

FREJA 306

Relay Testing System



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FREJA™ 306 is the latest member of the relay testing equipment from Programma, quick and easy to use, like the FREJA 300. The rugged hardware design is built for field use over a wide temperature range, with the possibilities of intelligent software to perform rapid testing.

FREJA 306 can be operated with or without a PC. After being put into the Local mode, FREJA 306 can be used stand-alone without a PC. Using the Local mode is easy.

FREJA 306 is an excellent choice when you want more current outputs, higher amps, VA or compliance voltage. Use it to test differential relays with 6 currents, or virtually any single or 3-phase relay.

When testing 1-phase relays, you can make use of either the high current (over 100 A), or the very high compliance voltage. This now makes it possible to test high impedance relays of different kinds, like rotating disc relays, earth protection relays, etc.

FREJA 306 can also be used as a disturbance simulator and create and generate simulated disturbances, or import actual recorded disturbances from e.g. EMTP or COMTRADE files (and edit the wave forms), by using the FREJA SIM Disturbance Simulator Software. With the built-in DC source you can directly supply the protective relay.

Application

Relay Testing

FREJA 306 is intended primarily for secondary testing of protective relay equipment. Virtually all types of protection relays can be tested.

Examples of what FREJA 300 can test	ANSI® No.
Distance protection equipment	21
Synchronising or synchronism-check relays	25
Undervoltage relays	27
Directional Power relays	32
Undercurrent or underpower relays	37
Negative sequence overcurrent relays	46
Overcurrent-/ ground fault relays	50
Inverse time overcurrent-/ ground fault relays	51
Power factor relays	55
Overvoltage relays	59
Voltage or current balance relays	60
Directional overcurrent relays	67
DC overcurrent relays	76
Phase-angle measuring or out-of-step protective relays	78
Automatic reclosing devices	79
Frequency relays	81
Differential protective relays	87
Directional voltage relays	91
Voltage and power directional relays	92

Operation

Local Mode - without PC

Using the dial by turning and clicking it is easy to make the settings. All settings are saved automatically when you exit, but if you prefer you can assign the settings a name and save them separately for convenient access when you conduct your next test. The display can also show the measured value that is being generated. This feature is equivalent to three voltmeters and three ammeters that present RMS values for all generators.

With a PC - FREJA Win

FREJA Win Control center

There are a number of instrument programs. You start the different programs at the Control center, where you also save and recall results. Since the test set-ups/results are saved via a regular Micro-soft® Explorer display, you can create your own test object structures. See the FREJA Win section for more information.

```

2ND 50.00 Hz 63.0 63.0 63.0 63.0 V
* - - VOLT 0.0 0.0 240.0 120.0
o o o -----ms 0.00 0.00 0.00A
2/6 Start SET 0.0 0.0 0.0
    
```

Local Mode General

```

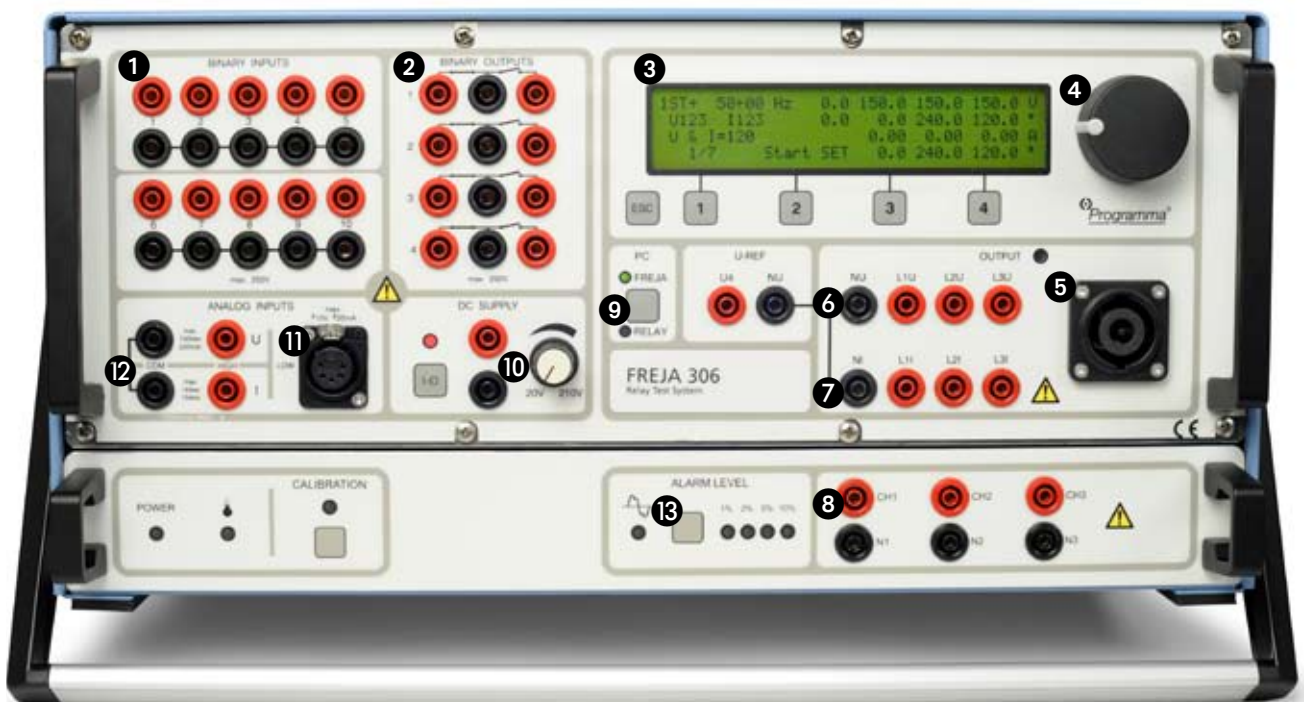
2ND 50.00Hz I: <1.000> U: 45.0V
* - - VOLT R: 45.000 |Z|: 45.000
o o o -----ms X: 0.000 Zφ: 0.0
2/3 Start RST Run: Seq
    
```

Local Mode Rx (I)



Control center

- 1 Binary inputs – Response-time compensated
- 2 Binary outputs – Operating-time compensated
- 3 Display and buttons used in the Local Mode.
- 4 Dial, press to Enter.
- 5 Multiconnector for voltage (L1U, L2U, L3U, NU) and current (L1I, L2I, L3I, NI).
- 6 Voltage outputs – Standard
- 7 Current outputs – Standard
- 8 Current outputs – High-end
- 9 Switch, PC to Freja 300 or relay
- 10 DC-supply, connect to (12) to read the values
- 11 Analog inputs, LOW, for measurement transducers
- 12 Analog inputs, HIGH, for volt- and ammeter
- 13 Distortion alarm level





Calibration box (optional)



Test lead set

Specifications FREJA 306

Specifications are valid for resistive load, nominal voltage supply and ambient temperature $+25^{\circ}\text{C} \pm 3^{\circ}\text{C}$, ($77^{\circ}\text{F} \pm 5.4^{\circ}\text{F}$) after 30 minutes warm up time. All hardware data are for full scale values. Specifications are subject to change without notice.

Environment

<i>Application field</i>	For use in high-voltage substations and industrial environments.
<i>Temperature</i>	
<i>Operating</i>	0°C to $+50^{\circ}\text{C}$ (32°F to $+122^{\circ}\text{F}$)
<i>Storage & transport</i>	-40°C to $+70^{\circ}\text{C}$ (-40°F to $+158^{\circ}\text{F}$)
<i>Humidity</i>	5% – 95% RH, non-condensing
<i>Altitude (operational)</i>	3000 m Full duty cycle up to 2000 m. Duty cycle limitation based on internal over temperature protection for altitudes >2000 m.

CE-marking

<i>EMC</i>	EMC 2004/108/EEG EN 61326-1:2006 + A1:1998 + A2:2001 + A3:2003 (Industrial locations)
<i>Safety</i>	LVD 73/23/EEC EN/IEC 61010-1:2001 incl. all national deviations

General

<i>Mains input (nominal)</i>	100 – 240 V AC, 50–60 Hz
<i>Power consumption</i>	1200 VA + 1500 VA (max)
<i>Dimensions</i>	
<i>Instrument</i>	450 x 224 x 410 mm (17.7" x 8.8" x 16.1")
<i>Transport case</i>	610 x 345 x 660 mm (24" x 13.6" x 26")
<i>Weight</i>	
<i>Instrument</i>	23 kg (50.7 lbs)
<i>Transport case</i>	12 kg (26.4 lbs)
<i>Display</i>	LCD
<i>Available languages</i>	English, French, German, Spanish, Swedish

Measurement section

Binary inputs

<i>Number</i>	10 Inputs (2 groups of 5 independent)
<i>Type</i>	Dry or wet contacts 275 V DC, 240 V AC Response-time compensated
<i>Internal resolution time</i>	50 μs

<i>Galvanic isolation</i>	Galvanically separated from the amplifier section. Two galvanically separated groups: 1 to 5 and 6 to 10
<i>Max measuring time</i>	15264 h (636 days)

Range	Resolution
0 - 9.9 ms	0.1 ms
10 ms - 60 min	1 ms
1 h - 15264 h	1 s

DC current measuring input, LOW

<i>Measuring range</i>	± 20 mA
<i>Resolution</i>	SW 0.1 μA HW 0.6 μA
<i>Inaccuracy</i>	0.01% typical, 0.03% guaranteed (= 6 μA)

DC voltage measuring input, LOW

<i>Measuring range</i>	± 10 V
<i>Resolution</i>	SW 0.1 mV HW 0.3 mV
<i>Inaccuracy</i>	0.01% typical, 0.03% guaranteed (= 3 mV)

AC/DC current measuring input, HIGH ¹⁾

<i>Measuring range</i>	± 14 A DC, 10 A AC _{RMS}
<i>Inaccuracy</i>	DC $<0.1\%$, AC $<0.3\%$

AC/DC voltage measuring input, HIGH ¹⁾

<i>Measuring range</i>	± 220 V DC, 150 V AC _{RMS}
<i>Inaccuracy</i>	DC $<0.05\%$, AC $<0.2\%$

Measurement, internally generated values

<i>Inaccuracy</i>	
<i>Voltage AC/DC</i>	$<1\%$ ± 1 digit
<i>Current AC/DC</i>	$<2\%$ ± 2 digit

Binary outputs

<i>Number</i>	2 x 4 (NO & NC)
<i>Type</i>	Zero-potential contacts, controlled via software
<i>Break capacity AC</i>	240 V AC, max 8 A, max load 2000 VA
<i>Break capacity DC</i>	275 V DC, max 8 A, max load 240 W

Low level outputs (Rogowski option)

<i>Setting range</i>	
<i>LLU</i>	3 X 0...2 V _{RMS}
<i>LLI</i>	3 X 0...2 V _{RMS}
<i>Max. output current</i>	5 mA
<i>Inaccuracy</i>	$<0.1\%$ typ. ($<0.2\%$ guaranteed)
<i>Resolution</i>	250 μV
<i>Distortion (THD+N) ²⁾</i>	$<0.05\%$ typ. ($<0.1\%$ guaranteed)
<i>Max. generating time</i>	5 minutes

Generator section	
Voltage outputs	
<i>Range</i>	
4-phase AC	4 x 150 V
1-phase AC (L-L)	2 x 300 V
DC (L-N)	180 V
<i>Power</i>	
3-phase AC	3 x 82 VA at 150 V
1-phase AC (L-L)	1 x 140 VA at 300 V
DC (L-N)	87 W
<i>Resolution</i>	
SW	10 mV
HW	6.5 mV
Inaccuracy ³⁾ (guaranteed)	(±0.01% of range) + (±0.05% of reading)
Distortion (THD+N) ⁴⁾	0.02% typical (0.04% max)
Current outputs	
Standard outputs – L1I, L2I, L3I	
<i>Range</i>	
3-phase AC	3 x 15 A
1-phase AC ²⁾	1 x 45 A
DC (L-N)	15 A
3-channel DC	–
<i>Power</i>	
3-phase AC	3 x 87 VA
1-phase AC ²⁾	1 x 250 VA
DC (L-N)	3 x 87 W (max)
<i>Resolution</i>	
SW	1 mA
HW	0.65 mA
Inaccuracy ³⁾ (guaranteed)	(±0.01% of range) + (±0.3% of reading)
Distortion (THD+N) ⁴⁾	0.1% typical (0.2% max)
High-end outputs – Ch1, Ch2, Ch3	
Voltage transients - Immunity	2500 V transient level (to chassis) + working voltage level (255 V)
Working voltage	255 V Not to be used on live circuits
<i>Application</i>	
3-phase AC (per phase)	250 VA, 5 A < I ≤ 25 A 200 VA, 25 A < I ≤ 30 A 150 VA, 30 A < I ≤ 35 A
1-phase AC (3 ch. in parallel)	750 VA, 15 A < I ≤ 75 A 600 VA, 75 A < I ≤ 90 A 450 VA, 90 A < I ≤ 100 A
3-ch. DC	3 x ±20 A
Compliance voltage	≤50 Vrms
<i>Time limits</i>	
Continuous	3 x 20 A, 150 VA (max)
0.5 s on 1 s off repeatedly	3 x 35 A
<i>Resolution</i>	
inaccuracy ⁵⁾ typical	< 0.3% (of reading), 0.5 A < I ≤ 35 A < 8 mA, 0 A < I ≤ 0.5 A
Phase inaccuracy ⁵⁾	< ±0.2°
Distortion (THD+N) ⁶⁾	< 0.4% typical
Generators, general	
<i>Frequency range</i>	
Continuous signals	DC – 2000 Hz
Transient signals	DC – 3.5 kHz
Frequency resolution	1 mHz
Frequency inaccuracy	0.01%
Phase angle range	0 – 360°

Phase resolution	0.1°
Phase inaccuracy ³⁾	±0.1°
Connection (Amplifier outputs)	4 mm stackable safety plugs or 8-pin amplifier multiconnector

All seven generators are continuously and independently adjustable in amplitude and phase. No switching of range is necessary. All current and voltage outputs are fully overload- and short-circuit-proof and protected against external high voltage transient signals and overtemperature.

Note! To allow continuous generation of high DC current (12–15 A), a minimum load impedance of 0.2 Ohm is required. For lower load impedances, e.g. short-circuit, the time is limited to 1 minute.

DC auxiliary voltage output

Range	20 – 210 V DC
Output power	75 W at 210 V

Other

On-line measurement of the current and voltage output, presented on the built-in display.

Calibration check when the temperature is changed. Full calibration can be conducted any time using the FREJA calibration box. This means you do not need to send away FREJA for calibration. Only the calibration box needs to be sent for calibration once per year.

Connection to IBM compatible PC (minimum Pentium II 266 MHz, 32 Mb RAM, Win 95/98/2000/XP, NT 4.0) via the serial port.

1) 50 or 60 Hz AC + harmonics only.

2) THD+N: Values at 50/60 Hz, at max amplitude, 50% power and resistive load. Measurement bandwidth 22 Hz – 22 kHz.

3) For sinusoidal signals at 50/60 Hz.

4) Parallel connection.

5) Values at max amplitude, 50% power and resistive load.

6) THD+N: Values at 25 A, 125 VA.

Ordering information	Art.No.
FREJA 306	
Complete with: FREJA Win, Two test lead sets, Hard transport case	CF-29091
Same as above but with soft transport case	CF-29090
FREJA 306 basic unit	
Incl. FREJA Win	CF-29000
FREJA 306, LLA	
Rogowski option	
Complete with: FREJA Win, Two test lead sets, Hard transport case	CF-29095
Same as above but with soft transport case	CF-29094
FREJA 306 Basic Unit, LLA	
Rogowski option	
Incl. FREJA Win	CF-29004
FREJA 306 Expert	
Same as CF-29091 + RELEX (data base)	CF-29098
FREJA 306 Expert, LLA	
Rogowski option	
Same as CF-29095 + RELEX (data base)	CF-29099
Optional	
Rebuild FREJA 300 to FREJA 306	CF-90090
Calibration box	CF-90100
Optional accessories	
See section "Relay testing accessories"	

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