

RT-1000 Multichannel Maintenance Manual



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- Issue: 2016/11/07 [Rev 1.03.a]
- Document-ID: 12-9-1-0015-3-6-60

Note

The manufacturer reserve the right to make modifications at any time and without previous information of the here described product.

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1 General Information

This document represents the maintenance manual of the RT-1000 Multichannel DF-System. All tests described in this document are recommended to be performed annually in order to proof the correct functionality of the DF-System.

All tests should be performed by the personnel, which have been educated on the RT-1000 DF-System or have other appropriate knowledge.

Necessary Measurement Equipment:

- RMS Voltmeter
- RF-Generator
- Spectrum Analyzer
- Antenna Modell (RHOTHETA RTM 1501)
- RF Cable min. 1,5m BNC male to BNC male
- 2 RF Cable min. 1,5m BNC male to SMB female
- Portable ATC RF-Transmitter with output power of min. 0.5 W

Applicable Documents:

- User Manual
- System Connection Plan

Note 1:

All connector names refer to the system connection plan, which is delivered with the DF-System.

Note 2:

All used measurement equipment should be calibrated and have not expired date of calibration.

2 Indoor Tests

2.1 AC Power Supply

	Test procedure:				
	Measure the input supply voltage in the supply socket with a RMS Voltmeter.				
TC.Nr.	TC. Name	Test point	Limits	Result	Passed
[TC 010.10]	AC Supply Input (UPS)	Supply Socket	$230V_{rms} \pm 15\%$		OK <input type="checkbox"/>
Measurement Equipment:	RMS Voltmeter				

	Test procedure:				
	Switch on the UPS if a UPS is installed. Measure the voltage from X1 to X2 with the RMS Voltmeter.				
TC.Nr.	TC. Name	Test point	Limits	Result	Passed
[TC 010.20]	AC Supply With input Supply	X1, X2	$230V_{rms} \pm 15\%$		OK <input type="checkbox"/>
Measurement Equipment:	RMS Voltmeter				

	Test procedure:				
	Switch ON the main supply switch S1 and measure the $230V_{AC,rms}$ at the internal connection panel from X80 to X90 with the RMS Voltmeter.				
TC.Nr.	TC. Name	Test point	Limits	Result	Passed
[TC 010.30]	AC Supply Internal Connection Panel	X80-X90	$230V_{rms} \pm 15\%$		OK <input type="checkbox"/>
Measurement Equipment:	RMS Voltmeter				

2.2 DC Power Supply

Test procedure: Switch on the DC Power Supply (KEPCO-POWER-SUPPLY +5 V, +15V, -15V). Measure the DC Voltage on DC Power Supply's front panel test points with a RMS Voltmeter.					
TC.Nr.	TC. Name	Test point	Limits	Result	Passed
[TC 020.11]	DF-Channel DC Supply DC Power Supply (KEPCO 5 V)	+Test Points- (KEPCO Front panel)	5,0...5,25 V _{DC}		OK <input type="checkbox"/>
[TC 020.12]	DF-Channel DC Supply DC Power Supply (KEPCO 15 V)	+Test Points- (KEPCO Front panel)	14,75...15,25 V _{DC}		OK <input type="checkbox"/>
[TC 020.13]	DF-Channel DC Supply DC Power Supply (KEPCO 15 V)	+Test Points- (KEPCO Front panel)	14,75...15,25 V _{DC}		OK <input type="checkbox"/>
[TC 020.14]	DF-Channel DC Supply DC Power Supply (KEPCO 15 V)	+Test Points- (KEPCO Front panel)	14,75...15,25 V _{DC}		OK <input type="checkbox"/>
Measurement Equipment:	RMS Voltmeter				

	Test procedure:					
	Measure the DC Voltage with a RMS Voltmeter on one of the DF-Channels from TP16 to GND, TP15 to GND, TP14 to GND					
TC.Nr.	TC. Name		Test point	Limits	Result	Passed
[TC 020.20]	DF-Channel 1	+5 V	TP16	+5,0...+5,25 V _{DC}		OK <input type="checkbox"/>
[TC 020.21]		+15 V	TP15	+14,75...+15,25 V _{DC}		OK <input type="checkbox"/>
[TC 020.22]		-15 V	TP14	-14,75...-15,25 V _{DC}		OK <input type="checkbox"/>
[TC 020.23]	DF-Channel 2	+5 V	TP16	+5,0...+5,25 V _{DC}		OK <input type="checkbox"/>
[TC 020.24]		+15 V	TP15	+14,75...+15,25 V _{DC}		OK <input type="checkbox"/>
[TC 020.25]		-15 V	TP14	-14,75...-15,25 V _{DC}		OK <input type="checkbox"/>
[TC 020.26]	DF-Channel 3	+5 V	TP16	+5,0...+5,25 V _{DC}		OK <input type="checkbox"/>
[TC 020.27]		+15 V	TP15	+14,75...+15,25 V _{DC}		OK <input type="checkbox"/>
[TC 020.28]		-15 V	TP14	-14,75...-15,25 V _{DC}		OK <input type="checkbox"/>
[TC 020.29]	DF-Channel 4	+5 V	TP16	+5,0...+5,25 V _{DC}		OK <input type="checkbox"/>
[TC 020.30]		+15 V	TP15	+14,75...+15,25 V _{DC}		OK <input type="checkbox"/>
[TC 020.31]		-15 V	TP14	-14,75...-15,25 V _{DC}		OK <input type="checkbox"/>
[TC 020.32]	DF-Channel 5	+5 V	TP16	+5,0...+5,25 V _{DC}		OK <input type="checkbox"/>
[TC 020.33]		+15 V	TP15	+14,75...+15,25 V _{DC}		OK <input type="checkbox"/>
[TC 020.34]		-15 V	TP14	-14,75...-15,25 V _{DC}		OK <input type="checkbox"/>
[TC 020.35]	DF-Channel 6	+5 V	TP16	+5,0...+5,25 V _{DC}		OK <input type="checkbox"/>
[TC 020.36]		+15 V	TP15	+14,75...+15,25 V _{DC}		OK <input type="checkbox"/>
[TC 020.37]		-15 V	TP14	-14,75...-15,25 V _{DC}		OK <input type="checkbox"/>
[TC 020.38]	DF-Channel 7	+5 V	TP16	+5,0...+5,25 V _{DC}		OK <input type="checkbox"/>
[TC 020.39]		+15 V	TP15	+14,75...+15,25 V _{DC}		OK <input type="checkbox"/>
[TC 020.40]		-15 V	TP14	-14,75...-15,25 V _{DC}		OK <input type="checkbox"/>
[TC 020.41]	DF-Channel 8	+5 V	TP16	+5,0...+5,25 V _{DC}		OK <input type="checkbox"/>
[TC 020.42]		+15 V	TP15	+14,75...+15,25 V _{DC}		OK <input type="checkbox"/>
[TC 020.43]		-15 V	TP14	-14,75...-15,25 V _{DC}		OK <input type="checkbox"/>
Measurement Equipment:	RMS Voltmeter					

2.3 RF-Splitter

	Test procedure: Disconnect the DF-Antenna from RF-IN on connector panel (see: General System Description, Chapter: Connector Panel). Connect 50Ω load to RF-IN on connector panel. Measure the attenuation of RF-Splitter: Connect the RF-Generator (Level 0 dBm) to the input TEST-IN of RF-Splitter and measure the output levels at LNA1-OUT and LNA2-OUT. Spectrum Analyzer setup: SPAN: 10 MHz, RBW: 3kHz, Ref. Level: 0dBm					
TC.Nr.	TC. Name	Test point	Limits	Result	Passed	Not Supplied
Single LNA (No Redundancy)						
[TC 030.10]	118 MHz	TEST-IN → LNA1-OUT	-17,5 dBm ±1,5 dB		OK <input type="checkbox"/>	<input type="checkbox"/>
[TC 030.11]	174 MHz	TEST-IN → LNA1-OUT	-17,5 dBm ±1.5 dB		OK <input type="checkbox"/>	
[TC 030.12]	100 MHz	TEST-IN → LNA1-OUT	≤ - 30 dBm		OK <input type="checkbox"/>	
[TC 030.13]	190 MHz	TEST-IN → LNA1-OUT	≤ - 60 dBm		OK <input type="checkbox"/>	
Double LNA (Redundancy)						
[TC 030.20]	118 MHz	TEST-IN → LNA1-OUT	-21 dBm ±1,5 dB		OK <input type="checkbox"/>	<input type="checkbox"/>
[TC 030.21]		TEST-IN → LNA2-OUT			OK <input type="checkbox"/>	
[TC 030.22]	174 MHz	TEST-IN → LNA1-OUT	-21 dBm ±1.5 dB		OK <input type="checkbox"/>	
[TC 030.23]		TEST-IN → LNA2-OUT			OK <input type="checkbox"/>	
[TC 030.24]	100 MHz	TEST-IN → LNA1-OUT	≤ - 30 dBm		OK <input type="checkbox"/>	
[TC 030.25]		TEST-IN → LNA2-OUT			OK <input type="checkbox"/>	
[TC 030.26]	190 MHz	TEST-IN → LNA1-OUT	≤ - 60 dBm		OK <input type="checkbox"/>	
[TC 030.27]		TEST-IN → LNA2-OUT			OK <input type="checkbox"/>	
Measurement Equipment:	Spectrum Analyzer RF-Generator					

2.4 DF-Channels

2.4.1 Display and Control Elements

	Test procedure:			
	Connect the RF-Generator to the antenna model Input. Connect the antenna model output to the Test In port of the RF-Splitter. Switch on the RF-Generator.			
	f = 127.000 MHz, Level = 0 dBm, Modulation AM: 800 Hz, m=60%.			
	Check the functionality of all control elements at all DF-Channels.			
TC.Nr.	TC. Name	Description	Criteria	Passed
[TC 040.10]	Switch «On/Off»	-	Position «ON»	OK <input type="checkbox"/>
[TC 040.11]	LED «+5V»	Supply +5V	Green	OK <input type="checkbox"/>
[TC 040.12]	LED «+15V»	Supply +15V	Green	OK <input type="checkbox"/>
[TC 040.13]	LED «-15V»	Supply -15V	Green	OK <input type="checkbox"/>
[TC 040.14]	LED «Pow»	Control lamp receiver supply voltage	Green	OK <input type="checkbox"/>
[TC 040.15]	LED «Sql»	Control lamp for receiver squelch	Yellow	OK <input type="checkbox"/>
[TC 040.16]	LED «F+, F-»	Control lamp, frequency offset	LED is off	OK <input type="checkbox"/>
[TC 040.17]	LED «No Sync»	Control lamp for error in receiver	LED is off	OK <input type="checkbox"/>
[TC 040.18]	Display «Frequency (MHz)»	Frequency (MHz) indication	Frequency indicated	OK <input type="checkbox"/>
[TC 040.19]	Switch «Local/Remote»	Switch for Local/Remote Mode	Local and Remote Mode switched	OK <input type="checkbox"/>
[TC 040.20]	Button «Band»	Switch for ATC band and Marine band	ATC band and Marine band switched	OK <input type="checkbox"/>
[TC 040.21]	Switch «Level/Frequency/QDR»	Switch for Input RX Level and QDR (Switch is not fixed)	Input RX Level and QDR Switched	OK <input type="checkbox"/>
[TC 040.22]	Button «↑,↓»	Buttons for frequency change in local mode	Frequency changed	OK <input type="checkbox"/>
[TC 040.23]	Bearing indication on Display (*)	-	With a bearing signal is « * » displayed	OK <input type="checkbox"/>
[TC 040.24]	Sync (o.k , Err.)	Synchronizations LEDs of the control signals	Green	OK <input type="checkbox"/>
[TC 040.25]	Audio	Check the audio output at the loudspeaker	The audio tone of 800 Hz should be audible	OK <input type="checkbox"/>
Measurement Equipment:	RF-Generator Antenna Model			

2.4.2 Phase Adjust

	Test procedure:					
	Connect the antenna model to the RF-IN of the RF-Splitter. Connect the RF-Generator with 127.000 MHz and with a level of -7 dBm at the antenna model RF input. Adjust the receiver to the 127.000 MHz. Switch the Antennal Model to 000° (QDM 180°). Phase adjustment can be set using the two rotary switches, "fine" and "coarse". Use these rotary switches and find the middle of the range where the green control lamp lights up. The QDM display should then show 180° (QDM).					
TC.Nr.	TC. Name	Test point		Result	Passed	Not Supplied
[TC 040.30]	Phase Adjust DF-Channel 1	Phase Adj. OK LED Green	coarse:		OK <input type="checkbox"/>	<input type="checkbox"/>
			fine:			
[TC 040.31]	Phase Adjust DF-Channel 2	Phase Adj. OK LED Green	coarse:		OK <input type="checkbox"/>	<input type="checkbox"/>
			fine:			
[TC 040.32]	Phase Adjust DF-Channel 3	Phase Adj. OK LED Green	coarse:		OK <input type="checkbox"/>	<input type="checkbox"/>
			fine:			
[TC 040.33]	Phase Adjust DF-Channel 4	Phase Adj. OK LED Green	coarse:		OK <input type="checkbox"/>	<input type="checkbox"/>
			fine:			
[TC 040.34]	Phase Adjust DF-Channel 5	Phase Adj. OK LED Green	coarse:		OK <input type="checkbox"/>	<input type="checkbox"/>
			fine:			
[TC 040.35]	Phase Adjust DF-Channel 6	Phase Adj. OK LED Green	coarse:		OK <input type="checkbox"/>	<input type="checkbox"/>
			fine:			
[TC 040.36]	Phase Adjust DF-Channel 7	Phase Adj. OK LED Green	coarse:		OK <input type="checkbox"/>	<input type="checkbox"/>
			fine:			
[TC 040.37]	Phase Adjust DF-Channel 8	Phase Adj. OK LED Green	coarse:		OK <input type="checkbox"/>	<input type="checkbox"/>
			fine:			
Measurement Equipment:	RF-Generator Antenna Model					

2.4.3 Frequency Offset Test

25 kHz Channel Spacing

	Test procedure:				
	Connect signal generator to RF-Splitter TEST-IN. Change Frequency ±10 kHz				
	Control LED «F+, F-» on one of the DF-Channels.				
	Frequency: 127,000 MHz				
	Level: -60 dBm				
Modulation: off					
TC.Nr.	TC. Name		Criteria	Passed	Not Supplied
[TC 040.40]	DF-Channel 1	127,010 MHz	«Δf+» LED on	OK <input type="checkbox"/>	<input type="checkbox"/>
[TC 040.41]		126,990 MHz	«Δf-» LED on	OK <input type="checkbox"/>	
[TC 040.42]	DF-Channel 2	127,010 MHz	«Δf+» LED on	OK <input type="checkbox"/>	<input type="checkbox"/>
[TC 040.43]		126,990 MHz	«Δf-» LED on	OK <input type="checkbox"/>	
[TC 040.44]	DF-Channel 3	127,010 MHz	«Δf+» LED on	OK <input type="checkbox"/>	<input type="checkbox"/>
[TC 040.45]		126,990 MHz	«Δf-» LED on	OK <input type="checkbox"/>	
[TC 040.46]	DF-Channel 4	127,010 MHz	«Δf+» LED on	OK <input type="checkbox"/>	<input type="checkbox"/>
[TC 040.47]		126,990 MHz	«Δf-» LED on	OK <input type="checkbox"/>	
[TC 040.48]	DF-Channel 5	127,010 MHz	«Δf+» LED on	OK <input type="checkbox"/>	<input type="checkbox"/>
[TC 040.49]		126,990 MHz	«Δf-» LED on	OK <input type="checkbox"/>	
[TC 040.50]	DF-Channel 6	127,010 MHz	«Δf+» LED on	OK <input type="checkbox"/>	<input type="checkbox"/>
[TC 040.51]		126,990 MHz	«Δf-» LED on	OK <input type="checkbox"/>	
[TC 040.52]	DF-Channel 7	127,010 MHz	«Δf+» LED on	OK <input type="checkbox"/>	<input type="checkbox"/>
[TC 040.53]		126,990 MHz	«Δf-» LED on	OK <input type="checkbox"/>	
[TC 040.54]	DF-Channel 8	127,010 MHz	«Δf+» LED on	OK <input type="checkbox"/>	<input type="checkbox"/>
[TC 040.55]		126,990 MHz	«Δf-» LED on	OK <input type="checkbox"/>	
Measurement Equipment:	RF-Generator				

8.33 kHz Channel Spacing

	Test procedure:				
	Connect signal generator to RF-Splitter TEST-IN. Change Frequency ± 4 kHz				
	Control LED « $\Delta f+$ », « $\Delta f-$ » on one of the DF-Channels.				
	Frequency: 127,005 MHz				
	Level: -60 dBm				
Modulation: off					
TC.Nr.	TC. Name		Criteria	Passed	Not Supplied
[TC 040.60]	DF-Channel 1	127,004 MHz	« $\Delta f+$ » LED on	OK <input type="checkbox"/>	<input type="checkbox"/>
[TC 040.61]		126,996 MHz	« $\Delta f-$ » LED on	OK <input type="checkbox"/>	
[TC 040.62]	DF-Channel 2	127,004 MHz	« $\Delta f+$ » LED on	OK <input type="checkbox"/>	<input type="checkbox"/>
[TC 040.63]		126,996 MHz	« $\Delta f-$ » LED on	OK <input type="checkbox"/>	
[TC 040.64]	DF-Channel 3	127,004 MHz	« $\Delta f+$ » LED on	OK <input type="checkbox"/>	<input type="checkbox"/>
[TC 040.65]		126,996 MHz	« $\Delta f-$ » LED on	OK <input type="checkbox"/>	
[TC 040.66]	DF-Channel 4	127,004 MHz	« $\Delta f+$ » LED on	OK <input type="checkbox"/>	<input type="checkbox"/>
[TC 040.67]		126,996 MHz	« $\Delta f-$ » LED on	OK <input type="checkbox"/>	
[TC 040.68]	DF-Channel 5	127,004 MHz	« $\Delta f+$ » LED on	OK <input type="checkbox"/>	<input type="checkbox"/>
[TC 040.69]		126,996 MHz	« $\Delta f-$ » LED on	OK <input type="checkbox"/>	
[TC 040.70]	DF-Channel 6	127,004 MHz	« $\Delta f+$ » LED on	OK <input type="checkbox"/>	<input type="checkbox"/>
[TC 040.71]		126,996 MHz	« $\Delta f-$ » LED on	OK <input type="checkbox"/>	
[TC 040.72]	DF-Channel 7	127,004 MHz	« $\Delta f+$ » LED on	OK <input type="checkbox"/>	<input type="checkbox"/>
[TC 040.73]		126,996 MHz	« $\Delta f-$ » LED on	OK <input type="checkbox"/>	
[TC 040.74]	DF-Channel 8	127,004 MHz	« $\Delta f+$ » LED on	OK <input type="checkbox"/>	<input type="checkbox"/>
[TC 040.75]		126,996 MHz	« $\Delta f-$ » LED on	OK <input type="checkbox"/>	
Measurement Equipment:	RF-Generator				

2.4.4 Level Check

		Test procedure:									
		Connect the RF-Generator to the TEST-IN of the RF-Splitter. Set RF-Generator output to appropriate level (see column Criteria). Check dBm level displayed on DF Commander. Also check % level displayed on DF Commander. Test all DF-Channels.									
TC.Nr.	TC. Name	Criteria	Result								
			DF-Channel								
			1	2	3	4	5	6	7	8	
[TC 040.80]	-100 dBm	-120 dBm \pm 6 dB									
		32% \pm 8%									
[TC 040.81]	-90 dBm	-110 dBm \pm 6 dB									
		42 \pm 8%									
[TC 040.82]	-80 dBm	-100 dBm \pm 6 dB									
		55 \pm 8%									
[TC 040.83]	-70 dBm	-90 dBm \pm 6 dB									
		68 \pm 8%									
[TC 040.84]	-60 dBm	-80 dBm \pm 6 dB									
		80 \pm 8%									
[TC 040.85]	-50 dBm	-70 \pm 6 dB									
		92 \pm 8%									
[TC 040.86]	-30 dBm	"> -63 dBm"									
		99%									
Passed			<input type="checkbox"/> OK	<input type="checkbox"/> OK	<input type="checkbox"/> OK	<input type="checkbox"/> OK	<input type="checkbox"/> OK	<input type="checkbox"/> OK	<input type="checkbox"/> OK	<input type="checkbox"/> OK	
Not Supplied			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Measurement Equipment:	RF-Generator										

2.4.5 Squelch Check

	Test procedure:			
	Set Squelch Level (SQ) of DF-Channels to 50%. Connect the RF-Generator to the TEST-IN of the RF-Splitter. Set RF-Generator output level to -80 dBm at the desired channel frequency of DF-Channel. The SQ LED on DF-Channel shall light up. Test all DF-Channels.			
TC.Nr.	TC. Name	Criteria	Passed	Not Supplied
[TC 040.90]	SQ level DF-Channel 1	LED «Sql» is ON	OK <input type="checkbox"/>	<input type="checkbox"/>
[TC 040.91]	SQ level DF-Channel 2	LED «Sql» is ON	OK <input type="checkbox"/>	<input type="checkbox"/>
[TC 040.92]	SQ level DF-Channel 3	LED «Sql» is ON	OK <input type="checkbox"/>	<input type="checkbox"/>
[TC 040.93]	SQ level DF-Channel 4	LED «Sql» is ON	OK <input type="checkbox"/>	<input type="checkbox"/>
[TC 040.94]	SQ level DF-Channel 5	LED «Sql» is ON	OK <input type="checkbox"/>	<input type="checkbox"/>
[TC 040.95]	SQ level DF-Channel 6	LED «Sql» is ON	OK <input type="checkbox"/>	<input type="checkbox"/>
[TC 040.96]	SQ level DF-Channel 7	LED «Sql» is ON	OK <input type="checkbox"/>	<input type="checkbox"/>
[TC 040.97]	SQ level DF-Channel 8	LED «Sql» is ON	OK <input type="checkbox"/>	<input type="checkbox"/>
Measurement Equipment:	RF-Generator			

2.4.6 Bearing Check

	Test procedure: Connect the RF-Generator to the input of antenna model. Connect the output of the antenna model to the TEST-IN port of the RF-Splitter and switch ON the RF-Generator. f = 127,000 MHz, Level = -10 dBm Modulation off. Control the displayed bearing at the DF Commander at Main Bearing Page for each channel.					
TC.Nr.	TC. Name	Test point	Limits	Result	Passed	Not Supplied
[TC 041.10]	Bearing Check DF-Channel 1		0° ±3°		OK <input type="checkbox"/>	<input type="checkbox"/>
			90° ±3°			
			180° ±3°			
			270° ±3°			
[TC 041.11]	Bearing Check DF-Channel 2		0° ±3°		OK <input type="checkbox"/>	<input type="checkbox"/>
			90° ±3°			
			180° ±3°			
			270° ±3°			
[TC 041.12]	Bearing Check DF-Channel 3		0° ±3°		OK <input type="checkbox"/>	<input type="checkbox"/>
			90° ±3°			
			180° ±3°			
			270° ±3°			
[TC 041.13]	Bearing Check DF-Channel 4		0° ±3°		OK <input type="checkbox"/>	<input type="checkbox"/>
			90° ±3°			
			180° ±3°			
			270° ±3°			
[TC 041.14]	Bearing Check DF-Channel 5		0° ±3°		OK <input type="checkbox"/>	<input type="checkbox"/>
			90° ±3°			
			180° ±3°			
			270° ±3°			
[TC 041.15]	Bearing Check DF-Channel 6		0° ±3°		OK <input type="checkbox"/>	<input type="checkbox"/>
			90° ±3°			
			180° ±3°			
			270° ±3°			
[TC 041.16]	Bearing Check DF-Channel 7		0° ±3°		OK <input type="checkbox"/>	<input type="checkbox"/>
			90° ±3°			
			180° ±3°			
			270° ±3°			
[TC 041.17]	Bearing Check DF-Channel 8		0° ±3°		OK <input type="checkbox"/>	<input type="checkbox"/>
			90° ±3°			
			180° ±3°			
			270° ±3°			
Measurement Equipment:	RF-Generator Antenna Model					

2.5 System Status Check

2.5.1 Status

	Test procedure:				
	Check the appearance of Errors and Warnings on the Channel Status Indicator (see Manual). There should be no Errors and Warnings displayed (all indicator must be green).				
TC.Nr.	TC. Name	Test point	Criteria	Passed	Not Supplied
[TC 050.10]	Errors and Warnings DF-Channel 1	DF-Channel 1	No Errors and Warnings	OK <input type="checkbox"/>	<input type="checkbox"/>
[TC 050.11]	Errors and Warnings DF-Channel 2	DF-Channel 2	No Errors and Warnings	OK <input type="checkbox"/>	<input type="checkbox"/>
[TC 050.12]	Errors and Warnings DF-Channel 3	DF-Channel 3	No Errors and Warnings	OK <input type="checkbox"/>	<input type="checkbox"/>
[TC 050.13]	Errors and Warnings DF-Channel 4	DF-Channel 4	No Errors and Warnings	OK <input type="checkbox"/>	<input type="checkbox"/>
[TC 050.14]	Errors and Warnings DF-Channel 5	DF-Channel 5	No Errors and Warnings	OK <input type="checkbox"/>	<input type="checkbox"/>
[TC 050.15]	Errors and Warnings DF-Channel 6	DF-Channel 6	No Errors and Warnings	OK <input type="checkbox"/>	<input type="checkbox"/>
[TC 050.16]	Errors and Warnings DF-Channel 7	DF-Channel 7	No Errors and Warnings	OK <input type="checkbox"/>	<input type="checkbox"/>
[TC 050.17]	Errors and Warnings DF-Channel 8	DF-Channel 8	No Errors and Warnings	OK <input type="checkbox"/>	<input type="checkbox"/>

2.5.2 Error and Warning Simulation

	Test procedure:			
	Check Errors and Warnings on Channel Status Indicator (see Manual).			
TC.Nr.	TC. Name	Description	Criteria	Passed
[TC 050.20]	DF-Channel Off	Turn off DF-Channel	Error must be displayed	OK <input type="checkbox"/>
[TC 050.21]	DF-Channel in Local Mode	Switch one of DF-Channels to local mode	Error must be displayed	OK <input type="checkbox"/>
[TC 050.22]	Frequency offset	Connect signal generator to RF Splitter TEST-IN. Change Frequency ± 10 kHz	Warning be displayed	OK <input type="checkbox"/>

2.6 UPS Duration Test

	Test procedure:		
	Turn off input supply from UPS. The System has to work 30 minutes without Errors. After test turn UPS input supply ON.		
TC.Nr.	TC. Name	Passed	Not Supplied
[TC 060.10]	30 minutes operation from UPS	OK <input type="checkbox"/>	<input type="checkbox"/>
Measurement Equipment:	Stopwatch		

3 Outdoor Test

The outdoor test is the test of bearing accuracy of the system inclusive the antenna and the installation position or area. Please note that due to the installation area or changes of installation area (e.g. new metal reflectors on the field) the bearing results may vary from the performance showed at factory acceptance test. Note that the system performance which was shown at factory acceptance test did not cover the influence of installation area and hence provided the true bearing performance of the direction finder.

3.1 Bearing Test with Antenna Mast

Test procedure:				
<ol style="list-style-type: none"> 1. Please define the position on the field, where the bearing is known. The distance should be at least 100m. 2. Go to the defined position and switch on the radio transmitter on the appropriate test frequency. 3. Write down the bearing result. 4. Turn the rotating mechanism of the antenna mast in one step and transmit again with the ATC radio device. Write down the bearing result. One step corresponds exactly to 10°, so bearing result should have been changed in 10° also. 5. Repeat this procedure with 10° steps until the full circle of 360° has been measured. 				
TC.Nr.	TC. Name	Limits	Result	Passed
[TC 060.10]	0° Measurement	0° ±3°		OK <input type="checkbox"/>
[TC 060.11]	10° Measurement	10° ±3°		OK <input type="checkbox"/>
[TC 060.12]	20° Measurement	20° ±3°		OK <input type="checkbox"/>
[TC 060.13]	30° Measurement	30° ±3°		OK <input type="checkbox"/>
[TC 060.14]	40° Measurement	40° ±3°		OK <input type="checkbox"/>
[TC 060.15]	50° Measurement	50° ±3°		OK <input type="checkbox"/>
[TC 060.16]	60° Measurement	60° ±3°		OK <input type="checkbox"/>
[TC 060.17]	70° Measurement	70° ±3°		OK <input type="checkbox"/>
[TC 060.18]	80° Measurement	80° ±3°		OK <input type="checkbox"/>
[TC 060.19]	90° Measurement	90° ±3°		OK <input type="checkbox"/>
[TC 060.20]	100° Measurement	100° ±3°		OK <input type="checkbox"/>
[TC 060.21]	110° Measurement	110° ±3°		OK <input type="checkbox"/>
[TC 060.22]	120° Measurement	120° ±3°		OK <input type="checkbox"/>
[TC 060.23]	130° Measurement	130° ±3°		OK <input type="checkbox"/>
[TC 060.24]	140° Measurement	140° ±3°		OK <input type="checkbox"/>
[TC 060.25]	150° Measurement	150° ±3°		OK <input type="checkbox"/>
[TC 060.26]	160° Measurement	160° ±3°		OK <input type="checkbox"/>
[TC 060.27]	170° Measurement	170° ±3°		OK <input type="checkbox"/>
[TC 060.28]	180° Measurement	180° ±3°		OK <input type="checkbox"/>
[TC 060.29]	190° Measurement	190° ±3°		OK <input type="checkbox"/>
[TC 060.30]	200° Measurement	200° ±3°		OK <input type="checkbox"/>
[TC 060.31]	210° Measurement	210° ±3°		OK <input type="checkbox"/>
[TC 060.32]	220° Measurement	220° ±3°		OK <input type="checkbox"/>
[TC 060.33]	230° Measurement	230° ±3°		OK <input type="checkbox"/>
[TC 060.34]	240° Measurement	240° ±3°		OK <input type="checkbox"/>
[TC 060.35]	250° Measurement	250° ±3°		OK <input type="checkbox"/>
[TC 060.36]	260° Measurement	260° ±3°		OK <input type="checkbox"/>
[TC 060.37]	270° Measurement	270° ±3°		OK <input type="checkbox"/>
[TC 060.38]	280° Measurement	280° ±3°		OK <input type="checkbox"/>
[TC 060.39]	290° Measurement	290° ±3°		OK <input type="checkbox"/>
[TC 060.40]	300° Measurement	300° ±3°		OK <input type="checkbox"/>
[TC 060.41]	310° Measurement	310° ±3°		OK <input type="checkbox"/>
[TC 060.42]	320° Measurement	320° ±3°		OK <input type="checkbox"/>
[TC 060.43]	330° Measurement	330° ±3°		OK <input type="checkbox"/>
[TC 060.44]	340° Measurement	340° ±3°		OK <input type="checkbox"/>
[TC 060.45]	350° Measurement	350° ±3°		OK <input type="checkbox"/>
[TC 060.46]	360° Measurement	360° ±3°		OK <input type="checkbox"/>
Measurement Equipment:	Mobile Transmitter			

3.2 Bearing Test without Mast

TC.Nr.	Test procedure:			
	1. Please define more than one position, where the bearing is known.			
	2. Go to the defined position and switch on the radio transmitter on the appropriate test frequency.			
	3. Write down the bearing result. The bearing result should correspond to the known bearing.			
	4. Repeat this procedure with all defined positions on a field.			
TC.Nr.	TC. Name	Limits	Result	Passed
[TC 070.10]	Position 1	0° ±3°		OK <input type="checkbox"/>
[TC 070.11]	Position 2			OK <input type="checkbox"/>
[TC 070.12]	Position 3			OK <input type="checkbox"/>
[TC 070.13]	Position 4			OK <input type="checkbox"/>
[TC 070.14]	Position 5			OK <input type="checkbox"/>
[TC 070.15]	Position 6			OK <input type="checkbox"/>
[TC 070.16]	Position 7			OK <input type="checkbox"/>
[TC 070.17]	Position 8			OK <input type="checkbox"/>
Measurement Equipment:	Mobile Transmitter			

3.3 Bearing Check with the Tower Signal

TC.Nr.	Test procedure:			
	The bearing value on a tower is normally defined. If not, so please do so. Hence, the bearing on a tower transmitter is a simple check of the system, which can be done many times without extra preparation.			
TC.Nr.	TC. Name	Limits	Result	Passed
[TC 080.10]	Tower Bearing	Tower Bearing ±3°		OK <input type="checkbox"/>
Measurement Equipment:	Mobile Transmitter			

4 Notes