the generation of reports).



## Tests as a Measure to Structural Analysis

Testing the performance quality of signal controllers is the central objective of MAT.CrossCheck. The tests define which aspects of the signal controller and traffic quality will be examined. After having a test provided with parameters, it is being executed, which means that one or multiple VISSIM runs are activated remotely and processed in the background. The results of these simulation runs are then being analysed and pre-processed. There are different types of tests that refer to the examination of different quality aspects of the control logic or traffic flow. A single project can contain any number of predefined test and report instances of any type.

### Functional Tests



**Single / concurrent detector calls**  
Detectors calling for green phases are individually/concurrently activated at different cycle seconds, and their impact is examined



**Detector green time extension**  
The detectors that request for green phases (vehicles, pedestrians and bikers) are collectively activated at different seconds within the control cycle and their impact is examined.



**PT calling point triggers**  
The PT calling point sequences with their corresponding roles (check in/out, confirm, etc.) are examined for each intersection with respect to the PT prioritisation and pre-emption



**Long-term simulations**  
Long-term simulation runs enable to observe various traffic light controls function and performance criteria

### Performance Intersection



**Capacity, Vehicles, Pedestrians, Bikes**  
By means of VISSIM runs characteristic capacity and performance statistics for vehicles, pedestrians and bikers are generated according to HCM.



**Capacity PT**  
By means of VISSIM runs characteristic capacity and performance statistics for PT are generated according to HCM.

### Performance Road Section



**Coordination (green wave)**  
The performance quality of intersections that are coordinated (green wave) is determined and assessed



**Route Travel Times**  
Travel time statistics are determined and benchmarked according to reference values on pre-defined routes within a road network



**Deviation of PT lines**  
Characteristic performance statistics for PT lines within the road network are determined and assessed according to HBS 200

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