1. TECHNICAL DATA

Unless otherwise specified, the values shown here apply to any operating conditions within the rated operating conditions specified in Section 1.6.

1.1 Generator

1.1.1 Frequency

Frequency setting
Continuously adjustable. . . . . From 15 Hz to 20,000 Hz
and 200 Hz to 4,000 Hz

Sweep frequency ranges . . . . . (30 ±10) Hz to (20 ± 1) kHz
f_{min} to f_{max} and (200 ± 10) Hz to (3,500 ± 150) Hz

Continuous sweep operation,
frequency rise and fall. . . . . 2 seconds each

Single sweep operation
(Converted by solder
straps inside the unit),
frequency rise. . . . . .20 seconds

Frequency characteristic. . . . . .approx. exponential

Fixed frequencies . . . . . .800 Hz ± 1 %, 400 Hz ± 3%,
3,000 Hz ± 3 %

Frequency display
by 4 position digital frequency counter with crystal time base

Resolution, switchable. . . . . 10 Hz and 1 Hz

Overflow indication at 1 Hz resolution by LED

Measuring rate at 10 Hz resolution. . . . . .approx. 8/s
at 1 Hz resolution. . . . . .approx. 4/s

Error limits of the frequency display . .$\pm$ 2 . 10^{-4} $\pm$ 1 digit

1.1.2 Generator level

Setting range
at $R_i = R_a = Z$ = 600 ohm and 1,200 ohm
or R_i = 0 ohm and $R_a \geqq$ 400 ohm . . . . . .-65 to +11 dB, dBm
at R_i = 0 ohm and $R_a \geqq$ 400 ohm
and Z = 600 ohm . . . . . .-65 to +16 dB, dBm

Switchable in 5 dB steps . . . . . .-60 to +15 dB, dBm
Continuously adjustable . . . . . -5 to +1 dB
Generator level is displayed on the receiver meter

Error limits of the generator level

Frequency	Temperature	Output level	Indication	Termination conditions	Error limits
800 Hz	23 ±5) °C	-10 dB, dBm	0 dB	$R_i = R_a$ = 600 Ω	±0,05 dB
200 Hz to 4 kHz	+15 to +35 °C	-65 to +11 dB, dBm	5-dB-scale	$R_i = R_a$ = 600 Ω	±0,2 dB
30 Hz to 15 kHz					±0,25 dB
15 Hz to 20 kHz	0 to +55 °C			$R_i = R_a$ = 600 Ω and 1 200 Ω	±0,5 dB

R_a balanced and floating

Additional error at R_i = 0 ohm and $R_a \geqq$ 400 ohm in the level range -65 to +16 dB, dBm . . . . .max. $\pm$ 0.15 dB

1.1.3 Output . . . . . .Floating, balanced, 3-pole CF connector

Output impedance, switchable . . . .0 ($\leqq$ 4 ohm), 600 ohm $\pm$ 1 %, 1,200 ohm $\pm$ 1 %

Signal balance ratio (f $\leqq$ 4 kHz at R_i = 1,200 ohm)
at output level $\geqq$ -25 dB, dBm. . . . . $\geqq$ 40 dB
at output level -25 dB, dBm. . . . . $\geqq$ 20 dB

Permissible dc loading at
R_i = 0 and 600 ohm . . . . . $\leqq$ 60 mA
Permissible ringing voltage, 25 or 50 Hz,
from an output impedance $\geqq$ 500 oh, max. 10 s . . $\leqq$ 100 V
Permissible dc voltage between output
sockets and case . . . . . $\leqq$ 100 V

Attenuation of output signal in operating
mode four-wire receive (generator switched off). $\geqq$ 90 dB

Output impedance and loadability of the
generator output, which is disconnected
in this mode . . . . . .600 ohm, 2 W

Blanking of the generator signal by pushbutton
(no change of output impedance)
Blanking attenuation . . . . . $\geqq$ 40 dB

1.1.4 Noise voltages at generator output

Harmonic ratio a_{k2}, a_{k3} (R_i any), R_a $\geqq$ 300 ohm
at fixed frequency 800 Hz. . . . . $\geqq$ 60 dB
in frequency range 30 Hz to 20 kHz . . . . . $\geqq$ 46 dB

Attenuation of nonharmonic noise voltages at
$R_i = R_a = Z$ in the frequency range 15 Hz to 20 kHz
(without 50 Hz noise voltage in the case of mains
operation). . . . . $\geqq$ 70 dB

50 Hz noise voltage for mains operation
in the level range $\geqq$ -50 dB, dBm. . . . . $\geqq$ 50 dB

1.2 Receiver

1.2.1 Operating mode level measurement ("Level")

Frequency range. . . . . .15 Hz to 20 kHz
Attenuation in frequency range ≧ 50 kHz. . . . ≧ 40 dB
in frequency range ≧ 100 kHz . . . ≧ 50 dB

Measuring ranges for 0 dB meter indication
Switchable in 5 dB steps . . . . .-80, -75, -70 to +20 dB, dBm
Meter scale, unexpanded . . . . . .-20 to +2 dB
expanded . . . . . -5 to +1 dB

Error limits after calibration

Frequency	Temperature	Meas. range	Indication	Termination conditions	Error limits
800 Hz	(23 ±5) °C	-10 dB, dBm	5-dB-scale	$R_q = R_e = 600\ \Omega$	±0,15 dB
200 Hz to 4 kHz	+15 to +35 °C	-60 to +20 dB, dBm	5-dB-scale	$R_q = R_e = 600\ \Omega$	±0,2 dB
30 Hz to 15 kHz	+15 to +35 °C	-60 to +20 dB, dBm	5-dB-scale	$R_q = R_e = 600\ \Omega$	±0,25 dB
15 Hz to 20 kHz	0 to +55 °C	-80 to +20 dB, dBm	-10 to +2 dB	$R_q = R_e = 600\ \Omega$ or 1200 Ω	±0,6 dB

R_q = balanced or floating

Additional error in the measuring ranges
-65 to -80 dB, dBm. . . . . .max. ± 0.1 dB
Additional error for R_q ≦ 600 ohm and R_e = 50 ohm ..max. ± 0.15 dB
Noise deflection with open input and
R_e = 600 or 1,200 ohm . . . . . .approx. -100 dB, dBm

Calibration, switchable
Voltage level (dB). . . . . .re 0.775 V
or power level (dBm). . . . . .re 1 mW

Calibration is carried out with pushbutton and calibration potentiometer. The reference level is generated by the transmitter generator, which is automatically switched to the calibration frequency.

Calibration frequency for level measurement
and noise and signal-to-noise voltage ratio
in the telephone channel. . . . . 800 Hz

For noise and signal-to-noise voltage ratio
measurements in the sound channel (only
in version BN 815/5). . . . . .6,300 Hz

Measuring rectifier . . . . . .genuine RMS rectifier
Additional indication error
at peak factor 5. . . . . .max. ± 0.2 dB

1.2.2 Noise voltage measurement in speech channel

Measuring range. . . . . same as level measurement mode
Weighted noise voltage measurement
Frequency response . . . . . .in accordance with CCITT
Rec. P53A, 1972
Rectification. . . . . .genuine RMS rectifier

Unweighted noise voltage measurement
Frequency response from 31.5 Hz to 20 kHz . .max. ± 0.5 dB
≦ 30 Hz . . . . . ≧ 12 dB/octave
≧ 50 kHz. . . . . ≧ 40 dB
≧ 100 kHz . . . . . ≧ 50 dB

Rectification. . . . . genuine RMS rectifier

Error limit of the level indication at
800 Hz, in the level range -85 to +22 dB,
dBm, when indicated on 5 dB scale and with
the receiver calibrated in the mode being
used at $R_q = R_e = Z$. . . . . .± 0.2 dB

1.2.3 Noise voltage measurement in the sound channel

Measuring range. . . . . same as level measurement mode

Frequency response and pseudo peak value rectification with weighted and unweighted noise voltage. . . . . In accordance with CCIR Rec. 468-1 (1976)

Error limit of the level indication at 6,300 Hz, in the level range -85 to +22 dBq, indicated on the 5 dB scale, and with the receiver calibrated in the mode being used at $R_q = R_e = Z$ . . . . . $\pm$ 0.2 dB

1.2.4 Inputs. . . . . .Floating, balanced, 3-pole CF socket

Input impedance, switchable. . . . . 600 ohm $\pm$ 1 %, 1,200 ohm $\pm$ 1 %
$\geqq$ 50 kohm approx. 150 pF

Signal balance ratio . . . .In accordance with CCITT Rec. P53A, 1972 [1)]

Permissible dc loading at R_e = 600 ohm . . . . . $\leqq$ 60 mA
Permissible dc voltage at R_e = 50 kohm . . . . . $\leqq$ 100 V
Permissible ringing voltage, 25 or 50 Hz, from an output impedance $\geqq$ 500 ohm, max. 10 s. . . $\leqq$ 100 V
Permissible dc voltage between input sockets and case. . . . . $\leqq$ 100 V

1.2.5 Outputs

Ac voltage output . . . . . .unbalanced, short-circuit-proof, 3-pole CF socket

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1) The indication is $\leqq$ 0.1 mV (-78 dB) when a voltage of 200 V at 50 Hz, 30 V at 300 Hz, 10 V at 800 Hz is connected between ground and the center point of an ohmmic resistance of 2 x 300 ohm connected across the input terminals at R_e = 50 kohm.

Open-circuit voltage at 0 dB
meter indication . . . . . 0 dB
Output impedance. . . . . 600 ohm
Dc voltage output, proportional to
meter indication, short-circuit proof,
3-pole CF socket
Open-circuit voltage at full-scale defelction . .+ 150 mV
Output impedance. . . . . 150 ohm

1.2.6 Receive frequency indication

Necessary meter indication for frequency measurement
up to measuring range -70 dB, dBm. . . . .+2 to approx.-15 dB
Measuring rate at 1 Hz resolution. 1/s

For further data, see Section 1.1.1, frequency display.

1.3 Measuring attachments

Vector impedance measurement (Z_x)

Measuring ranges (full scale
deflection) . . . . . .80 ohm, 250 ohm, 800 ohm,
2,5 kohm, 8 kohm
Frequency range . . . . . .15 Hz to 20 kHz
Error limits in scale range 250 to
800 or 80 to 250, with balanced and
floating measuring resistances, in
frequency range 15 Hz to 20 kHz, $|Z_x|$
$\leqq$ 80 kohm and $\varphi \leqq 30^{\circ}$ . . . . .$\pm$ 10 %
In the frequency range 200 Hz to 4 kHz, $|Z_x|$
$\leqq$ 2.5 kohm and $\varphi \leqq 30^{\circ}$ . . . . .$\pm$ 5 %
Measuring level across measured resistance
at full scale deflection. . . .-10 dB

Balance return loss measurement (a_F)

Balance return loss ranges referred
to 0 dB indication . . . . . .0 to 50 dB
Frequency range. . . . . .15 Hz to 15 kHz

Intrinsic return loss of the measuring bridge
for X = N = 200 to 1,200 ohm, balance
and floating . . . . . .≧ 60 dB

Measuring level at X or N with bridge balanced . . -10 dB
with bridge not balanced . . - 4 dB

Permissible dc voltage at socket (8) . . . . . ≦ 100 V
Isolating capacitor between sockets (8) and (9). .2 µF

1.4 Speech circuit and monitoring device

1.4.1 Monitoring loudspeaker

Switchable. . . . . .on, ready, off

In the position "Ready", the received signal being measured is suppressed, while an incoming speech signal is reproduced.

Switching of the loudspeaker on the receive or transmit side is carried out, in accordance with the table below, by selecting the operating mode with pushbutton switch (13).

Operating mode	Loudspeaker connection
4-wire measurement	to receiver output
2-wire measurement, transmit	in series with transmitter output
2-wire measurement, receive	to receiver output

The error limits of the measuring set are not exceeded when the loudspeaker is active.

1.4.2 Speech circuit (communication circuit)
for speech communication via the line being measured
to the opposite station, for four and two-wire connections.

Connection for handset. . . . . .8-pole socket

Microphone supply (by internal power supply). approx. 2 mA

1.5 Power supplies

1.5.1 Mains operation

Mains voltage. . . . . .187 to 242 V
can be converted internally to . . . . . 93 to 121 V
Mains frequency. . . . . 45 to 66 Hz
Power consumption. . . . . approx. 20 VA
Protection class . . . . . I (IEC 348,
VDE 0411)

With protective isolated power supply unit, protective
conductor and measuring ground separated.

1.5.2 Operation with built-in battery

Battery type. . . . . .NiCd accumulator
16.8 V/1.8 Ah
Make. . . . . .SAFT 14 VR 2.0 or VARTA 14/RS 1.8
Operating time of measuring set
with fully charged battery. . . . . .approx. 6 h
Charging time for fully discharged battery. . .14 h
The battery is not damaged by overcharging.

The measuring set is completely functional even without
the internal battery.
The battery can be checked under load by depressing a
pushbutton; indication on the meter.
When the protective transport cover is fitted, the internal
battery is switched off.

1.5.3 Operation with external battery

Voltage range. . . . . .11.5 to 68 V

With the internal battery connected, the measuring set is supplied from the external battery only when the voltage of this battery is > 20 V.

Power consumption. . . . . .approx. 6 W

Connection . . . . . .potential-fee, 6-pole socket, + on 2, - on 1

The internal battery is neither charged nor buffered by the external battery.

1.6 Rated operated conditions

The rated operated conditions described those operating conditions (in any combination), for which the specified error limits are valid. Special reference is made in the specifications to any restrictions for specific error limit data.

Mains voltage. . . . . .187 to 242 V or 93 to 121 V
Mains frequency. . . . . .45 to 66 Hz
Voltage range with external battery. . . .11.5 to 68 V
Ambient temperature. . . . . .0 to +55°C
Warming-up time. . . . . .None
Operating position . . . . . .Vertical or horizonta.

1.7 Additional specifications

Degree of radio frequency interference. . . . . K

Ambient temperature for storage and transport
(without battery). . . . . .-40 to +70°C

Effects of external fields. . . .in accordance with DIN 45 405
(July 67), Section 3.9

Unit dimensions with cover (w x h x d in mm) . .330 x 280 x 280

Weight. . . . . .approx. 10 kg

1.8 Ordering data

AF measuring set PMG-2. . . . . Version BN 815/4
Version BN 815/5

FTZ-K number for version BN 815/4. . . . . .2760 98068
for version BN 815/5. . . . . .2760 98069

Subject to change without notice.