LoGiCal®
produced by LGC

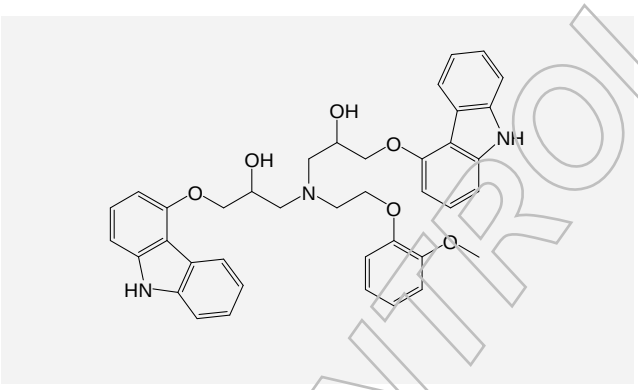
Certificate of Analysis

Reference Substance

Carvedilol Biscarbazole
(1,1'-[[2-(2-Methoxyphenoxy)ethyl]nitrilo]-bis[3-(9H-carbazol-4-yloxy)propan-2-ol])

Catalogue Number:	LGCFOR0291.02
Lot Number:	9652
Molecular Formula:	$C_{39}H_{39}N_3O_6$
Molecular Weight:	645.74
CAS Number:	[918903-20-5]

Long-term Storage:	2 to 8 °C, dark
Appearance:	white solid
Melting Point:	160 °C (dec.) hygroscopic
Assay 'as is':	96.4 %



Date of shipment: **2016-May-20**

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

Release Date: 2011-09-02

LGC GmbH

Dr. Sabine Schröder
Product Release

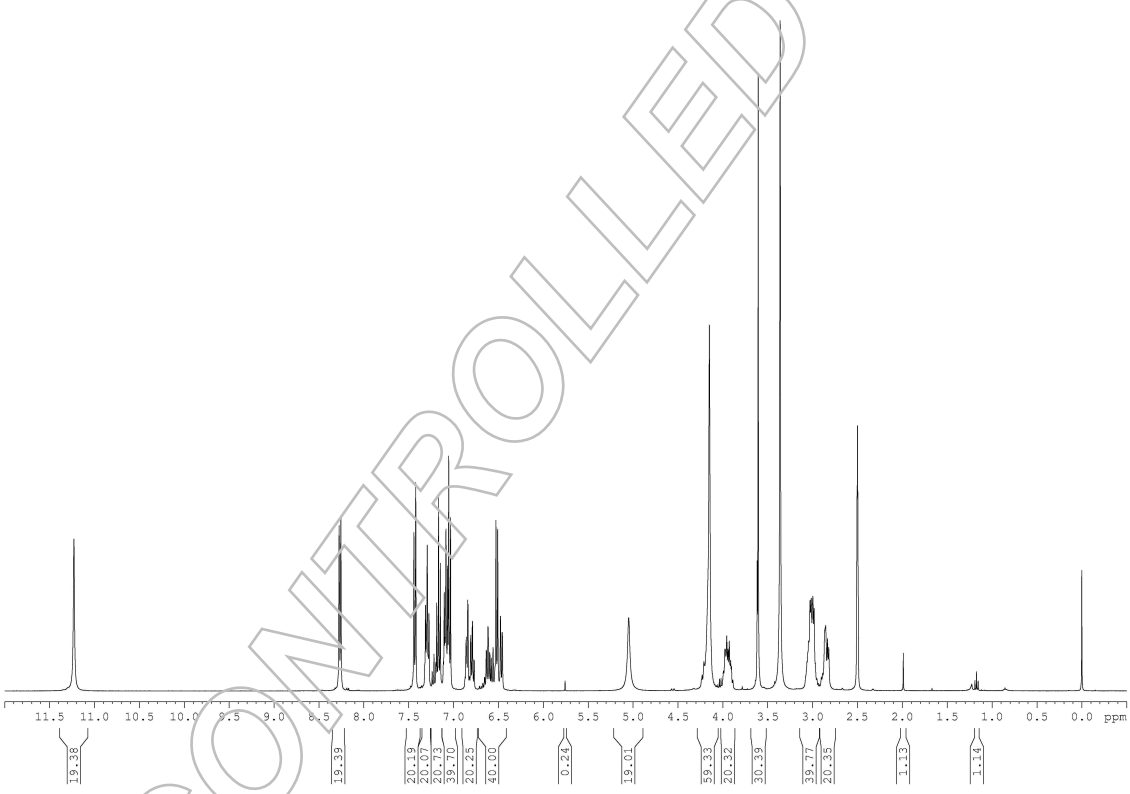
I. Identity

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

Ia. ^{1}H-NMR Spectrum

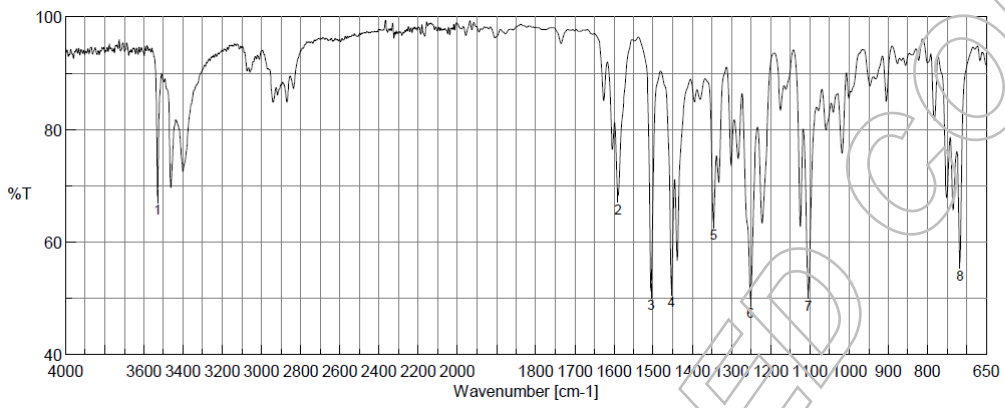
Conditions: 400 MHz, DMSO-d_6

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



Ib. IR Spectrum

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



Result of Peak Picking

No.	Position	Intensity
1	3530.06	68.0714
2	1590.02	68.2069
3	1505.17	51.2845
4	1453.1	51.7631
5	1346.07	63.692
6	1251.58	49.7973
7	1104.05	51.1724
8	716.425	56.4521

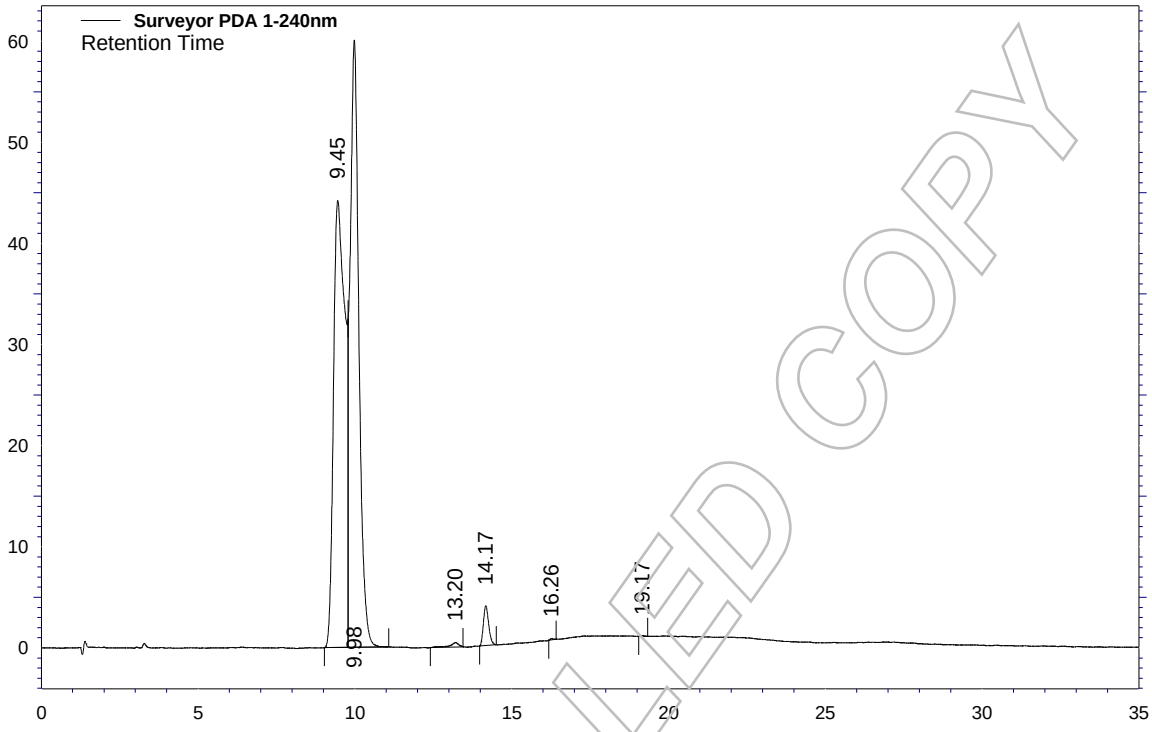
The signals of the IR spectrum and their interpretation are consistent with the structural formula.

II. Purity

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

HPLC Conditions:

Column:	**Conditions:**	**Detector:**	**Injector:**
J´sphere M80 4 µm, 150 x 4 mm	1.0 ml/min, 40 °C 0-10 min Water/Acetonitrile 60/40 10-15 min Water/Acetonitrile to 40/60 15-20 min Water/Acetonitrile 40/60 20-25 min Water/Acetonitrile to 60/40 25-35 min Water/Acetonitrile 60/40 (v/v); 0.1 % H_3PO_4	DAD 240 nm	Auto 4 µl; 0.03134 mg/ml in Acetonitrile



Area Percent Report - Sorted by Signal

Pk #	Retention Time	Area	Area %	
1	9.45	1149138	48.39	Isomer I
2	9.98	1170080	49.27	Isomer II
3	13.20	8582	0.36	
4	14.17	45676	1.92	
5	16.26	845	0.04	
6	19.17	595	0.03	
Totals		2374916	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	97.67 %
Number of results	n=6
Standard deviation	0.05 %

III. Water Content

Method: Karl Fischer titration

Results:

Average	0.62 %
Number of results	n=3
Standard deviation	0.08 %

IV. Residual Solvents

Method: ^{1}H-NMR

Result: 0.52 % Ethyl acetate
0.16 % Dichloromethane

V. Final Result

Total impurities (HPLC)	2.33 %
Water content	0.62 %
Residual solvents	0.68 %
Assay (100 % method) [1]	96.40 %

The assay is assessed to be 96.4 % ‘as is’

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

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

$$\text{Assay (\%)} = (100\ \% - \text{KF} - \text{RES}) * \frac{\text{Purity HPLC (\%)}}{100\ \%}$$

Water (KF) and Residual solvents (RES) are considered as absolute contributions, HPLC purity is considered as relative contribution.