Australian Government
Department of Industry, Innovation and Science

National Measurement Institute

NATA ACCREDITED FOR TECHNICAL COMPETENCE

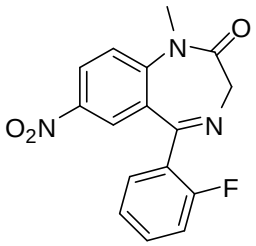
CERTIFIED REFERENCE MATERIAL CERTIFICATE OF ANALYSIS

NMIA D882: Flunitrazepam

Report ID: D882.2018.01 (Bottled 151015)

Chemical Formula: $C_{16}H_{12}FN_3O_3$

Molecular Weight: 313.3 g/mol



Certified value

Batch No.	CAS No.	Purity (mass fraction)
07-D-05	1622-62-4	99.7 ± 0.4%

The uncertainty is stated at the 95% confidence limit.

Synonyms: 2H-1,4-Benzodiazepin-2-one
5-(2-fluorophenyl)-1,3-dihydro-1-methyl-7-nitro
5-(2-Fluorophenyl)-1,3-dihydro-1-methyl-7-nitro-2H-1,4-benzodiazepin-2-one
7-Nitro-1-methyl-5-(2-fluorophenyl)-3H-1,4-benzodiazepin-2(1H)-one
Narcozep
Rohypnol
Silece

Expiration of certification: The property values are valid till 12th December 2018, i.e. three years from the date of re-certification provided the **unopened** material is handled and stored in accordance with the recommendations below. The material as issued in the unopened container and stored as recommended below should be suitable for use beyond this date, subject to confirmation of batch stability from the issuing body. The expiry date/shelf life does not apply to sample bottles that have been opened. In such cases it is recommended that the end-user conduct their own in-house stability trials.

Description: Off-white powder prepared by synthesis or sourced from an external supplier, certified for identity and purity by NMIA. Packaged in amber glass bottles with a septum and crimped aluminium cap or screw top cap.

Intended use: This certified reference material is suitable for use as a primary calibrator.

Instructions for use: Equilibrate the bottled material to room temperature before opening.

Recommended storage: When not in use this material should be stored at or below 20 ºC in a closed container in a dry, dark area.

Metrological traceability: The certified purity value is traceable to the SI unit for mass (kg) through Australian national standards via balance calibration. In the mass balance approach all impurities are quantified as a mass fraction and subtracted from 100%. Quantitative NMR provides an independent direct measure of the mass fraction of the analyte of interest, calibrated with an internal standard certified for purity (mass fraction).

Stability: This material has demonstrated stability over a minimum period of three years. The measurement uncertainty at the 95% coverage interval includes a stability component which has been estimated from long term stability trials. The long-term stability of the compound in solution has not been examined.

Homogeneity assessment: The homogeneity of the material was assessed using purity assay by GC-FID on ten randomly selected 1-2 mg sub samples of the material. The material was judged to be sufficiently homogeneous at this level of sampling as the variation in analysis results between samples was not significantly different at a 95% confidence level from that observed on repeat analysis of the same sample.

Caution: Treat as a hazardous substance. Use appropriate work practices when handling to avoid skin or eye contact, ingestion or inhalation of dust. Refer to the provided safety data sheet.

S. R. Davies

Dr Stephen R. Davies,
Team Leader,
Chemical Reference Materials, NMI.
17 December 2018

This report supersedes any issued prior to 13th December 2018

NATA logo notice: Accredited for compliance with ISO 17034. Accreditation No. 198 / Corporate Site No. 20844. The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

Legal notice: Neither NMIA as a representative of the Commonwealth of Australia, nor any person acting on NMIA's behalf, assumes any liability with respect to the use of, or for damages resulting from the use of, this reference material or the information contained in this document.

Characterisation Report:

The identity was confirmed by a range of spectroscopic techniques, NMR, IR and MS. The certified purity value was obtained by mass balance from a combination of traditional analytical techniques, including GC-FID, thermogravimetric analysis, Karl Fischer analysis and ^{1}H NMR spectroscopy. The purity value is calculated as per Equation 1.

Purity = (100 % - I_{ORG}) x (100 % - I_{VOL} – I_{NVR}) Equation 1

I_{ORG} = Organic impurities of related structure, I_{VOL} = volatile impurities, I_{NVR} = non-volatile residue.

Supporting evidence is provided by qualitative elemental microanalysis.

GC-FID:	Instrument:	Varian CP-3800
	Column:	VF-1MS, 30 m × 0.32 mm I.D. × 0.25 μm
	Program:	200 °C (1 min), 6 °C/min to 300 °C (3 min)
	Injector:	250 °C
	Detector Temp:	320 °C
	Carrier:	Helium
	Split ratio:	20/1
	Relative mass fraction of the main component:	
	Initial analysis:	Mean = 99.8%, s = 0.03% (5 sub samples in duplicate, January 2010)
	Re-analysis:	Mean = 99.6%, s = 0.02% (5 sub samples in duplicate, December 2012)
	Re-analysis:	Mean = 99.6%, s = 0.03% (10 sub samples in duplicate, November 2015)
	Re-analysis:	Mean = 99.8%, s = 0.01% (5 sub samples in duplicate, December 2018)
GC-FID:	Instrument:	Agilent 6890N
	Column:	HP-1, 30 m × 0.32 mm I.D. × 0.25 μm
	Program:	200 °C (1 min), 10 °C/min to 300 °C (3 min)
	Injector:	250 °C
	Detector Temp:	320 °C
	Carrier:	Helium
	Split ratio:	20/1
	Relative mass fraction of the main component:	
	Initial analysis:	Mean = 99.9%, s = 0.03% (10 sub samples in duplicate, November 2007)
	Re-analysis:	Mean = 99.8%, s = 0.02% (5 sub samples in duplicate, November 2008)
Thermogravimetric analysis:		Volatile content < 0.1% and non volatile residue < 0.2 % mass fraction (November 2007)
Karl Fischer analysis:		Moisture content < 0.2 % mass fraction (January 2008, November 2008, December 2009, December 2012 and November 2015)

Spectroscopic and other characterisation data

GC-MS:	Instrument:	Agilent 6890/5973
	Column:	ZB-5ms, 30 m × 0.25 mm I.D. × 0.25 μm
	Program:	60 °C (1 min), 30 °C/min to 300 °C (5 min)
	Injector:	250 °C
	Transfer line temp:	300 °C
	Carrier:	Helium, 1.0 mL/min
	Split ratio:	20/1
	The retention time of the parent compound is reported along with the major peaks in the mass spectrum. The latter are reported as mass/charge ratios and (in brackets) as a percentage relative to the base peak.	
	9.3 min:	314 ($M+1^+$, 11), 313 (M^+, 67), 312 (100), 285 (86), 266 (45), 238 (33), 183 (16), 109 (8) *m/z*
IR:	Instrument:	Biorad FTS300MX FT-IR
	Range:	4000-400cm-1, KBr powder
	Peaks:	3352, 3117, 2997, 2863, 1687, 1601, 1520, 1453, 1336, 1102, 766 cm^{-1}
^{1}H NMR:	Instrument:	Bruker DMX600
	Field strength:	600 MHz
	Solvent:	$CDCl_3$ (7.26 ppm)
	Spectral data:	δ 3.49 (3H, s), 3.79 (1H, d, *J* = 10.9 Hz), 4.95 (1H, d, *J* = 10.9 Hz), 7.05 (1H, dd, *J* = 9.1, 9.1 Hz), 7.29 (1H, dd, *J* = 7.6, 7.6 Hz), 7.50-7.48 (2H, m), 7.72 (1H, dd, *J* = 7.6, 7.6 Hz), 8.09 (1H, d, *J* = 1.9 Hz), 8.37 (1H, dd, *J* = 2.6, 9.1 Hz) ppm
^{13}C NMR:	Instrument:	Bruker DMX600
	Field strength:	151 MHz
	Solvent:	$CDCl_3$ (77.2 ppm)
	Spectral data:	δ 35.1, 56.8, 116.3 (d, J = 21.1 Hz), 121.9, 124.75, 124.77, 126.0, 126.1, 130.2 (d, *J* = 1.6 Hz), 131.2 (d, J = 2.1 Hz), 133.0 (d, *J* = 8.4 Hz), 143.2, 147.4, 160.4 (d, *J* = 250.2 Hz), 165.7, 169.0 ppm
TLC:	Conditions:	Kieselgel 60F254. Dichloromethane/ethyl acetate (1/1) Single spot observed, Rf = 0.55. Visualisation with UV at 254 nm
Melting point:		169-170 °C
Microanalysis:	Found:	C = 61.5%; H = 4.0%; N = 13.6% (November 2007)
	Calc:	C = 61.3%; H = 3.9%; N = 13.4% (Calculated for $C_{16}H_{12}FN_3O_3$)