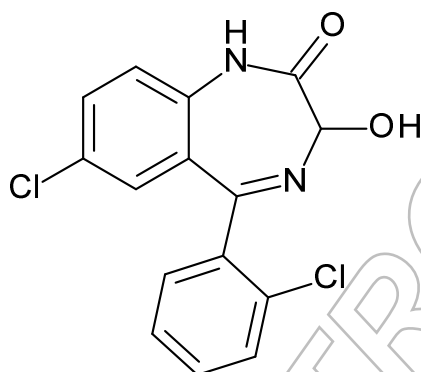




Certificate of Analysis

Reference Standard

Lorazepam



Molecular Formula: C₁₅H₁₀Cl₂N₂O₂
Molecular Weight: 321.16
CAS Number: 846-49-1

Catalogue Number: LGCFOR0071.00
Lot Number: 128758
Long-term Storage: 2 to 8 °C, dark
Appearance: white solid
Melting Point: 165 °C (dec.)
Assay 'as is': 99.9 %

Date of shipment: **2017-January-25**

This certificate is valid for two years from the date of shipment provided the substance is stored under the recommended conditions unopened in the original container.

LGC Quality | ISO 9001:2008
DQS 102448 QM08

LGC GmbH, Im Biotechnologiepark, TGZ II, D-14943 Luckenwalde, Germany

LoGiCal[®]
produced by LGC

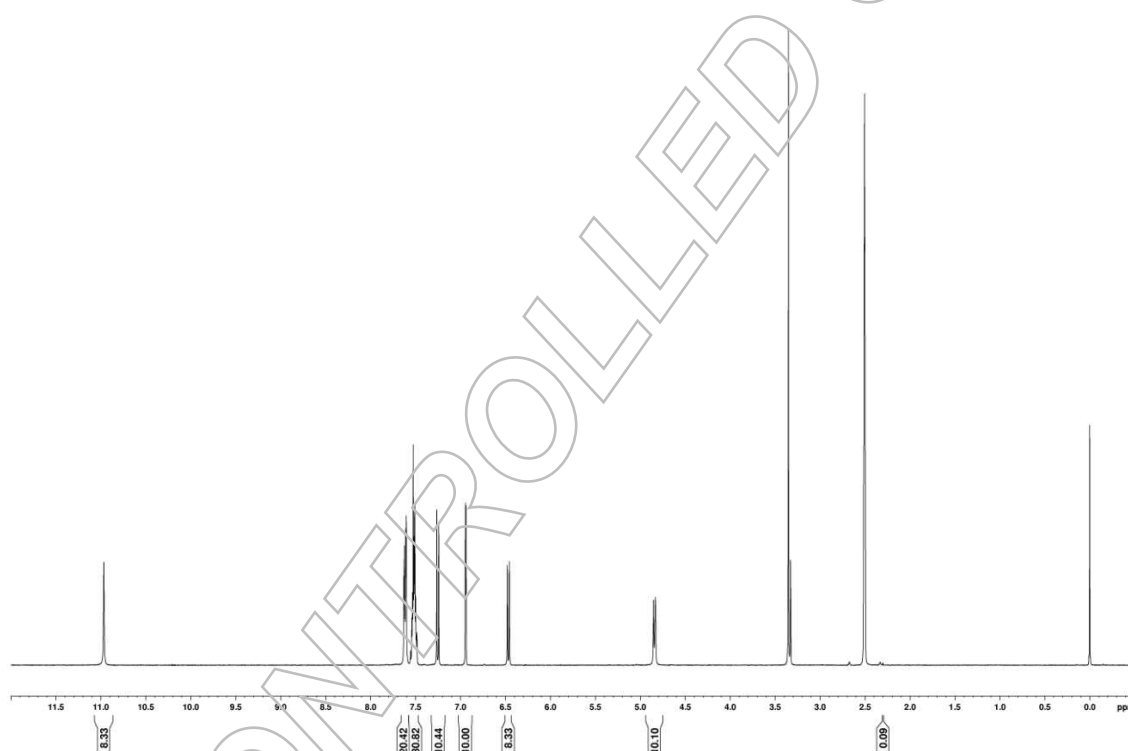


I. Identity

The identity of the reference substance was established by following analyses.

1a. ¹H-NMR Spectrum

Conditions: 400 MHz, DMSO-d₆

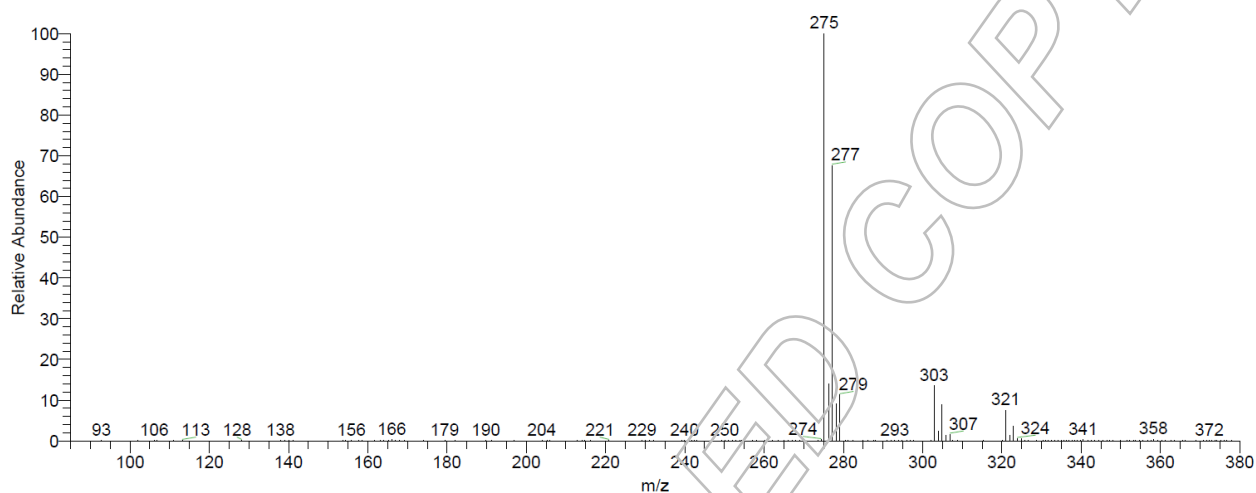


The structure is confirmed by the signals of the spectrum and their interpretation.



Ib. Mass Spectrum

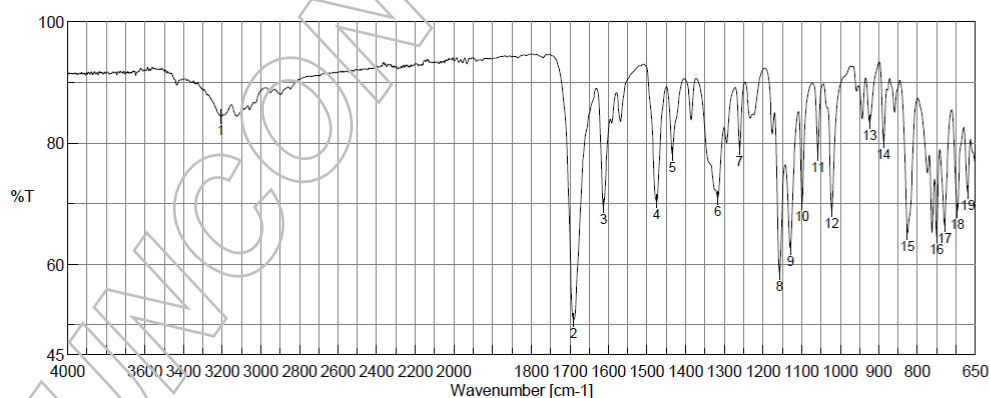
Method: 4.5 kV ESI+; vaporization temperature: 200 °C



The signals of the mass spectrum and their interpretation are consistent with the structural formula.

Ic. IR Spectrum

Method: Attenuated Total Reflection Fourier Transform Infrared (ATR-FTIR) Spectroscopy



Result of Peak Picking		
No.	Position	Intensity
1	3207.04	84.3439
2	1690.3	50.7988
3	1613.16	69.6263
4	1475.28	70.3336
5	1434.78	78.117
6	1317.14	70.9417
7	1260.25	79.0443
8	1157.08	58.529
9	1129.12	62.6479
10	1099.23	69.9822
11	1057.76	78.1271
12	1022.09	68.9234
13	923.736	83.4163
14	888.059	80.2434
15	826.348	65.1001
16	750.174	64.5507
17	729.925	66.4005
18	697.141	68.7278
19	670.142	71.8854

The signals of the IR spectrum and their interpretation are consistent with the structural formula.



II. Purity

IIa. High Performance Liquid Chromatography (HPLC)

The purity of the reference substance was analysed by high performance liquid chromatography (HPLC).

HPLC Conditions:

Column:

Hypersil Gold C18
5 μ m, 150 x 4.6 mm

Conditions:

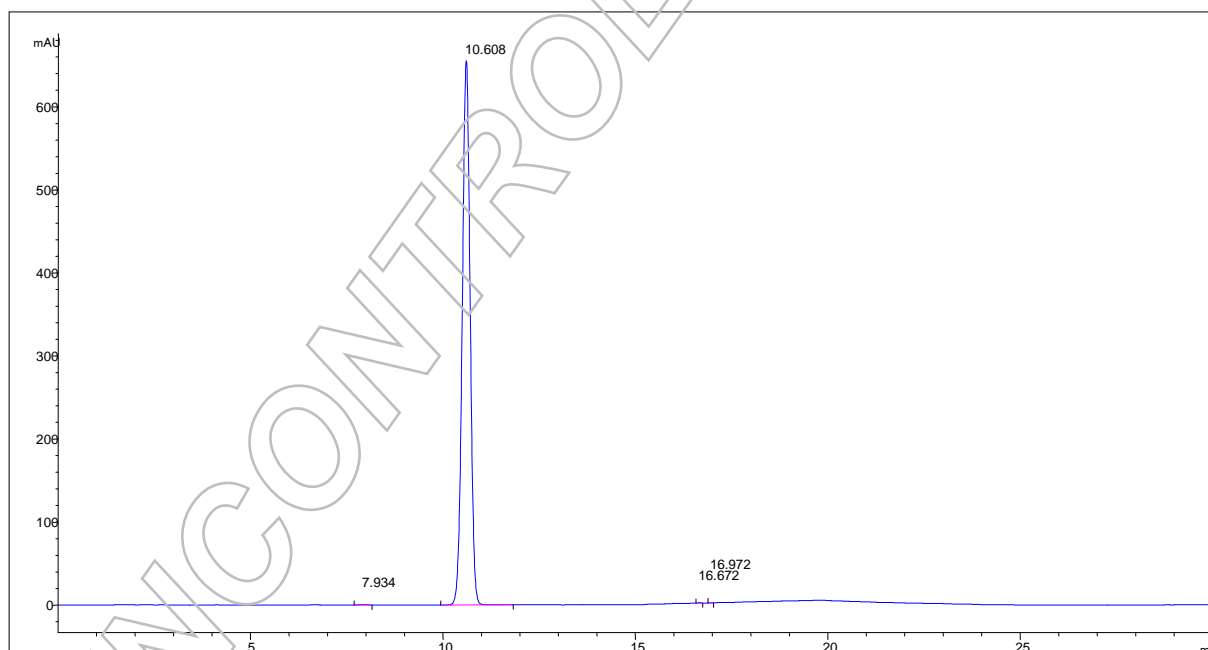
1.0 ml/min, 40 °C
0-12 min Water/Acetonitrile 70/30
12-17 min Water/Acetonitrile to 20/80
17-22 min Water/Acetonitrile to 70/30
22-30 min Water/Acetonitrile 70/30 (v/v);
0.1 % H₃PO₄

Detector:

DAD
235 nm

Injector:

Auto
5 μ l; 0.05528 mg/ml in
Water/Acetonitrile 50/50 (v/v)





Area Percent Report - Sorted by Signal

Pk #	Retention Time	Area	Area %
1	7.934	3.05	0.03
2	10.608	9319.41	99.94
3	16.672	2.33	0.03
4	16.972	0.61	0.01
Totals		9325.40	100.00

For the calculation the system peaks were ignored. The content of the analyte was determined as ratio of the peak area of the analyte and the cumulative areas of the purities, added up to 100 %.

Results:

Average 99.94 %
Number of results n=6
Standard deviation < 0.01 %

IIb. Water Content

Method: Karl Fischer titration

No significant amounts of water were detected (< 0.05 %).

IIc. Residual Solvents

Method: ¹H-NMR

Result: 0.09 % Toluene



III. Final Result

Chromatographic purity (HPLC)	99.94 %
Water content	No significant amounts of water were detected (< 0.05 %).
Residual solvents	0.09 %
Assay (100 % method)¹	99.85 %

The assay is assessed to be 99.9 % 'as is'

The assay 'as is' is equivalent to the assay based on the not anhydrous and not dried substance respectively.

Release Date:

Luckenwalde, 2017-01-17

Dr. Sabine Schröder
Product Release

¹ The calculation of the 100 % method follows the formula:

$$\text{Assay (\%)} = (100 \% - \text{volatile contents}) * \frac{\text{Purity (\%)}}{100 \%}$$

Volatile contents are considered as absolute contributions, purity is considered as relative contribution.