Saturn Studio II - STL Advanced Report Generator
Version 1.01

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1 Saturn Studio II – STL Analysis Suite

The Saturn Studio II – STL Analysis Suite is a fully automatic analysis package for typical high voltage tests.

The Short-Circuit Testing Liaison (STL) provides a forum for voluntary international collaboration between testing organizations. The basic aim is the harmonized application of IEC and Regional Standards to the type testing of electrical power equipment.

The analysis is based on the recommendations of the short-circuit testing liaison STL www.stl-liaison.org.

2 Standard Reports of STL Packages

In addition to the powerful analysis and individual test reporting in Saturn Studio II – STL Analysis Suite AMOtronics offers the STL Report Generator module.

The Advanced Report Generator is a tool to summarize all results of different tests for one test object in a global test report.

This chapter describes some basic report features about the STL Analysis Suite, chapter 3 “Advanced Report Generator” presents the additional functions with the Report Generator.

2.1 Document Structure

All available STL-Packages automatically generate three different result-documents:

1. Text-File with all results (result.txt)

   Very simple to use for own programming and documentation utilities.

2. Word document with summarized results (*.doc)

   A one page word report with the summarized results of the test.

3. A fully detailed PDF document with all calculation results step by step

   Multi-Page report with detailed calculations of (depending on STL-package):
   - operation detection
   - travel
   - current signals
   - voltage signals
   - TRV analyze

For some of the calculations no load and prospective test analyses are necessary prior to the real tests. The software supports this kind of dependencies between the tests.

2.2 Example Reports

[RESULT]
tcl_L1_1=-
top_L1_1=46.5
tcl_L1_2=55.2
top_L1_2=45.1
Test_1=3
Test_2=3
trial=COMBI
topen_L1=73.028
tclose_L1=372.848
operation=OCO
travel=YES
tcl_L2_1=-
top_L2_1=46.6
tcl_L2_2=55.0
top_L2_2=45.2
topen_L2=73.148
tclose_L2=372.678
tcl_L3_1=-
top_L3_1=46.8
tcl_L3_2=54.9
top_L3_2=45.4
topen_L3=73.338
tclose_L3=372.548
CT=-671.563
CS=-661.250
CT_rel=66.872
CS_rel=68.246
U_MAX=-422.808
U_MIN=-1173.705
tcl=55.1
top=46.6
Uod_1=110
Uod_2=110
Ucd_1=-
Ucd_2=110
op_1=O
op_2=CO

Figure 2: Example for NO LOAD TEST … Result.txt (simple text file)

Test Results
No-Load Operations

Test performed: No-load operations
Date of test: 13th September 2006
Condition of test object before test: Factory new.
Gas pressure (abs. rel. to 20 °C): -

Test No.		COMBI		3					
Operating sequence				O-0.3s-CO		O-0.3s-CO		O-0.3s-CO	
C-Operation	Voltage of closing device		V	-	110				
	Closing time	L1	ms	-	55.2				
		L2	ms	-	55.0				
		L3	ms	-	54.9				
O-Operation	Voltage of opening device		V	110	110				
	Opening time	L1	ms	46.5	45.1				
		L2	ms	46.6	45.2				
		L3	ms	46.8	45.4				

Legend: -
Remarks:

Figure 1: Example for NO LOAD TEST … No_Load_E.doc (formatted Word file)

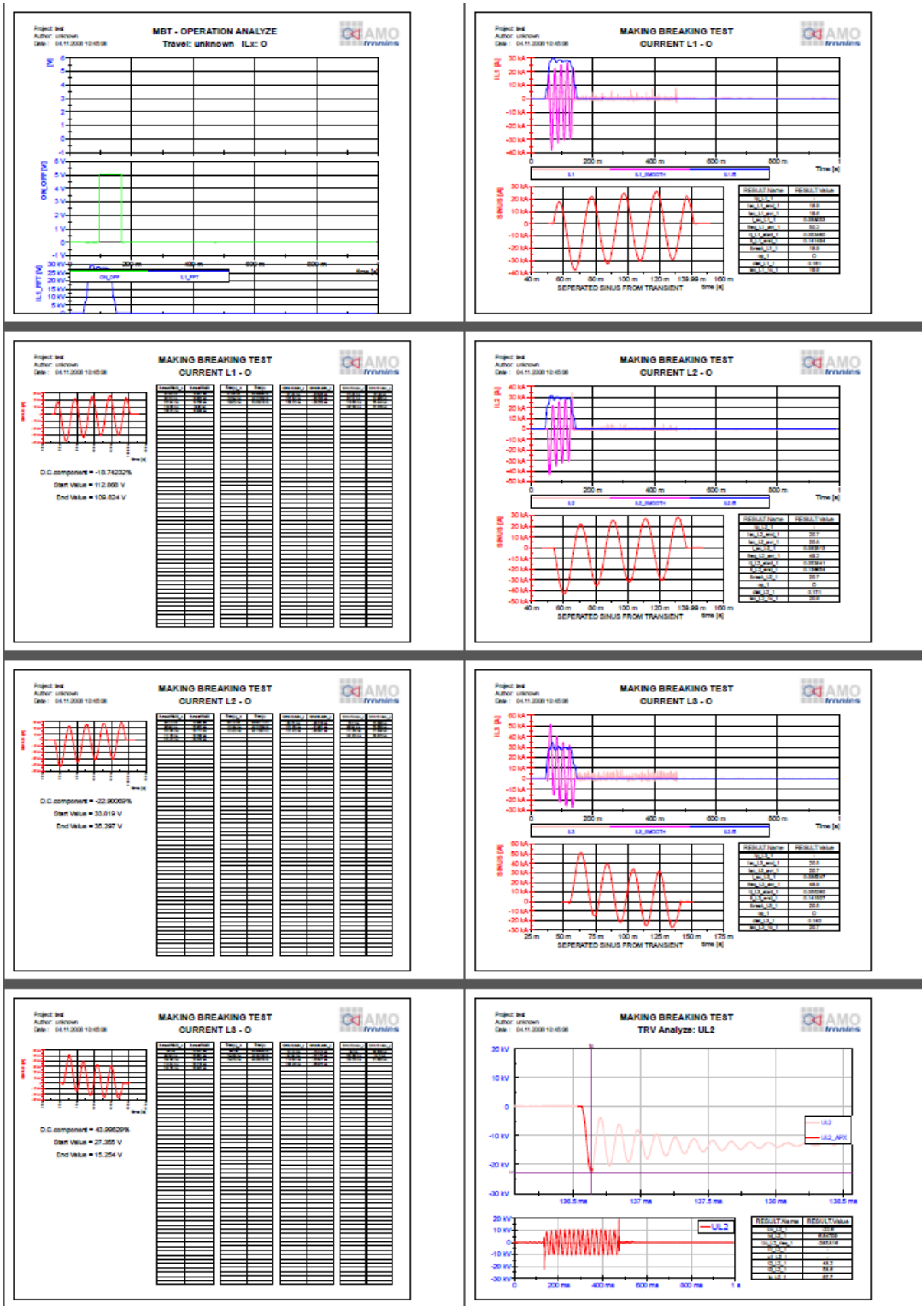


Figure 3: Synthetic Test Report

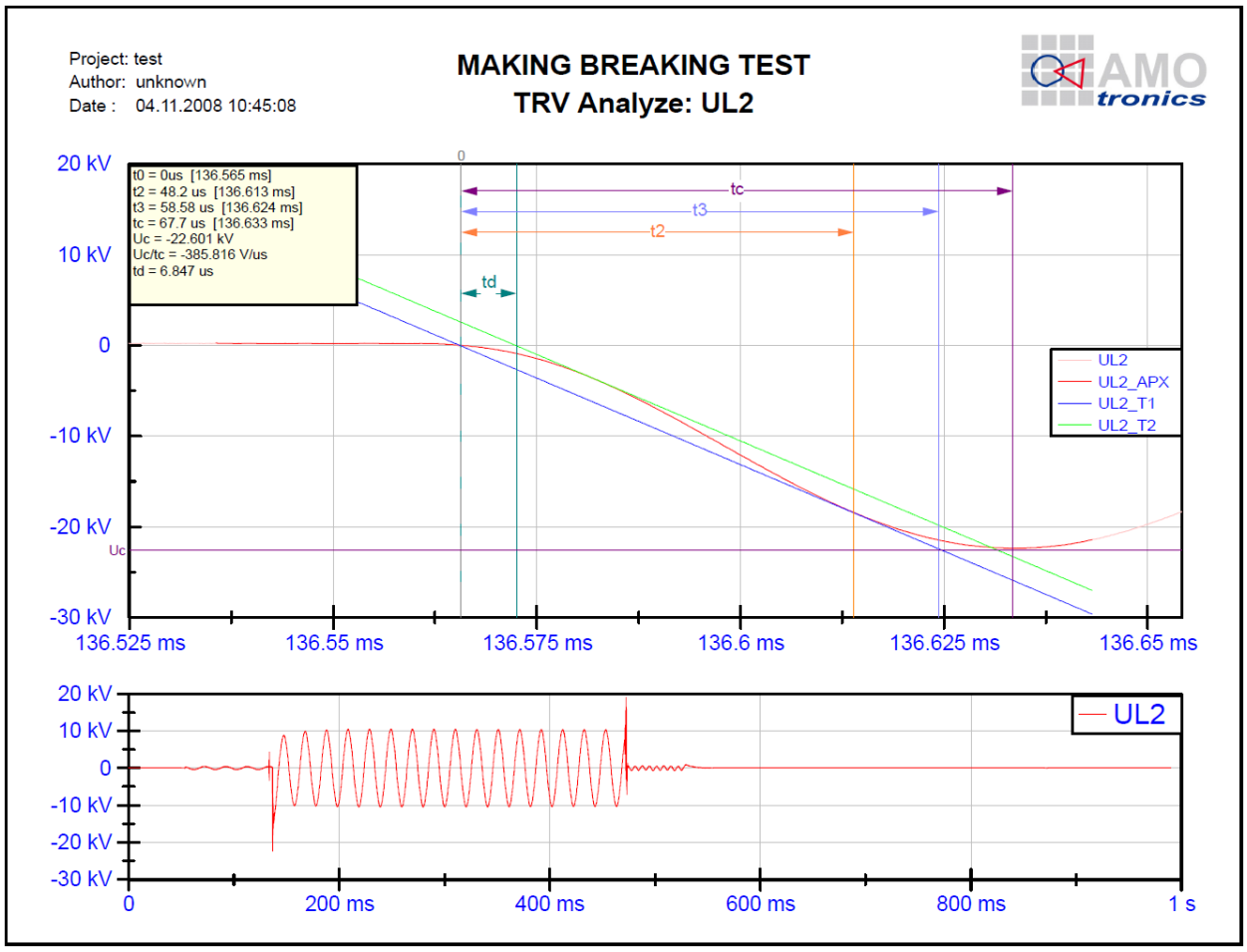


Figure 4: Transient Recovery Voltage Report (TRV)

3 Advanced Report Generator

The Advanced Report Generator is a tool to summarize all results for one test object in a global test report. The single test projects are automatically archived and sorted in a hierarchical file structure called “campaign”. Each campaign represents a number of tests for the same DUT (Device Under Test).

After finishing all tests and calculation of all results the REPORT GENERATOR can be used to generate a complete report by automatically combining different predefined templates, tables and pictures.

3.1 Working with the Advanced Report Generator

The generator starts by selecting a target report out of a list of available predefined templates:

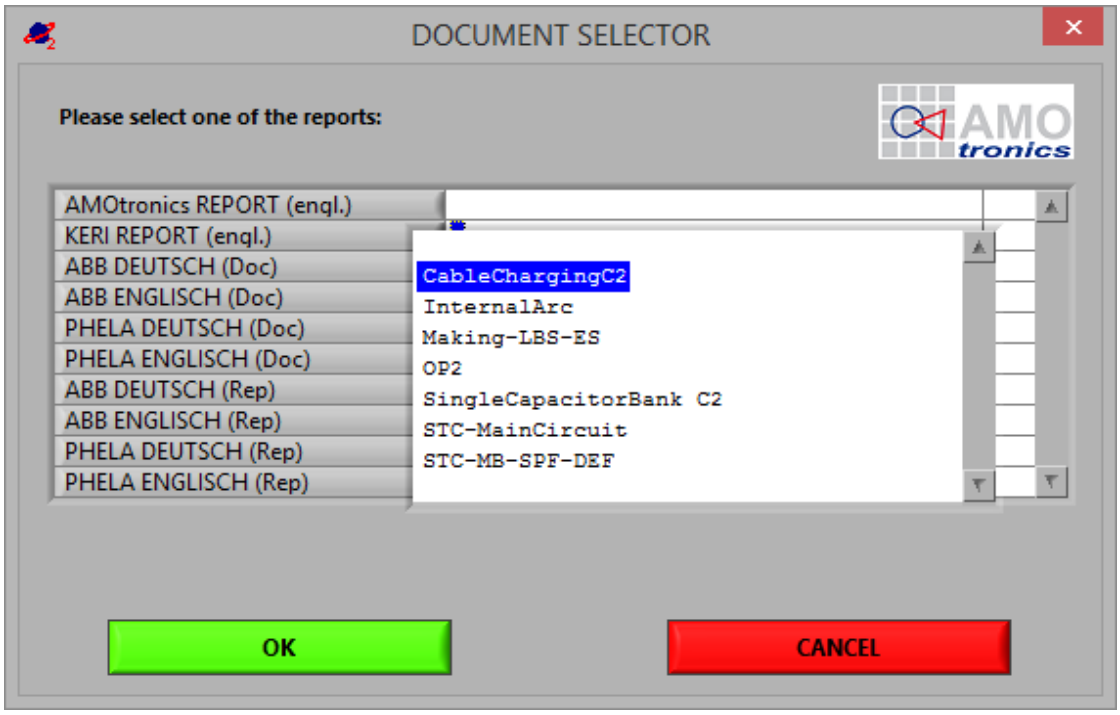


Figure 5: Document Selector

After selecting of the report type, the program automatically knows the structure of the document and guides the user through a number of selection menus to specify the content in detail. The program evaluates the relation between all tests and shows only reasonable options for selection.

Example of selecting the synthetic tests to be used in the report:

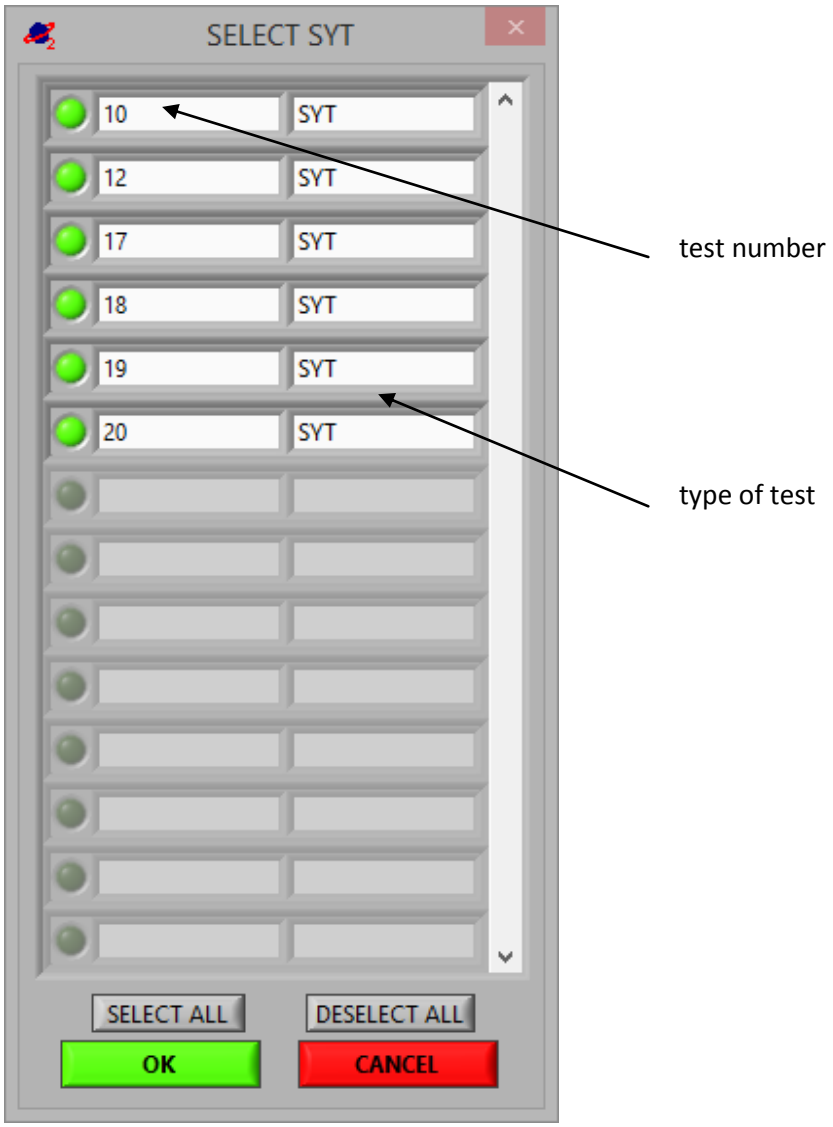
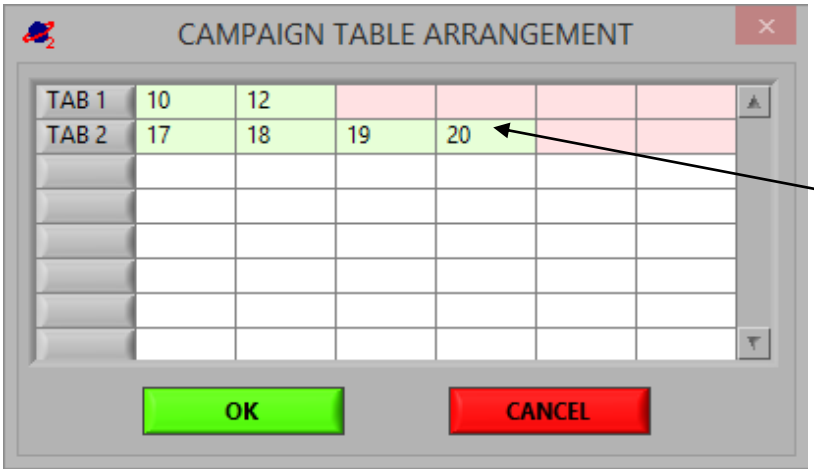


Figure 6: Test Selector for SYT

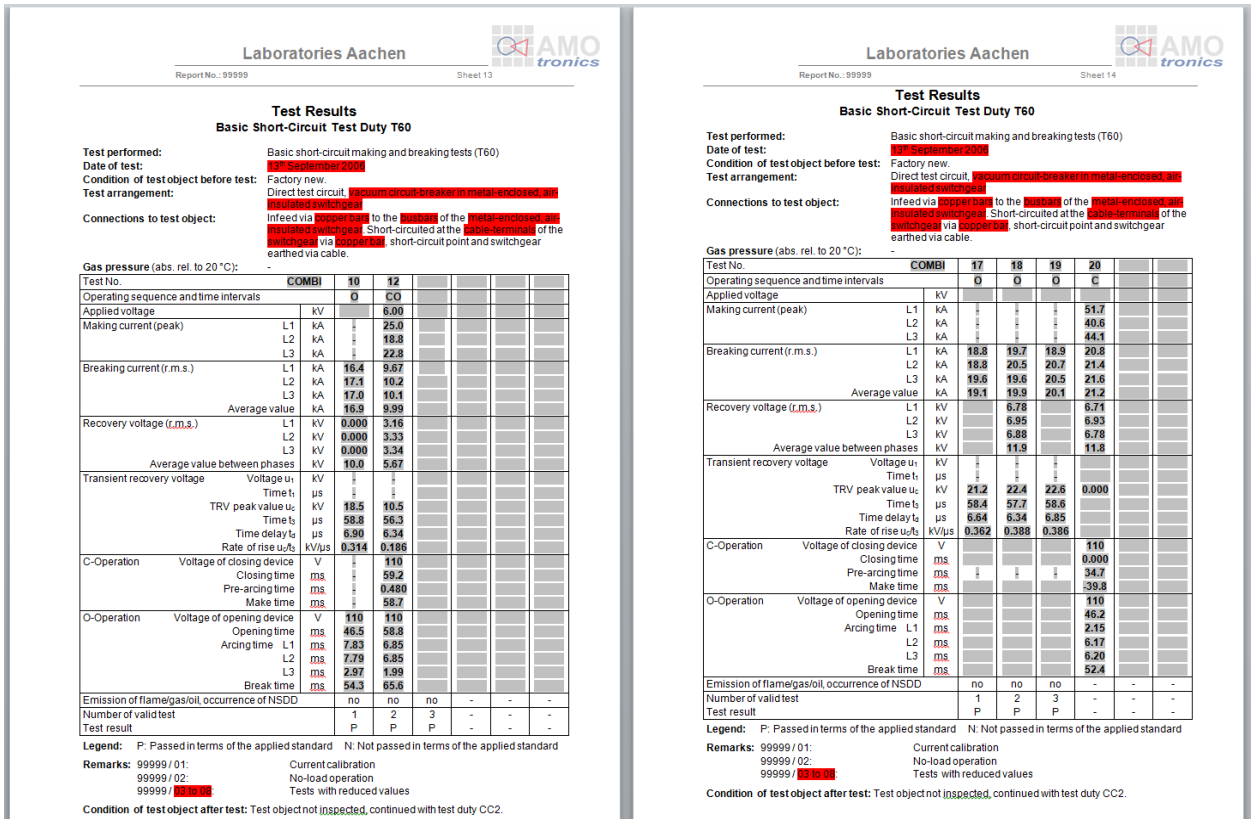
After selection of all synthetic tests for the report, the user has the possibility to adjust the column and table position of the results. The software does automatically increments the number of required multicolumn tables.



Column and table arrangement can be easily arranged by mouse functions

Figure 7: Test Selector for SYT

Depending on the arrangement of test 10+12 (in above example) for the first table and test 17-20 for the second table the software will automatically generate two tables in the report:



Laboratories Aachen

Report No.: 99999 Sheet 13

Test Results
Basic Short-Circuit Test Duty T60

Test performed: Basic short-circuit making and breaking tests (T60)
Date of test: 13th September 2006
Condition of test object before test: Factory new.
Test arrangement: Direct test circuit, vacuum circuit-breaker in metal-enclosed, air-insulated switchgear
Connections to test object: Infeed via copper bars to the busbars of the metal-enclosed, air-insulated switchgear. Short-circuited at the cable-terminals of the switchgear via copper bar, short-circuit point and switchgear earthed via cable.
Gas pressure (abs. rel. to 20 °C): -

Test No.			COMBI	10	12				
Operating sequence and time intervals				O	CO				
Applied voltage			kV		6.00				
Making current (peak)		L1	kA	-	25.0				
		L2	kA	-	18.8				
		L3	kA	-	22.8				
Breaking current (r.m.s.)		L1	kA	16.4	9.67				
		L2	kA	17.1	10.2				
		L3	kA	17.0	10.1				
		Average value	kA	16.9	9.99				
Recovery voltage (r.m.s.)		L1	kV	0.000	3.16				
		L2	kV	0.000	3.33				
		L3	kV	0.000	3.34				
		Average value between phases	kV	10.0	5.67				
Transient recovery voltage	Voltage u_1		kV	-	-				
	Time t_1		µs	-	-				
	TRV peak value u_c		kV	18.5	10.5				
	Time t_3		µs	58.8	56.3				
	Time delay t_d		µs	6.90	6.34				
	Rate of rise u_c/t_3		kV/µs	0.314	0.186				
C-Operation	Voltage of closing device		V	-	110				
	Closing time		ms	-	59.2				
	Pre-arcing time		ms	-	0.480				
	Make time		ms	-	58.7				
O-Operation	Voltage of opening device		V	110	110				
	Opening time		ms	46.5	58.8				
	Arcing time	L1	ms	7.83	6.85				
		L2	ms	7.79	6.85				
		L3	ms	2.97	1.99				
	Break time		ms	54.3	65.6				
Emission of flame/gas/oil, occurrence of NSDD				no	no	no	-	-	-
Number of valid test				1	2	3	-	-	-
Test result				P	P	P	-	-	-

Legend: P: Passed in terms of the applied standard N: Not passed in terms of the applied standard

Remarks: 99999 / 01: Current calibration
99999 / 02: No-load operation
99999 / 03 to 06: Tests with reduced values

Condition of test object after test: Test object not inspected, continued with test duty CC2.

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Report No.: 99999 Sheet 14

Test Results
Basic Short-Circuit Test Duty T60

Test performed: Basic short-circuit making and breaking tests (T60)
Date of test: 13th September 2006
Condition of test object before test: Factory new.
Test arrangement: Direct test circuit, vacuum circuit-breaker in metal-enclosed, air-insulated switchgear
Connections to test object: Infeed via copper bars to the busbars of the metal-enclosed, air-insulated switchgear. Short-circuited at the cable-terminals of the switchgear via copper bar, short-circuit point and switchgear earthed via cable.
Gas pressure (abs. rel. to 20 °C): -

Test No.			COMBI	17	18	19	20		
Operating sequence and time intervals				O	O	O	C		
Applied voltage			kV						
Making current (peak)		L1	kA	-	-	-	51.7		
		L2	kA	-	-	-	40.6		
		L3	kA	-	-	-	44.1		
Breaking current (r.m.s.)		L1	kA	18.8	19.7	18.9	20.8		
		L2	kA	18.8	20.5	20.7	21.4		
		L3	kA	19.6	19.6	20.5	21.6		
		Average value	kA	19.1	19.9	20.1	21.2		
Recovery voltage (r.m.s.)		L1	kV		6.78		6.71		
		L2	kV		6.95		6.93		
		L3	kV		6.88		6.78		
		Average value between phases	kV		11.9		11.8		
Transient recovery voltage	Voltage u_1		kV	-	-	-			
	Time t_1		µs	-	-	-			
	TRV peak value u_c		kV	21.2	22.4	22.6	0.000		
	Time t_3		µs	58.4	57.7	58.6			
	Time delay t_d		µs	6.64	6.34	6.85			
	Rate of rise u_c/t_3		kV/µs	0.362	0.388	0.386			
C-Operation	Voltage of closing device		V				110		
	Closing time		ms				0.000		
	Pre-arcing time		ms	-	-	-	34.7		
	Make time		ms				-39.8		
O-Operation	Voltage of opening device		V				110		
	Opening time		ms				46.2		
	Arcing time	L1	ms				2.15		
		L2	ms				6.17		
		L3	ms				6.20		
	Break time		ms				52.4		
Emission of flame/gas/oil, occurrence of NSDD				no	no	no	-	-	-
Number of valid test				1	2	3	-	-	-
Test result				P	P	P	-	-	-

Legend: P: Passed in terms of the applied standard N: Not passed in terms of the applied standard

Remarks: 99999 / 01: Current calibration
99999 / 02: No-load operation
99999 / 03 to 06: Tests with reduced values

Condition of test object after test: Test object not inspected, continued with test duty CC2.

Figure 8: (preview of the later result)

The report tool continues with different selection menus for all other tests to be integrated in the report:

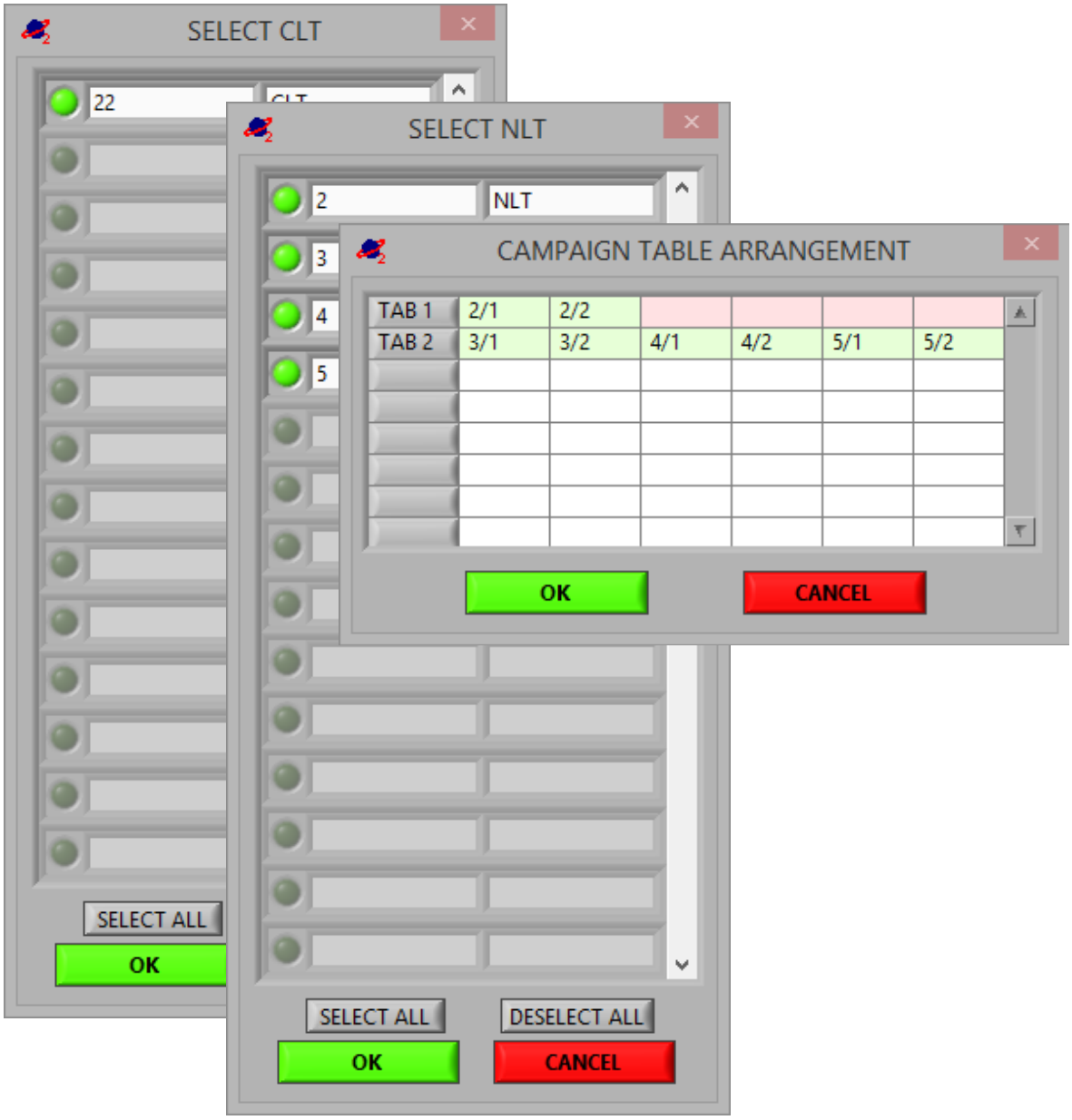


Figure 9: Several Test Selection Windows

After selection of all tests it is possible to define drawings and screenshots to be added to the report:

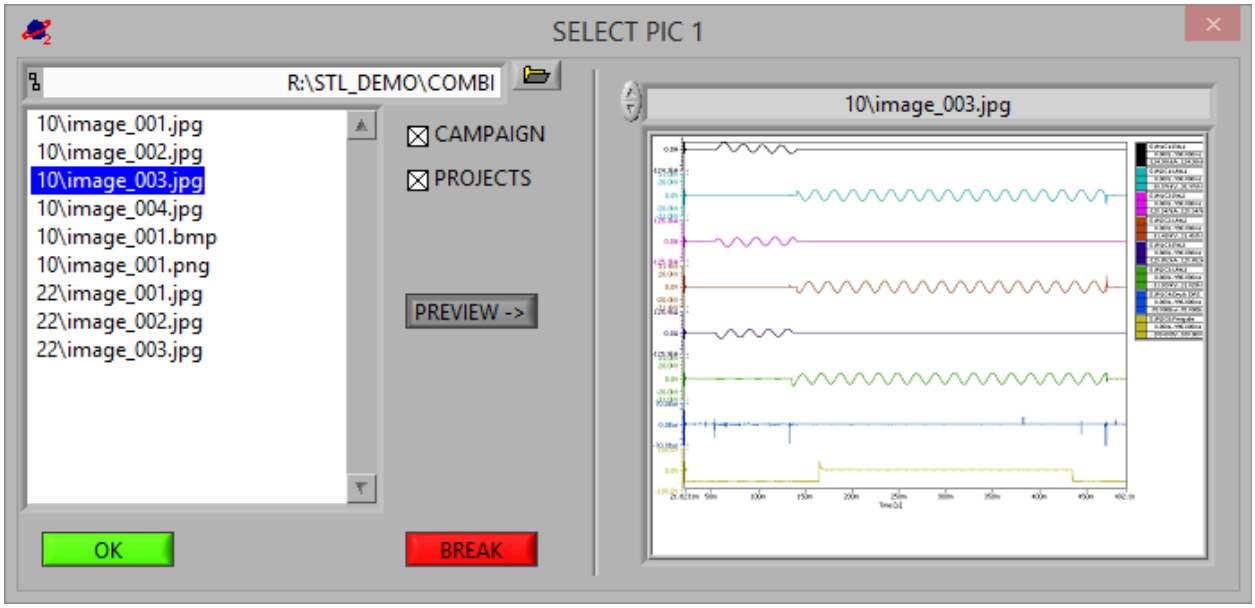
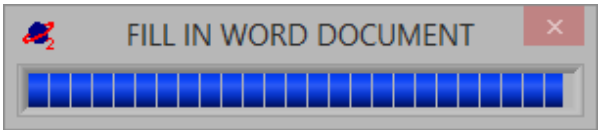


Figure 10: Additional Graphics Selection Windows

The report generator displays a list of all previously captured screenshots and drawings of the campaign and the related projects. It is also possible to use images or photos from outside of the selected project and campaign hierarchy.

The integrated preview window supports the selection of correct files.

The resulting report will be generated…



...and automatically opened on the PC.

3.2 Example: Advanced Report Generator

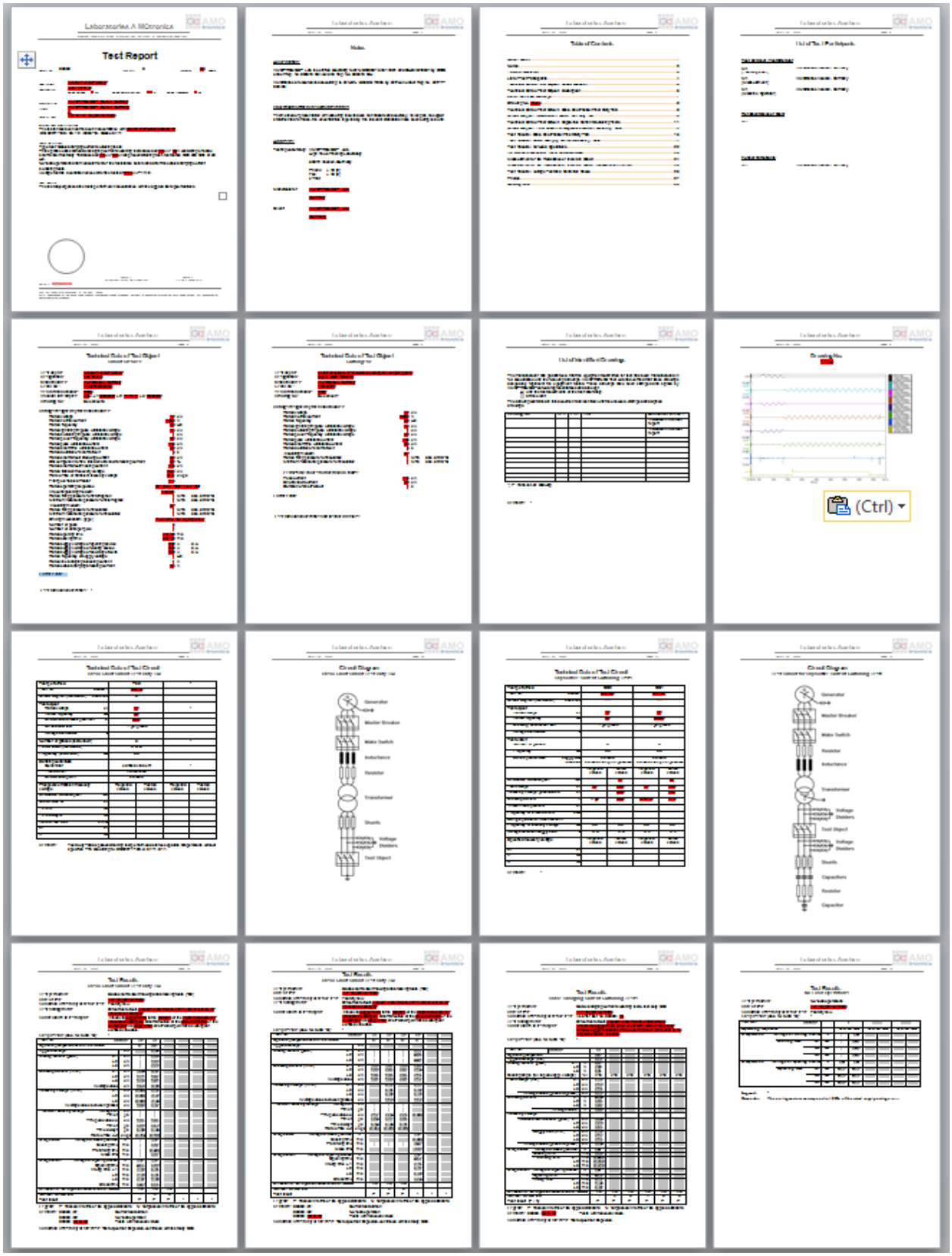
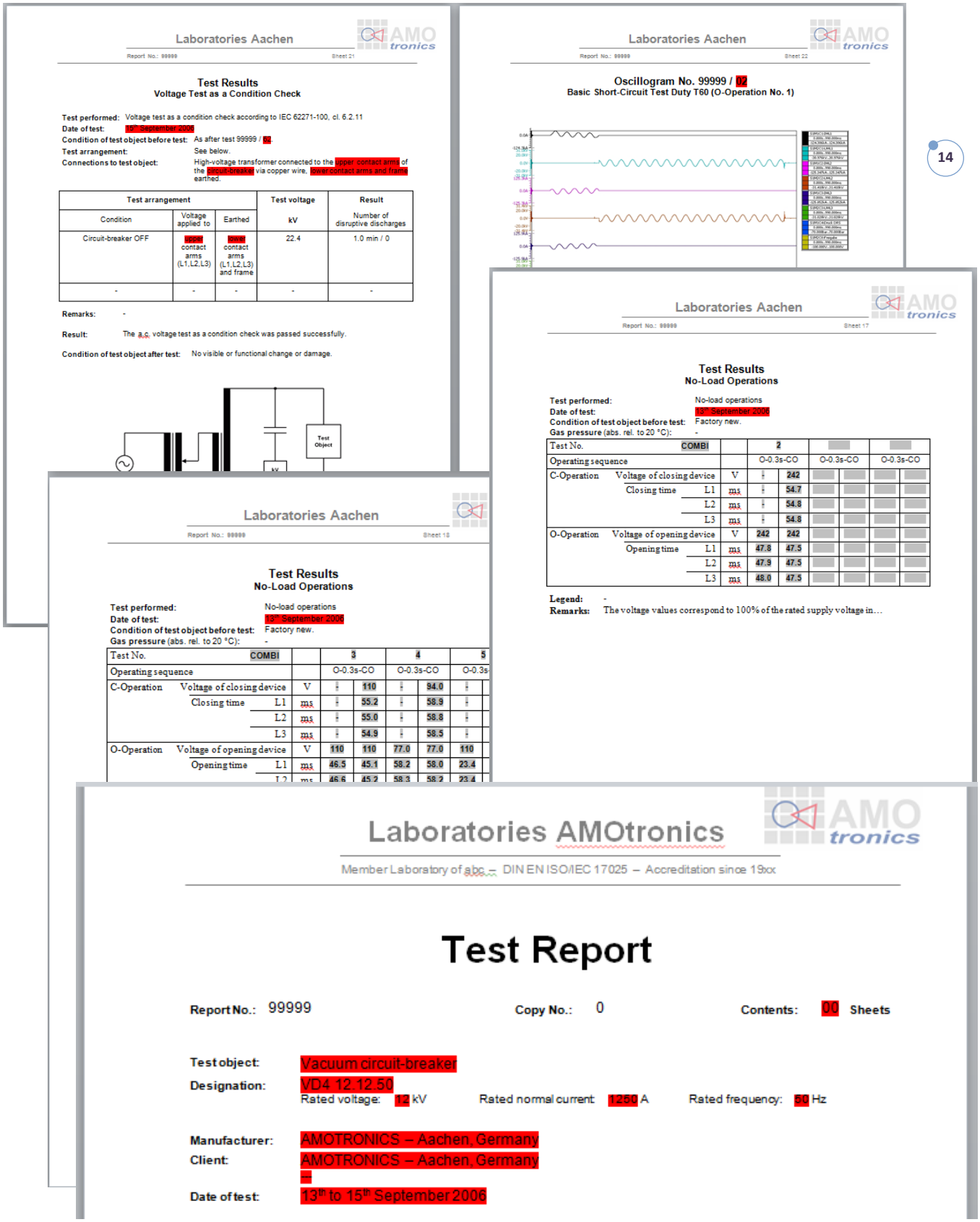


Figure 11: Example of a simple multipage report



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Report No.: 99999 Sheet 21

Test Results
Voltage Test as a Condition Check

Test performed: Voltage test as a condition check according to IEC 62271-100, cl. 6.2.11
Date of test: 15th September 2006
Condition of test object before test: As after test 99999 / 02.
Test arrangement: See below.
Connections to test object: High-voltage transformer connected to the upper contact arms of the circuit-breaker via copper wire, lower contact arms and frame earthed.

Test arrangement			Test voltage	Result
Condition	Voltage applied to	Earthed	kV	Number of disruptive discharges
Circuit-breaker OFF	upper contact arms (L1,L2,L3)	lower contact arms (L1,L2,L3) and frame	22.4	1.0 min / 0
-	-	-	-	-

Remarks: -
Result: The a.c. voltage test as a condition check was passed successfully.
Condition of test object after test: No visible or functional change or damage.

Test Object

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Report No.: 99999 Sheet 22

Oscillogram No. 99999 / 02
Basic Short-Circuit Test Duty T60 (O-Operation No. 1)

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Report No.: 99999 Sheet 17

Test Results
No-Load Operations

Test performed: No-load operations
Date of test: 13th September 2006
Condition of test object before test: Factory new.
Gas pressure (abs. rel. to 20 °C): -

Test No.		COMBI		2					
Operating sequence				O-0.3s-CO		O-0.3s-CO		O-0.3s-CO	
C-Operation	Voltage of closing device		V	-	242				
	Closing time	L1	ms	-	54.7				
		L2	ms	-	54.8				
		L3	ms	-	54.8				
O-Operation	Voltage of opening device		V	242	242				
	Opening time	L1	ms	47.8	47.5				
		L2	ms	47.9	47.5				
		L3	ms	48.0	47.5				

Legend: -
Remarks: The voltage values correspond to 100% of the rated supply voltage in…

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Report No.: 99999 Sheet 18

Test Results
No-Load Operations

Test performed: No-load operations
Date of test: 13th September 2006
Condition of test object before test: Factory new.
Gas pressure (abs. rel. to 20 °C): -

Test No.		COMBI		3		4		5	
Operating sequence				O-0.3s-CO		O-0.3s-CO		O-0.3s	
C-Operation	Voltage of closing device		V	-	110	-	94.0	-	
	Closing time	L1	ms	-	55.2	-	58.9	-	
		L2	ms	-	55.0	-	58.8	-	
		L3	ms	-	54.9	-	58.5	-	
O-Operation	Voltage of opening device		V	110	110	77.0	77.0	110	
	Opening time	L1	ms	46.5	45.1	58.2	58.0	23.4	
		L2	ms	46.6	45.2	58.3	58.2	23.4	

Laboratories AMOtronics

Member Laboratory of abc – DIN EN ISO/IEC 17025 – Accreditation since 19xx

Test Report

Report No.: 99999 **Copy No.:** 0 **Contents:** 00 **Sheets**

Test object: Vacuum circuit-breaker
Designation: VD4 12.12.50
Rated voltage: 12 kV Rated normal current: 1250 A Rated frequency: 50 Hz

Manufacturer: AMOTRONICS – Aachen, Germany
Client: AMOTRONICS – Aachen, Germany

Date of test: 13th to 15th September 2006

Figure 12: Extract of a simple multipage report

4 Contact

Products of AMOtronics' Saturn transient recorder family are distributed all over the world. Please contact the following address for your inquiries:

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