

**FRAMATOME ANP**

# ***SWR-1000: NRC-Visit***

**Quality Assurance for External Vessel Cooling Test**

# ***QA for External Vessel Cooling Test - Roadmap***

**> QA system of the FANP Technical Center**

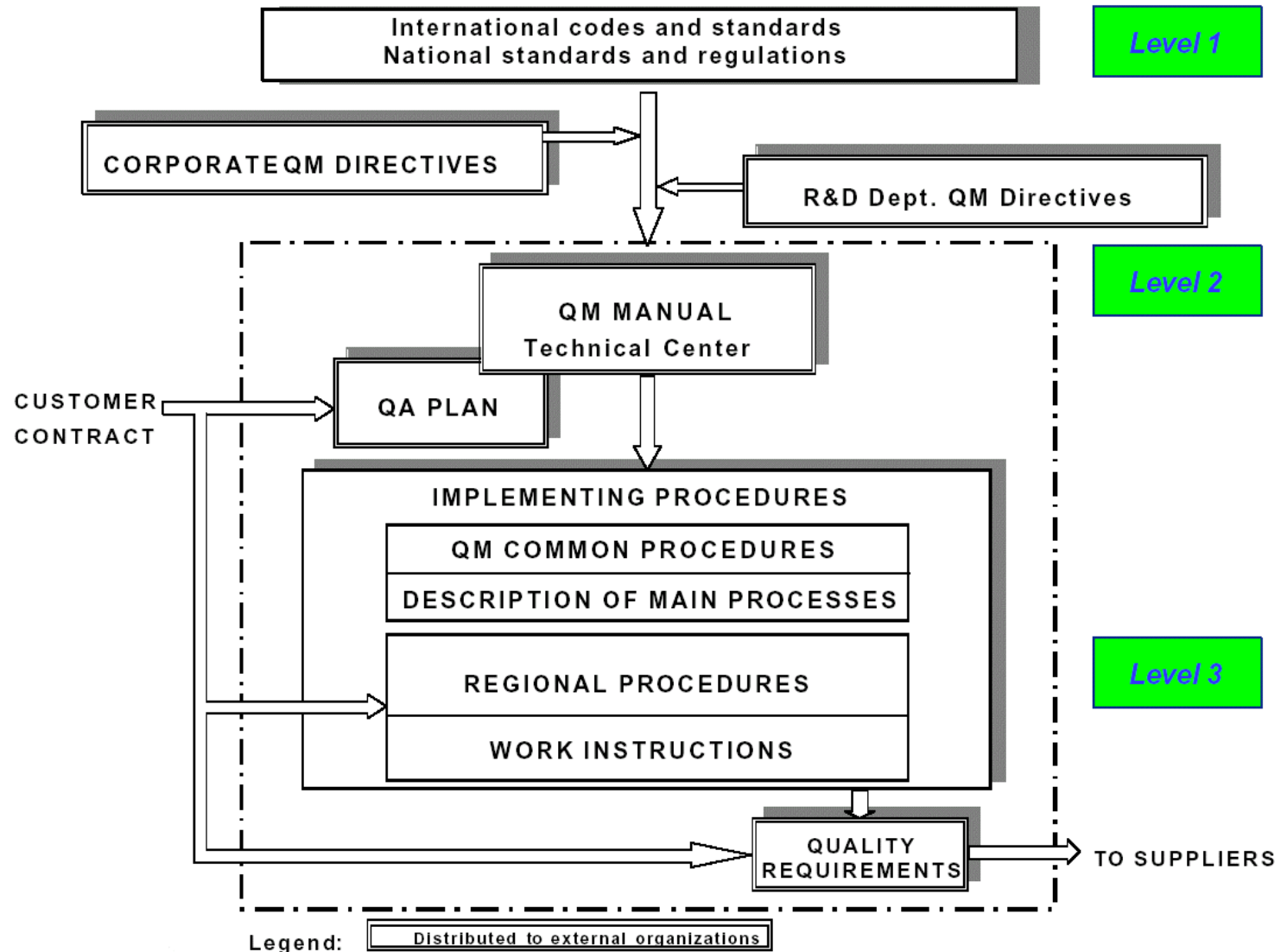
**> QA for External Vessel Cooling Test**

- Design and Manufacturing

- Measuring and Test Equipment

- Data Acquisition

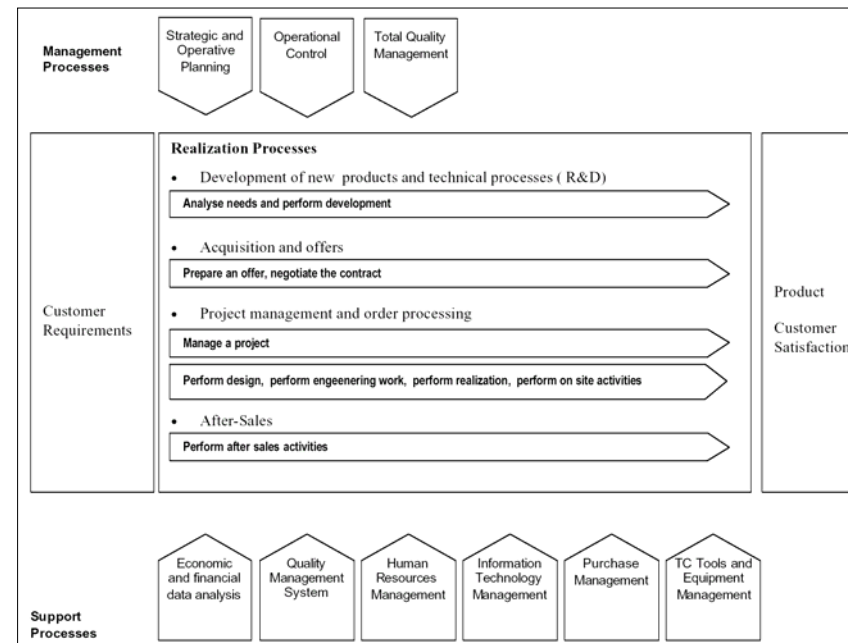
# QA System of FANP Technical Center - Structure of QA Documents



# QA System of FANP Technical Center - Quality Management Manual (QMM)

- > framework for the QA system of the Technical Center
- > identical to the QMMs of the business sectors *Services, Projects & Engineering* except Organization and Processes
- > contains

- organizational structure, responsibilities
- process charts of the Technical Center
- description of the main processes



- > regular indoctrination, e.g. during department meetings

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**FRAMATOME**

# ***QA for External Vessel Cooling Test - Roadmap***

**> QA system of the FANP Technical Center**

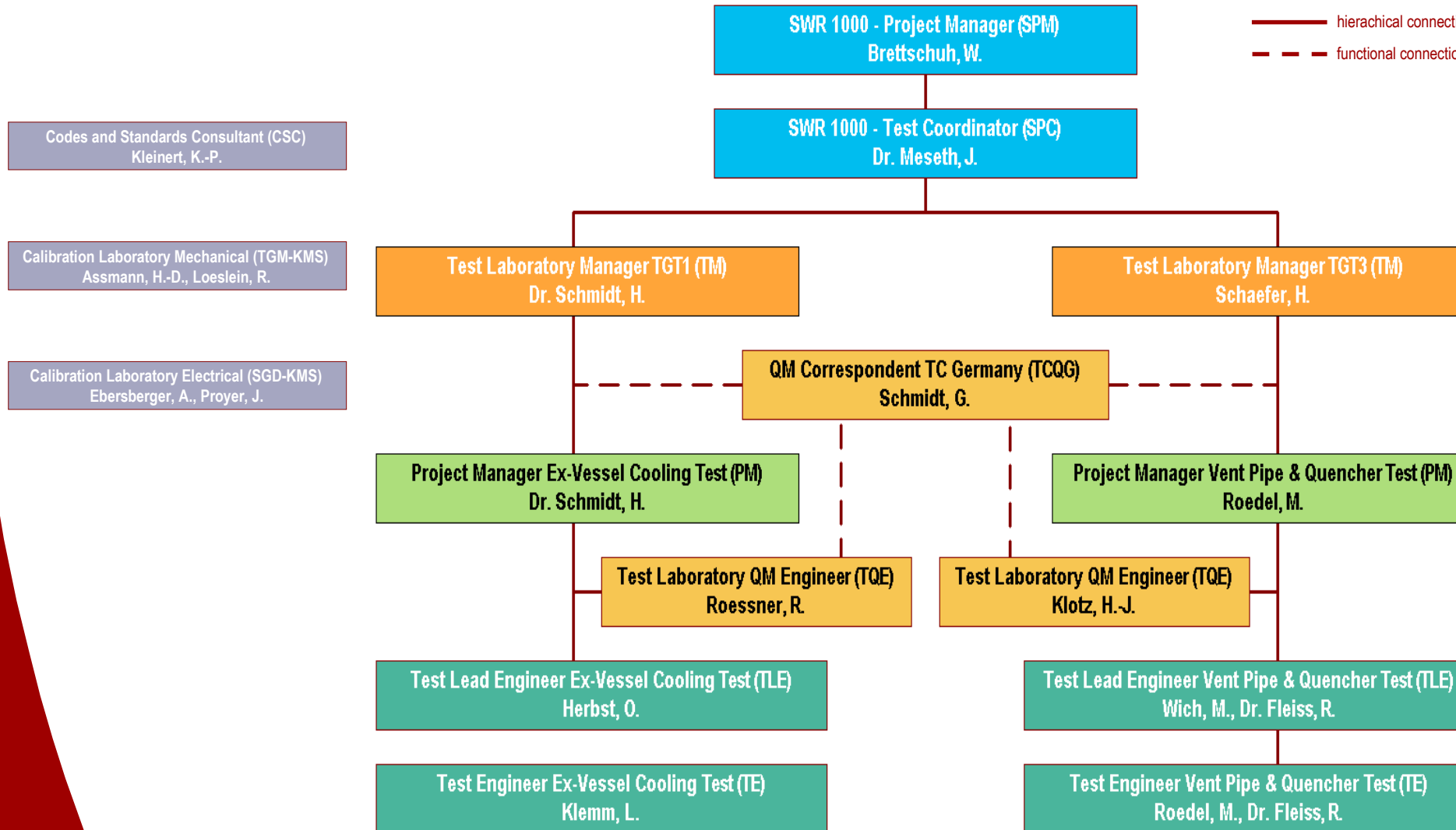
**> QA for External Vessel Cooling Test**

- **Design and Manufacturing**

- **Measuring and Test Equipment**

- **Data Acquisition**

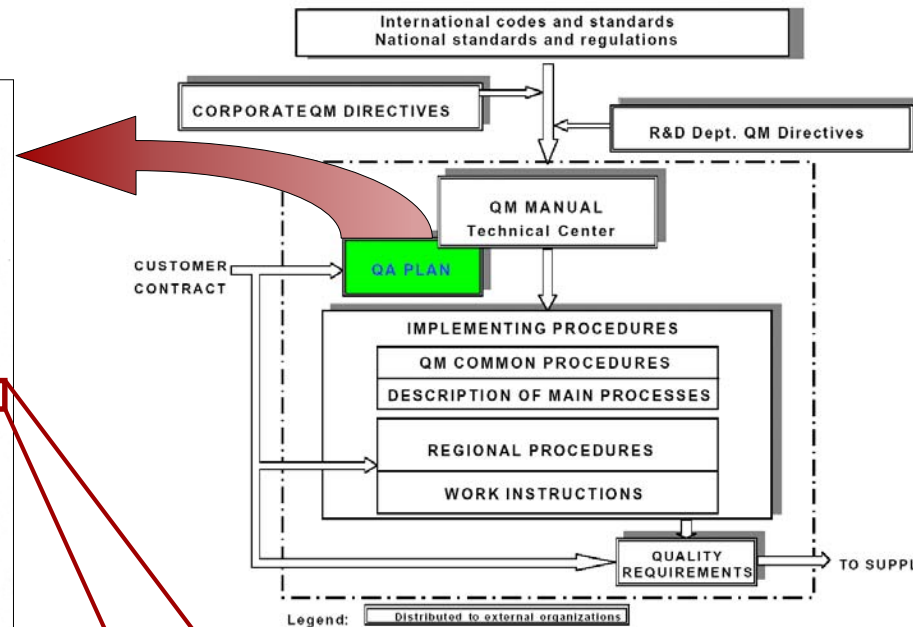
# QA for External Vessel Cooling Test - Organizational Structure





# QA for External Vessel Cooling Test - Quality Assurance Plan (QAP)

<b>FRAMATOME ANP</b>	Document: <b>Quality Assurance Plan (QAP)</b>		QAP-No.: TG-001																															
			Rev.: A																															
				Prepared by: TGT																														
Title <b>SWR 1000, Ex-Vessel Cooling Test, Vent Pipe Test and Quencher Test</b>																																		
Proj.-Code <b>ZBX101</b>	DCC <b>AQA</b>	Contents Code	UND																															
		Pages: 17    Appendices: 5																																
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<table border="0"> <tr> <td>Released:</td> <td>Dr. J. Meseth</td> <td>FANP NGPF</td> <td><i>J. Meseth</i></td> <td>Nov. 24, 2002</td> </tr> <tr> <td>Reviewed:</td> <td>K.-P. Kleinert</td> <td>FANP SGQ</td> <td><i>K. Kleinert</i></td> <td>Nov 13 2002</td> </tr> <tr> <td>Reviewed:</td> <td>G. Schmidt</td> <td>FANP TGM</td> <td><i>G. Schmidt</i></td> <td>14.11.2002</td> </tr> <tr> <td>Prepared:</td> <td>R. Roessner</td> <td>FANP TGT1</td> <td><i>R. Roessner</i></td> <td>14.11.2002</td> </tr> <tr> <td>Prepared:</td> <td>H.-J. Klotz</td> <td>FANP TGT3</td> <td><i>H. Klotz</i></td> <td>14.11.2002</td> </tr> <tr> <td></td> <td>Name</td> <td>Dept.</td> <td>Signature</td> <td>Date</td> </tr> </table>					Released:	Dr. J. Meseth	FANP NGPF	<i>J. Meseth</i>	Nov. 24, 2002	Reviewed:	K.-P. Kleinert	FANP SGQ	<i>K. Kleinert</i>	Nov 13 2002	Reviewed:	G. Schmidt	FANP TGM	<i>G. Schmidt</i>	14.11.2002	Prepared:	R. Roessner	FANP TGT1	<i>R. Roessner</i>	14.11.2002	Prepared:	H.-J. Klotz	FANP TGT3	<i>H. Klotz</i>	14.11.2002		Name	Dept.	Signature	Date
Released:	Dr. J. Meseth	FANP NGPF	<i>J. Meseth</i>	Nov. 24, 2002																														
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Prepared:	R. Roessner	FANP TGT1	<i>R. Roessner</i>	14.11.2002																														
Prepared:	H.-J. Klotz	FANP TGT3	<i>H. Klotz</i>	14.11.2002																														
	Name	Dept.	Signature	Date																														



Type of Document/Record	Preparation	Review	Approval	Release
Test Requirements Document	STC	-	SPM	SPM
Test Procedure	TLE	TQE	PM	STC or SPM
Test Record	TE	-	TLE	TLE
Test Report (Final Report)	PM	TQE	TM	STC or SPM

- > The qualification records have to be filed in the Human Resources Department of Framatome ANP GmbH
- > The qualification of the personnel has been checked prior to the test
- > Specific QA indoctrination was performed prior to the test
  - QA Plan SWR-1000
  - 10CFR50, App. B
  - 10 CFR21
  - ANSI/ASME NQA-1-1989
  - applicable procedures

> SWR-1000: NRC-Visit, Quality Assurance for External Vessel Cooling - 2003-06-25, TGT1 / Roe - NRC Visit 2003 06 QA.ppt

# ***QA for External Vessel Cooling Test - Design and Development***

- > Design and development activities by the test laboratories were done according to QMM, Chapter 4.3, and associated implementing procedures
- > Design and development activities are related to
  - the design of the tests as documented and referenced in the test procedure
  - the design of the the test vessel which is an approx. 8° segment (sector) of the RPV bottom

# QA for External Vessel Cooling Test - Manufacturing Control

**MECHANIK  
CENTER**

## List of certifications and qualifications obtained

Information given by MEC's Quality Management Department

Certificate	Issuer	Erlangen	Berlin
DIN EN ISO 9001	TÜV-Cert	x	x
Certification concerning the suitability of the quality assurance system according to KTA 1401 and AVS D 100/50	Bayernwerk AG	x	
Higher qualification certificate DIN 18800 Part 7, Par. 6.2 / DIN 15018 / Z30.3-DIBt	LGA Bavaria	x	
Lower qualification certificate DIN 18800 Part 7, Par. 6.3	SLV Berlin - Brandenburg		x
Certification according to AD specification HP 0 / EN 729-2	TÜV Southern Germany	x	
Zertifikat nach AD-Merkblatt HP 0 / EN 729-2	TÜV Rheinland / Berlin-Brandenburg		x
Certification according to KTA nuclear safety standards 3201.3, 3204, 3401.3, 3205.1, 3903, 3905 and 1408.3	TÜV Southern Germany	x	
Germanischer Lloyd / Welding qualification	Germanischer Lloyd		
Germanischer Lloyd / Welding of pressure vessels	Germanischer Lloyd		
Germanischer Lloyd / Authorization to transfer markings on test and examination certificates according to DIN EN 10204 3.1B / 3.1C	Germanischer Lloyd		
Qualification certificate for welding railborne vehicles and parts thereof DIN 6700 Part 2 Class C2.2	SLV Munich		
Verification of qualification for welding structural parts of aluminum DIN 4113	SLV Berlin-Brandenburg		
WIWEB welding qualification in connection with BWB according to VG 95077 Parts 1, 2, 3 / DIN 85004 Part 2	SLV Munich		
Verification as a B calibration laboratory for mechanical measuring variables	Armed forces scientific instit structural, explosive and fue WIWEB		
Verification of the QM system No. 29-2	Siemens calibration service		
ASME Code Section VIII Div. 1 U und UM Stamp	ANF Lingen		
Licence for production, repair, structural inspection and first pressure test for containers (type 4, like gas pressure switches and switch gears)	ASME International		
Certification according to QSF-A of the Association of the German Aerospace Industry	SVTI ASIT		
	EADS - Augsburg		

**MECHANIK  
CENTER**

Nr. 3227

Werkbescheinigung  
Inspection Certificate

2.1 nach EN 10 204  
2.1 to EN 10 204

Abteilung:  
department: FANP NT 31

Bearbeiter:  
Name: KH BZ-Nr.:  
Intern. No.:

Auftrags-Nr.:  
Order No. XNABE-D-0000-918617

Werkstoff-Normbez.  
Mat. Stand. Desig. siehe Doku IVZ 527

Lfd.-Nr.:  
con. No.:

Werkstoff-Nr.:  
Material No. ---

Spezifikations-Nr.:  
Specification No. ---

DIN bzw. Zeichng.-Nr.:  
DIN and / or Drawing No. Skizze

Bezeichnung:  
Designation: Versuchsbehälter SWR 1000  
Test Tank SWR 1000

Stückzahl:  
Quantity:

Wir bestätigen, daß der oben genannte Behälter den Vereinbarungen der Beste  
We hereby confirm that the a.m. tank meets the arrangements acc. to the order.

Erlangen, den 21.11.2002

MEC  
OS1

Der Werkssachverständige  
Works Inspector

Mechanik Center Erlangen GmbH  
Qualitätssicherung



Fertigungskontrolle  
Experimente zum Nachweis der Außenkühlung  
Ort Mechanik Center Erlangen

Kontrolle entsprechend Bilder:

Kontrollleur  
Aigner

Datum  
16.11.01

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Aigner

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Aigner



# QA for External Vessel Cooling Test - Manufacturing, Heating Wires

Heizleiter-Belegungsplan SWR 1000

Nut	Nut im	Länge 1	Länge 2	Länge 3	Länge 4	Rolle	HL-
[Nr.]	Segment	[mm]	[mm]	[mm]	[mm]	[ - ]	[ - ]
41	15	332	240	237	322	9	10
42	16	326	235	230	320	2	11
43	17	324	226	226	316	2	11
44	18	321	224	222	313	2	11
45	19	316	222	217	312	2	11
46	20	315	219	216	310	2	11
47	21	312	216	212	307	4	12
48	22	309	213	211	305	4	12
49	23	307	211	210	302	4	12
50	24	306	210	208	301	4	12
51	25	305	210	207	300	4	12
52	26	303	210	207	300	4	12
53	27	302	210	206	296	6	13
54	28	299	207	206	295	6	13
55	29	299	209	206	294	6	13
56	30	299	209	207	293	6	13
57	31	298	210	207	292	6	13
58	32	298	209	210	295	6	13
59	33	298	210	210	295	7	14
60	34	298	212	212	295	7	14
61	35	296	215	215	295	7	14
62	36	296	219	216	294	7	14
63	37	297	220	218	294	7	14
64	38	296	222	222	295	7	14
65	39	298	225	226	297	2	15
66	40	299	230	232	297	2	15
67	41	300	235	236	297	2	15
68	42	303	242	240	300	2	15
69	43	305	246	246	301	2	15
70	44	306	257	256	305	3	16
71	45	308	263	265	307	3	16
72	46	315	275	274	309	3	16
73	47	323	287	282	315	3	16
74	48	323	296	310	321	3	16
75	2	1432	0	0	0	2	17
76	3	1430	0	0	0	2	17
77	4	1427	0	0	0	2	17
78	5	1425	0	0	0	2	18
79	6	1422	0	0	0	2	18
80	7	1422	0	0	0	2	18

Spezifiziert von:  
Installiert von:

*Handwritten signatures and dates*

Heizleiter-Belegungsplan SWR 1000

Erstellt von: Herbst Oliver, TGT1

Seite 1 von 10

Nut	Nut im	Länge 1	Länge 2	Länge 3	Länge 4	Rolle	HL-	linke Seite	Art der Anschlüsse	rechte Seite	Bögen	Anzahl	Abnahmemessung	Strom	Spannung	Widerstand	Fart
[Nr.]	Segment	[mm]	[mm]	[mm]	[mm]	[ - ]	[ - ]		Mitte				Verbinde	[A]	[V]	[Ohm]	legen
1	1	1567	0	0	0	4	1	Anschluß Kupferschiene "+"	-	Bogen aus 3mm Kupfer	1	1		4.3	36	8.4	Roll
2	2	1565	0	0	0	4	1	Bogen aus 3mm Kupfer	-		1						
3	3	1564	0	0	0	4	1		-	Bogen aus 3mm Kupfer	1						
4	4	1561	0	0	0	4	1	Anschluß Kupferschiene "-"	-		1						1
5	5	1559	0	0	0	4	2	Anschluß Kupferschiene "+"	-	Bogen aus 3mm Kupfer	1	1		4.3	36	8.4	
6	6	1557	0	0	0	4	2	Bogen aus 3mm Kupfer	-		1						
7	7	1555	0	0	0	4	2		-	Bogen aus 3mm Kupfer	1						
8	8	1554	0	0	0	4	2	Anschluß Kupferschiene "-"	-		1						Roll
9	9	1554	0	0	0	4	3	Anschluß Kupferschiene "+"	-	Bogen aus 3mm Kupfer	1	1		4.3	36	8.4	2
10	10	1553	0	0	0	4	3	Bogen aus 3mm Kupfer	-		1						
11	11	1550	0	0	0	4	3		-	Bogen aus 3mm Kupfer	1						
12	12	1547	0	0	0	4	3	Anschluß Kupferschiene "-"	-		1						
13	13	1546	0	0	0	4	4	Anschluß Kupferschiene "+"	-	Bogen aus 3mm Kupfer	1	1		4.3	36	8.4	Roll
14	14	1545	0	0	0	4	4	Bogen aus 3mm Kupfer	-		1						
15	15	1545	0	0	0	4	4		-	Bogen aus 3mm Kupfer	1						
16	16	1544	0	0	0	4	4	Anschluß Kupferschiene "-"	-		1						3
17	17	1542	0	0	0	4	5	Anschluß Kupferschiene "+"	-	Bogen aus 3mm Kupfer	1	1		4.3	36	8.4	
18	18	1540	0	0	0	4	5	Bogen aus 3mm Kupfer	-		1						
19	19	1537	0	0	0	4	5		-	Bogen aus 3mm Kupfer	1						
20	20	1535	0	0	0	4	5	Anschluß Kupferschiene "-"	-		1						Roll
21	21	1533	0	0	0	4	6	Anschluß Kupferschiene "+"	-	Bogen aus 3mm Kupfer	1	1		4.3	36	8.4	
22	22	1531	0	0	0	4	6	Bogen aus 3mm Kupfer	-		1						
23	23	1530	0	0	0	4	6		-	Bogen aus 3mm Kupfer	1						
24	24	1529	0	0	0	4	6	Anschluß Kupferschiene "-"	-		1						
25	25	1525	0	0	0	4	7	Anschluß Kupferschiene "+"	-	Bogen aus 3mm Kupfer	1	1		4.3	36	8.4	Roll
26	26	1525	0	0	0	4	7	Bogen aus 3mm Kupfer	-		1						
27	1	1522	0	0	0	4	7		-	Bogen aus 3mm Kupfer	1						
28	2	1520	0	0	0	4	7	Anschluß Kupferschiene "-"	-		1						5
29	3	1519	0	0	0	6	8	Anschluß Kupferschiene "+"	-	Bogen aus 3mm Kupfer	1	1		4.3	36	8.4	
30	4	1518	0	0	0	6	8	Bogen aus 3mm Kupfer	-		1						
31	5	1516	0	0	0	6	8		-	Bogen aus 3mm Kupfer	1						
32	6	1514	0	0	0	6	8	Anschluß Kupferschiene "-"	-		1						Roll
33	7	1512	0	0	0	2	9	Anschluß Kupferschiene "+"	-	Bogen aus 3mm Kupfer	1	1		4.8	36	7.5	6
34	8	375	318	311	367	2	9	Bogen aus 3mm Kupfer	3X Kupferverbinder 3mm		1		3				
35	9	364	298	292	357	2	9		3X Kupferverbinder 3mm	Bogen aus 3mm Kupfer	1		3				
36	10	354	284	275	351	2	9	Anschluß Kupferschiene "-"	3X Kupferverbinder 3mm		1	3					
37	11	346	272	265	346	5	10	Anschluß Kupferschiene "+"	3X Kupferverbinder 3mm	Bogen aus 3mm Kupfer	1	1	3				
38	12	340	262	258	340	5	10	Bogen aus 3mm Kupfer	3X Kupferverbinder 3mm		1		3	4.3	36	8.4	Roll
39	13	337	252	249	333	5	10		3X Kupferverbinder 3mm	Bogen aus 3mm Kupfer	1		3				
40	14	335	245	243	325	5	10		3X Kupferverbinder 3mm		1		3				

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Tab.-Nr.: NT31-00-918167/T1  
Datum: 11.07.2002

Tab.-Nr.: NT31-00-918167/T1  
Datum: 11.07.2002

# ***QA for External Vessel Cooling Test - Roadmap***

**> QA system of the FANP Technical Center**

**> QA for External Vessel Cooling Test**

■ Design and Manufacturing

■ Measuring and Test Equipment

■ Data Acquisition

# QA for External Vessel Cooling Test - Measuring and Test Process

<b>FRAMATOME ANP</b>	Document:	QAP-No.: TG-001
	Quality Assurance Plan (QAP)	Rev.: A
		Prepared by: TGT
Title <b>SWR 1000, Ex-Vessel Cooling Test, Vent Pipe Test and Quencher Test</b>		
Proj.-Code ZBX101	DCC AQA	Contents Code
Pages: 17    Appendices: 5 Handling Instructions: RESTRICTED		
<b>Table of Contents</b>		
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1	Quality Management System.....	5
2	Management Responsibility.....	8
3	Resource Management .....	11
4	Product Realization.....	13
5	Measurement, Analysis and Improvement .....	16
6	References .....	17
7	Appendices.....	17
Release: Dr. J. Meseth    FANP NGPF    7. Sept. Nov. 24, 2002		
Reviewed: K.-P. Kleinert    FANP SGQ    Nov 13, 2002		
Reviewed: G. Schmidt    FANP TGM    14.11.2002		
Prepared: R. Roessner    FANP TGT1    14.11.2002		
Prepared: H.-J. Klotz		
Name		
Framatome ANP GmbH QAP TG-001.doc		

	Ex-Vessel Cooling Test
Measuring process	Test specification TGT1/02/e42, Sect. 1.3
Test process	Test specification TGT1/02/e42, Sect. 1.4
Evaluation of test results	Test specification TGT1/02/e42, Sect. 1.4
Final report	Test specification TGT1/02/e42, Sect. 1.5

<b>FRAMATOME ANP</b>	Ref. (Department/Year/Language/Serial No.)	
	FANP /TGT1/02/e42	
Subject/Title	Place	Date
	Erlangen	16.09.02
Tests to prove the functioning of the external cooling concept of the SWR 1000	Prepared by	Department
	Herbst, Oliver	TGT1
Reviewed by	Tel.	Signature
	97028	
Project	Reviewed by	
	Roessner, Roland    TGT1    92352	
Handling Instructions	Dr. Holger Schmidt, TGT1    Mr. Werner Brettschuh, TGT1	
	Unrestricted	
Export Classification (Reports with techn. content)	Released by concerned department	
	(content, handling, distribution, requirement)	
AL: N	ECCN: N	Doc. Ident. No.
Proj.-Code	UA	DCC
ZXX020	BN	07045
Summary		Pages of text: 15    Appendices: A
<p>Framatome ANP is developing a new boiling water reactor called SWR 1000. Its safety concept consists of passive safety equipment combined with active systems, and through this diversity, meets the goal of reducing the probability of core damage compared to existing plants. Furthermore, the design is aimed at being able to control a postulated core melt accident to such an extent that the consequences of an accident remain restricted to the plant. The core melt is retained in the Reactor Pressure Vessel (RPV) at low pressure owing to cooling of the RPV exterior. For this purpose a passive flooding system is installed which feeds by gravity into the lower area of the drywell from the core flooding pool. The water will penetrate through apertures in the RPV-insulation into the gap between the insulation and the RPV-wall.</p> <p>Framatome ANP is preparing tests to confirm the functioning of the exterior cooling concept of the boiling water reactor SWR 1000. For this purpose, pretests have been performed to identify the shape of a section model. They are documented in the reports /1 to 4/, which are in German language. The fundamental ideas for performing the final test are described in /5 to 7/.</p> <p>It is the objective of the final test to identify safety margins of the exterior cooling concept by considering the influence of the control rod drive housings. In order to simulate the heat flux of the molten material heating wires will be installed on the upper surface.</p> <p>This report specifies, how the final test will be performed. The background, methodology and objectives of the final test are described in the appendix of this report.</p>		
Distribution		
Mr. Brettschuh	NGPF	Mr. Brand    f.i.o.    TGT
Mr. Bieler	NGEM4	Mr. Klotz    f.i.o.    TGT3
Dr. Meseth	NGPF	Mr. G. Schmidt    f.i.o.    TGM
Mr. Herbst	TGT1	
Mr. Klemm	TGT1	
Dr. Ganzmann	TGT1	
Framatome ANP GmbH		
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# ***QA for External Vessel Cooling Test - Preparation of Measurement Techniques***

As already mentioned, the requirements for the accuracy of the measurements are relatively low

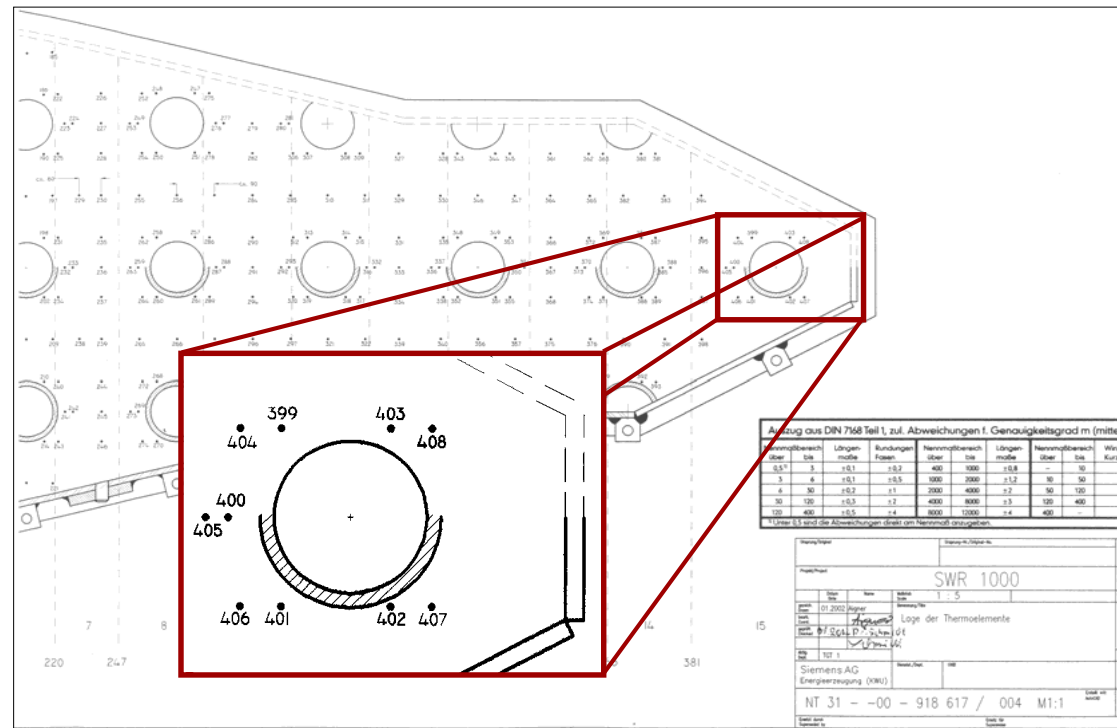
- > Commercial accuracy is acceptable
- > Within all checks the whole chain has to be checked, from the sensor to the data acquisition
- > A separate error analysis is not required
- > But if calibrated equipment is requested, calibration tests have to be performed before and after the final test



# QA for External Vessel Cooling Test

## - Measuring Techniques, Example: Thermocouples (1)

- > The temperature measurements of the heated surface will be checked based on plausibility
  - Plausibility check is described in the Test Procedure (FANP TGT1/02/e42)
  - Installation has to be done and checked according to the respective drawing



Anstieg aus DIN 7568 Teil 1, zul. Abweichungen f. Genauigkeitsgrad m (mitte)									
Abmßbereich über bis	Längen m	Rundungen mm	Normmßbereich über bis	Längen m	Normmßbereich über bis	Normmßbereich über bis	Normmßbereich über bis	Normmßbereich über bis	Werte
0,5/1	3	±0,1	±0,2	400	1000	±0,8	-	50	50
3	6	±0,1	±0,5	1000	2000	±1,2	50	50	50
6	30	±0,2	±1	2000	4000	±1,7	50	100	100
30	100	±0,5	±2	4000	8000	±2,5	100	400	400
100	400	±0,5	±4	8000	12000	±4	400	-	-

SWR 1000	
1:5	
Lage der Thermoelemente	
NT 31 - -00 - 918 617 / 004 M1:1	

# QA for External Vessel Cooling Test

## - Measuring Techniques, Example: Thermocouples (2)

Belegungsplan SCXI 1303 - Module

Chassis	Slot	Kanal auf Platine	Thermoelement-Nr.	Kanal - Nr. in Meßstellenliste
1	3	0	RWT 001	0
1	3	1	RWT 002	1
1	3	2	RWT 003	2
1	3	3	RWT 004	3
1	3	4	RWT 005	4
1	3	5	RWT 006	5
1	3	6	RWT 007	6
1	3	7	RWT 008	7
1	3	8	RWT 009	8
1	3	9	RWT 010	9
1	3	10	RWT 011	10
1	3	11	RWT 012	11
1	3	12	RWT 013	12
1	3	13	RWT 014	13
1	3	14	RWT 015	14
1	3	15	RWT 016	15
1	3	16	RWT 017	16
1	3	17	RWT 018	17
1	3	18	RWT 019	18
1	3	19	RWT 020	19
1	3	20	frei	frei
1	3	21	RWT 022	21
1	3	22	RWT 023	22
1	3	23	RWT 024	23
1	3	24	RWT 025	24
1	3	25	RWT 026	25
1	3	26	RWT 027	26
1	3	27	frei	frei
1	3	28	RWT 029	28
1	3	29	RWT 030	29
1	3	30	frei	frei
1	3	31	Vergleichsstelle	31

Chassis	Slot	Kanal auf Platine	Thermoelement-Nr.	Kanal - Nr. in Meßstellenliste
1	4	0	RWT 032	32
1	4	1	RWT 033	33
1	4	2	frei	frei
1	4	3	RWT 035	35
1	4	4	RWT 036	36
1	4	5	RWT 037	37
1	4	6	RWT 038	38
1	4	7	RWT 039	39
1	4	8	RWT 040	40
1	4	9	RWT 041	41
1	4	10	RWT 042	42
1	4	11	RWT 043	43
1	4	12	RWT 044	44
1	4	13	RWT 045	45
1	4	14	RWT 046	46
1	4	15	frei	frei
1	4	16	RWT 048	48
1	4	17	RWT 049	49
1	4	18	RWT 050	50
1	4	19	RWT 051	51
1	4	20	frei	frei
1	4	21	RWT 053	53
1	4	22	frei	frei
1	4	23	RWT 055	55
1	4	24	RWT 056	56
1	4	25	RWT 057	57
1	4	26	RWT 058	58
1	4	27	RWT 059	59
1	4	28	frei	frei
1	4	29	frei	frei
1	4	30	RWT 062	62
1	4	31	Vergleichsstelle	63

Meßstellenliste:

MST	KAN STF	Bezeichnung	Kurz-bezeichnung	Meß-wandler	Meßbereich	SI-Meßbereich	Meßort	Bemerkung
1	0	Temperatur 001	TE RWT001	SCXI-11 02		0 - 1000 °C		SCXI Chassis1 SLOT03
2	1	Temperatur 002	TE RWT002	SCXI-11 02		0 - 1000 °C		SCXI Chassis1 SLOT03
3	2	Temperatur 003	TE RWT003	SCXI-11 02		0 - 1000 °C		SCXI Chassis1 SLOT03
4	3	Temperatur 004	TE RWT004	SCXI-11 02		0 - 1000 °C		SCXI Chassis1 SLOT03

Autor: Herbst

Datei: SWR1000.mst

Versuchsdatum: 01.11.02



Geprüft  
14.3.03  
Stk. Post

FANP TGT1 / Herbst / 3/13/03



Certificate of Calibration

### Board Information

Serial Number: 460669  
NI Part Number: 1865541-01  
Description: DAQCard-6062E

Calibration Date: 16-MAY-2002  
Calibration Interval: 12 Months  
Calibration Due: 16-MAY-2003

Ambient Temperature: 23 °C  
Relative Humidity: 52 %

### Certificate Information

Certificate Number: 460669  
Date Printed: 17-MAY-2002  
NI Part Number: 184632A-01

National Instruments certifies that at the time of manufacture, the above product was calibrated in accordance with the applicable National Instruments procedures. These procedures are in compliance with relevant clauses of ISO 9002 and are designed to assure that the product listed above meets or exceeds National Instruments specifications.

National Instruments further certifies that the measurements standards and instruments used during the calibration of this product are traceable to the National Institute of Standards and Technology or are derived from accepted values of natural physical constants.

The environment in which this product was calibrated is maintained within the operating specifications of the instrument and the standards.

For questions or comments, please contact National Instruments Technical Support.

Signed,

J.E. Brochtrup

Joseph Brochtrup  
Test Engineering Manager

# ***QA for External Vessel Cooling Test - Roadmap***

**> QA system of the FANP Technical Center**

**> QA for External Vessel Cooling Test**

**■ Design and Manufacturing**

**■ Measuring and Test Equipment**

**■ Data Acquisition**

# QA for External Vessel Cooling Test - Data Acquisition Software (1)

> *National Instruments' LabView  
is most widely used to*



*acquire*



*analyze*

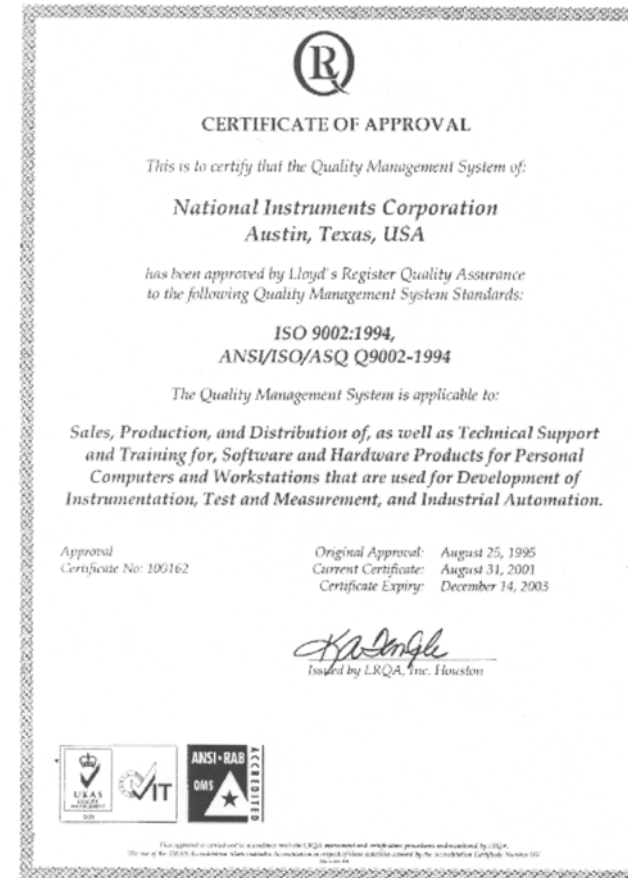


*present*

*data*

> Software, and any revisions to it,  
is tested and/or validated prior to  
use, approved for use, and archived

> Validation is performed by comparison with manual  
calculations. The results are documented



# QA for External Vessel Cooling Test - Data Acquisition Software (2)

## > Developers' experience

### ■ Test Lead Engineer

	year
<b>1. Performed activities:</b>	
• Planning and realization of tests on heat transfer and pressure drop of:	
• rifled tubes, type Foster Wheeler	1999
• rifled tubes, type 16 and type Babcock-Hitachi	1999
• rifled tubes, type 18 and type 19	2001
• Planning and realization of EU-projects	
• ISB 2000	2001
• HIPE CFB-Boiler	2002
• Evaluation of all tests; presentation of the results at license negotiations (Babcock&Wilcox, Ohio and Foster Wheeler, New Jersey, USA)	1999-2001
• Responsible for development of computer programs WATHUN2D and DRUBEN (heat transfer and pressure drop for boiler design)	2002
• Training of BENSON licensees in these programs	2001
• Development of the complete data acquisition, visualization and evaluation system with the software package LabView for BENSON-projects rifled tubes, type 18 and 19, for EU-projects ISB-2000 and HIPE and for the FANP-projects EPR-spreading concept and SWR1000-external cooling of RPV	2001/2002
• Software development for nuclear business (FLORA, Calculation of leakage rates within the scope of the LBB-concept). Presentation of the program at SMiRT16-conference in Washington, USA	2000/2001
• Co-author in VDI Wärmeatlas	2000-2002
<b>2. Training:</b>	
• LabView Data acquisition and visualization	2000
<b>3. Indoctrination</b>	
• Quality Management within Technical Center	2002
• QA Plan SWR 1000, QAP TG 001	
• 10CFR50, App. B, 10CFR21	
• ANSI/ASME NQA-1	
• Applicable procedures	

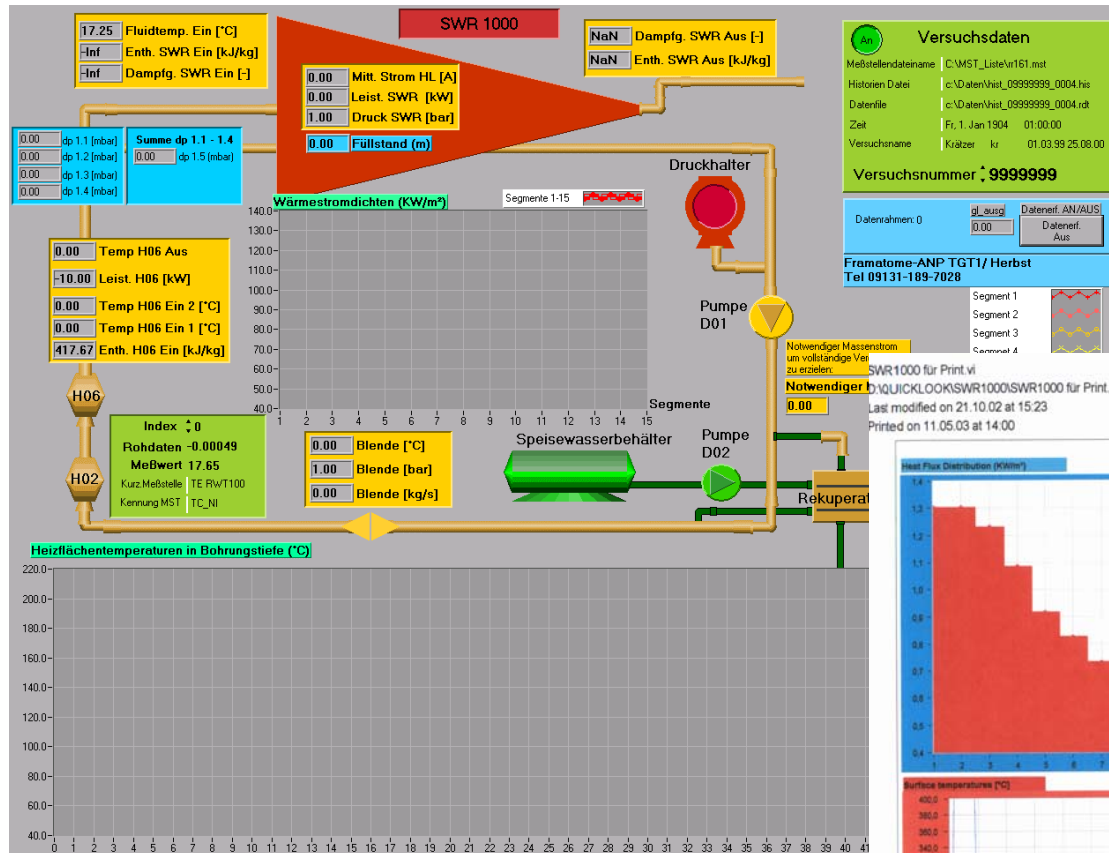
### ■ Test Engineer

	year
<b>1. Performed activities:</b>	
• Tests on heat transfer and pressure drop of:	
• rifled tubes, type 16 and type Babcock-Hitachi	1999
• rifled tubes, type 18 and type 19	2000
• rifled tube, type 20	2000
• Re-design of the control system of the BENSON test rig, incl. start-up tests	2001/02
• Development of a data acquisition system in exchange for the pen recorders of the BENSON test rig	2000
<b>2. Training:</b>	
• LabView Data acquisition and visualization	2000
<b>3. Indoctrination</b>	
• Quality Management within Technical Center	2000
• QA Plan SWR 1000, QAP TG 001	
• 10CFR50, App. B, 10CFR21	
• ANSI/ASME NQA-1	
• Applicable procedures	



# QA for External Vessel Cooling Test Data Acquisition Software (3)

> Online display



> "Quicklook"

