

Analysis of the salts $(\text{PPh}_4)_2[\text{Pd}_2(\text{Se}_2\text{N}_2)\text{Br}_6]$ (Kelly *et al.*, 1997) and $(\text{PPh}_4)_2[\text{Pd}_2(\text{Se}_2\text{N}_2)\text{Cl}_6]$ (Kelly & Slawin, 1995) shows that there are interactions between the cations and anions which are absent from compound (I). In the case of $(\text{PPh}_4)_2[\text{Pd}_2(\text{Se}_2\text{N}_2)\text{Br}_6]$, there are C—H \cdots Se interactions having C \cdots Se distances of the order of 4.5 Å and C—H \cdots Br interactions having C \cdots Br distances in the range 3.8–3.95 Å. In addition, there is weak π – π stacking, with the Se_2N_2 unit held between two benzene rings, at a distance of 4.3 Å from each benzene ring. This weak π – π stacking is not observed in $(\text{PPh}_4)_2[\text{Pd}_2(\text{Se}_2\text{N}_2)\text{Cl}_6]$; instead, there are C—H \cdots Se interactions having C \cdots Se distances of the order of 4.3 Å and C—H \cdots Cl interactions having C \cdots Cl distances of the order of 3.6 Å. It is possible that the absence from (I) of relatively acidic C—H donors, such as the aromatic C—H groups of the tetraphenylphosphonium cations, may thus lead to a greater symmetry in the Se_2N_2 unit in the former.

A potentially important feature of (I) is the fact that the Pd—N bond is the longest so far observed for such systems (Tables 1 and 2). This fact, along with the high yield of the compound, suggests that it is likely to be the most effective starting material for studies into the liberation of the Se_2N_2 unit.

Experimental

The title compound was prepared according to the literature method of Kelly *et al.* (1997) and single crystals were grown by slow diffusion of diethyl ether into a CH_2Cl_2 solution.

Crystal data

$(\text{C}_{16}\text{H}_{36}\text{N})_2[\text{Pd}_2\text{Br}_6(\text{N}_2\text{Se}_2)]$	$Z = 1$
$M_r = 1363.12$	$D_x = 1.938 \text{ Mg m}^{-3}$
Triclinic, $P\bar{1}$	Mo $K\alpha$ radiation
$a = 9.081 (2) \text{ \AA}$	Cell parameters from 2921 reflections
$b = 10.671 (3) \text{ \AA}$	$\theta = 2.4\text{--}27.2^\circ$
$c = 12.415 (3) \text{ \AA}$	$\mu = 7.49 \text{ mm}^{-1}$
$\alpha = 95.131 (4)^\circ$	$T = 150 (2) \text{ K}$
$\beta = 98.598 (4)^\circ$	Lath, orange
$\gamma = 98.689 (4)^\circ$	$0.30 \times 0.20 \times 0.09 \text{ mm}$
$V = 1168.1 (5) \text{ \AA}^3$	

Data collection

Bruker SMART 1000 CCD area-detector diffractometer	4049 independent reflections
ω rotation scans with narrow frames	3002 reflections with $I > 2\sigma(I)$
Absorption correction: multi-scan (SADABS; Sheldrick, 2003)	$R_{\text{int}} = 0.037$
$T_{\text{min}} = 0.195$, $T_{\text{max}} = 0.508$	$\theta_{\text{max}} = 25.0^\circ$
8065 measured reflections	$h = -10 \rightarrow 10$
	$k = -12 \rightarrow 12$
	$l = -14 \rightarrow 14$

Refinement

Refinement on F^2	$w = 1/[\sigma^2(F_o^2) + (0.046P)^2 + 10.845P]$
$R[F^2 > 2\sigma(F^2)] = 0.050$	where $P = (F_o^2 + 2F_c^2)/3$
$wR(F^2) = 0.131$	$(\Delta/\sigma)_{\text{max}} = 0.001$
$S = 1.04$	$\Delta\rho_{\text{max}} = 0.85 \text{ e \AA}^{-3}$
4049 reflections	$\Delta\rho_{\text{min}} = -1.50 \text{ e \AA}^{-3}$
212 parameters	
H-atom parameters constrained	

Table 1
Selected geometric parameters (Å, °).

Pd1—N1	1.978 (7)	Pd1—Br3	2.4316 (12)
Pd1—Br1	2.4299 (12)	Se1 ¹ —N1 ¹	1.806 (7)
Pd1—Br2	2.4066 (13)	Se1—N1	1.809 (7)
N1—Pd1—Br2	176.6 (2)	Br1—Pd1—Br3	170.88 (5)
N1—Pd1—Br1	85.4 (2)	Se1 ¹ —N1—Se1	97.9 (3)
Br2—Pd1—Br1	94.39 (4)	Se1 ¹ —N1—Pd1	130.5 (4)
N1—Pd1—Br3	85.7 (2)	Se1—N1—Pd1	130.2 (4)
Br2—Pd1—Br3	94.61 (4)	N1 ¹ —Se1—N1	82.1 (3)

Symmetry code: (i) $1 - x, 1 - y, 2 - z$.

Table 2
Selected bond lengths (Å) in (I) and related compounds.

Compound	Metal—N	Se—N	Reference
(I)	1.978 (7)	1.806 (7), 1.809 (7)	<i>a</i>
(AlBr ₃) ₂ (Se ₂ N ₂)	1.92 (2)	1.77 (1), 1.81 (1)	<i>b</i>
(PPh ₄) ₂ [Pd ₂ (Se ₂ N ₂)Br ₆]	1.875 (9)	1.809 (10), 1.920 (9)	<i>c</i>
(PPh ₄) ₂ [Pd ₂ (Se ₂ N ₂)Cl ₆]	1.946 (4)	1.804 (5), 1.779 (4)	<i>d</i>

(*a*) This work; (*b*) Kelly & Slawin (1996); (*c*) Kelly *et al.* (1997); (*d*) Kelly & Slawin (1995).

Methylene (C—H = 0.99 Å) and methyl (C—H = 0.98 Å) H atoms were placed in geometric positions and refined using a riding model. $U_{\text{iso}}(\text{H})$ values were set at $1.2U_{\text{eq}}(\text{C})$ for methylene and $1.5U_{\text{eq}}(\text{C})$ for methyl H atoms. The data set was truncated at $2\theta = 50^\circ$, as only statistically insignificant data were present above this limit.

Data collection: SMART (Bruker, 2001); cell refinement: SAINT (Bruker, 2001); data reduction: SAINT; program(s) used to solve structure: SHELXTL (Sheldrick, 2000); program(s) used to refine structure: SHELXTL; molecular graphics: SHELXTL; software used to prepare material for publication: SHELXTL and local programs.

The authors would like to acknowledge the EPSRC (UK) for the provision of a studentship (to KEH) and a Postdoctoral Research Assistantship (to SMA).

Supplementary data for this paper are available from the IUCr electronic archives (Reference: BM1591). Services for accessing these data are described at the back of the journal.

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supporting information

Acta Cryst. (2004). C60, m643–m644 [doi:10.1107/S0108270104027040]

Bis(tetra-*n*-butylammonium) (μ -N,N'-diselenium dinitride)bis[tribromo-palladate(II)]

Stephen M. Aucott, Sophie H. Dale, Mark R. J. Elsegood, Kathryn E. Holmes, Sarah L. M. James and Paul F. Kelly

Computing details

Data collection: *SMART* (Bruker, 2001); cell refinement: *SAINTE* (Bruker, 2001); data reduction: *SAINTE*; program(s) used to solve structure: *SHELXTL* (Sheldrick, 2000); program(s) used to refine structure: *SHELXTL*; molecular graphics: *SHELXTL*; software used to prepare material for publication: *SHELXTL* and local programs.

Bis(tetra-*n*-butylammonium) (μ -N,N'-diselenium dinitride)bis[tribromopalladate(II)]

Crystal data

(C₁₆H₃₆N)₂[Pd₂Br₆(N₂Se₂)]

$M_r = 1363.12$

Triclinic, $P\bar{1}$

Hall symbol: -P 1

$a = 9.081$ (2) Å

$b = 10.671$ (3) Å

$c = 12.415$ (3) Å

$\alpha = 95.131$ (4)°

$\beta = 98.598$ (4)°

$\gamma = 98.689$ (4)°

$V = 1168.1$ (5) Å³

$Z = 1$

$F(000) = 662$

$D_x = 1.938$ Mg m⁻³

Mo $K\alpha$ radiation, $\lambda = 0.71073$ Å

Cell parameters from 2921 reflections

$\theta = 2.4$ – 27.2 °

$\mu = 7.49$ mm⁻¹

$T = 150$ K

Lath, orange

$0.30 \times 0.20 \times 0.09$ mm

Data collection

Bruker SMART 1000 CCD area-detector diffractometer

Radiation source: sealed tube

Graphite monochromator

ω rotation with narrow frames scans

Absorption correction: multi-scan (*SADABS*; Sheldrick, 2003)

$T_{\min} = 0.195$, $T_{\max} = 0.508$

8065 measured reflections

4049 independent reflections

3002 reflections with $I > 2\sigma(I)$

$R_{\text{int}} = 0.037$

$\theta_{\max} = 25.0$ °, $\theta_{\min} = 1.7$ °

$h = -10 \rightarrow 10$

$k = -12 \rightarrow 12$

$l = -14 \rightarrow 14$

Refinement

Refinement on F^2

Least-squares matrix: full

$R[F^2 > 2\sigma(F^2)] = 0.050$

$wR(F^2) = 0.131$

$S = 1.04$

4049 reflections

212 parameters

0 restraints

Primary atom site location: structure-invariant direct methods

Secondary atom site location: difference Fourier map

Hydrogen site location: inferred from neighbouring sites

H-atom parameters constrained

$$w = 1/[\sigma^2(F_o^2) + (0.046P)^2 + 10.845P]$$

where $P = (F_o^2 + 2F_c^2)/3$
 $(\Delta/\sigma)_{\max} = 0.001$

$$\Delta\rho_{\max} = 0.85 \text{ e } \text{\AA}^{-3}$$

$$\Delta\rho_{\min} = -1.50 \text{ e } \text{\AA}^{-3}$$

Special details

Geometry. All e.s.d.'s (except the e.s.d. in the dihedral angle between two l.s. planes) are estimated using the full covariance matrix. The cell e.s.d.'s are taken into account individually in the estimation of e.s.d.'s in distances, angles and torsion angles; correlations between e.s.d.'s in cell parameters are only used when they are defined by crystal symmetry. An approximate (isotropic) treatment of cell e.s.d.'s is used for estimating e.s.d.'s involving l.s. planes.

Fractional atomic coordinates and isotropic or equivalent isotropic displacement parameters (\AA^2)

	x	y	z	$U_{\text{iso}}^*/U_{\text{eq}}$
Pd1	0.38454 (7)	0.27271 (7)	0.81142 (5)	0.0250 (2)
Br1	0.60510 (11)	0.35536 (10)	0.73407 (8)	0.0389 (3)
Br2	0.31511 (11)	0.08397 (11)	0.68135 (9)	0.0453 (3)
Br3	0.17092 (11)	0.22292 (10)	0.90619 (8)	0.0355 (3)
N1	0.4496 (8)	0.4223 (7)	0.9237 (6)	0.0273 (17)
Se1	0.37705 (10)	0.46360 (9)	1.04779 (7)	0.0267 (2)
N2	0.7449 (7)	0.8942 (7)	0.7313 (6)	0.0203 (15)
C1	0.5911 (9)	0.8135 (8)	0.7296 (7)	0.0214 (18)
H1A	0.5967	0.7689	0.7963	0.026*
H1B	0.5170	0.8720	0.7349	0.026*
C2	0.5298 (9)	0.7150 (9)	0.6320 (7)	0.027 (2)
H2A	0.5990	0.6522	0.6265	0.032*
H2B	0.5212	0.7568	0.5638	0.032*
C3	0.3748 (10)	0.6478 (9)	0.6468 (7)	0.029 (2)
H3A	0.3040	0.7100	0.6451	0.035*
H3B	0.3826	0.6156	0.7195	0.035*
C4	0.3115 (10)	0.5358 (10)	0.5569 (8)	0.036 (2)
H4A	0.2969	0.5682	0.4853	0.053*
H4B	0.2145	0.4925	0.5712	0.053*
H4C	0.3828	0.4755	0.5569	0.053*
C5	0.7997 (9)	0.9643 (9)	0.8442 (7)	0.0229 (19)
H5A	0.9027	1.0117	0.8458	0.027*
H5B	0.8079	0.9004	0.8969	0.027*
C6	0.7015 (9)	1.0590 (9)	0.8844 (7)	0.0242 (19)
H6A	0.7015	1.1291	0.8373	0.029*
H6B	0.5961	1.0146	0.8779	0.029*
C7	0.7581 (12)	1.1130 (12)	0.9996 (8)	0.047 (3)
H7A	0.8588	1.1655	1.0034	0.056*
H7B	0.7716	1.0417	1.0440	0.056*
C8	0.6588 (11)	1.1934 (11)	1.0505 (9)	0.045 (3)
H8A	0.6814	1.2810	1.0323	0.067*
H8B	0.6777	1.1934	1.1303	0.067*
H8C	0.5526	1.1583	1.0220	0.067*
C9	0.8593 (10)	0.8099 (9)	0.7057 (7)	0.027 (2)
H9A	0.8295	0.7710	0.6286	0.032*
H9B	0.9589	0.8650	0.7116	0.032*

C10	0.8776 (10)	0.7057 (9)	0.7764 (8)	0.029 (2)
H10A	0.7794	0.6483	0.7698	0.035*
H10B	0.9077	0.7432	0.8539	0.035*
C11	0.9946 (10)	0.6288 (10)	0.7454 (8)	0.034 (2)
H11A	1.0883	0.6880	0.7418	0.041*
H11B	0.9575	0.5826	0.6712	0.041*
C12	1.0323 (11)	0.5326 (10)	0.8245 (9)	0.042 (3)
H12A	1.0741	0.5777	0.8975	0.063*
H12B	1.1067	0.4849	0.7984	0.063*
H12C	0.9403	0.4732	0.8286	0.063*
C13	0.7294 (9)	0.9863 (9)	0.6456 (7)	0.025 (2)
H13A	0.6426	1.0297	0.6554	0.030*
H13B	0.7053	0.9363	0.5722	0.030*
C14	0.8670 (10)	1.0875 (9)	0.6474 (8)	0.031 (2)
H14A	0.9558	1.0455	0.6411	0.037*
H14B	0.8879	1.1423	0.7185	0.037*
C15	0.8441 (11)	1.1703 (9)	0.5546 (8)	0.033 (2)
H15A	0.8322	1.1169	0.4834	0.040*
H15B	0.7504	1.2066	0.5571	0.040*
C16	0.9753 (10)	1.2765 (9)	0.5632 (8)	0.032 (2)
H16A	0.9837	1.3320	0.6319	0.047*
H16B	0.9596	1.3262	0.5011	0.047*
H16C	1.0684	1.2406	0.5624	0.047*

Atomic displacement parameters (Å²)

	U^{11}	U^{22}	U^{33}	U^{12}	U^{13}	U^{23}
Pd1	0.0231 (4)	0.0280 (4)	0.0221 (4)	0.0029 (3)	0.0017 (3)	-0.0002 (3)
Br1	0.0377 (6)	0.0458 (6)	0.0350 (5)	0.0040 (5)	0.0167 (4)	0.0014 (5)
Br2	0.0327 (6)	0.0482 (7)	0.0475 (6)	0.0093 (5)	-0.0050 (5)	-0.0194 (5)
Br3	0.0291 (5)	0.0411 (6)	0.0322 (5)	-0.0064 (4)	0.0053 (4)	0.0025 (4)
N1	0.028 (4)	0.031 (4)	0.021 (4)	-0.003 (3)	0.007 (3)	0.002 (3)
Se1	0.0243 (5)	0.0294 (5)	0.0255 (5)	-0.0028 (4)	0.0093 (4)	0.0007 (4)
N2	0.013 (3)	0.025 (4)	0.025 (4)	0.004 (3)	0.007 (3)	0.005 (3)
C1	0.014 (4)	0.029 (5)	0.022 (4)	-0.001 (4)	0.008 (3)	0.001 (4)
C2	0.015 (4)	0.036 (5)	0.028 (5)	-0.003 (4)	0.008 (4)	-0.002 (4)
C3	0.021 (5)	0.038 (6)	0.027 (5)	0.001 (4)	0.007 (4)	0.003 (4)
C4	0.021 (5)	0.040 (6)	0.040 (6)	-0.002 (4)	0.001 (4)	-0.006 (5)
C5	0.019 (4)	0.032 (5)	0.018 (4)	0.004 (4)	0.005 (3)	0.004 (4)
C6	0.017 (4)	0.032 (5)	0.022 (4)	0.012 (4)	-0.005 (3)	-0.002 (4)
C7	0.044 (6)	0.061 (8)	0.035 (6)	0.028 (6)	-0.001 (5)	-0.012 (5)
C8	0.035 (6)	0.056 (7)	0.041 (6)	0.010 (5)	0.010 (5)	-0.015 (5)
C9	0.022 (4)	0.035 (5)	0.027 (5)	0.011 (4)	0.009 (4)	0.001 (4)
C10	0.027 (5)	0.029 (5)	0.032 (5)	0.000 (4)	0.015 (4)	0.004 (4)
C11	0.025 (5)	0.046 (6)	0.035 (5)	0.012 (4)	0.007 (4)	0.006 (5)
C12	0.030 (5)	0.048 (7)	0.049 (6)	0.018 (5)	-0.001 (5)	0.009 (5)
C13	0.016 (4)	0.035 (5)	0.024 (5)	0.003 (4)	0.007 (4)	0.000 (4)
C14	0.017 (4)	0.033 (5)	0.040 (5)	-0.005 (4)	-0.002 (4)	0.016 (4)

C15	0.040 (6)	0.023 (5)	0.033 (5)	-0.005 (4)	0.005 (4)	0.007 (4)
C16	0.029 (5)	0.031 (5)	0.032 (5)	0.002 (4)	-0.002 (4)	0.005 (4)

Geometric parameters (Å, °)

Pd1—N1	1.978 (7)	C7—H7A	0.9900
Pd1—Br1	2.4299 (12)	C7—H7B	0.9900
Pd1—Br2	2.4066 (13)	C8—H8A	0.9800
Pd1—Br3	2.4316 (12)	C8—H8B	0.9800
Se1—N1 ⁱ	1.806 (7)	C8—H8C	0.9800
Se1—N1	1.809 (7)	C9—C10	1.491 (13)
N2—C5	1.504 (10)	C9—H9A	0.9900
N2—C13	1.517 (11)	C9—H9B	0.9900
N2—C1	1.522 (10)	C10—C11	1.510 (12)
N2—C9	1.522 (10)	C10—H10A	0.9900
C1—C2	1.508 (12)	C10—H10B	0.9900
C1—H1A	0.9900	C11—C12	1.524 (13)
C1—H1B	0.9900	C11—H11A	0.9900
C2—C3	1.525 (11)	C11—H11B	0.9900
C2—H2A	0.9900	C12—H12A	0.9800
C2—H2B	0.9900	C12—H12B	0.9800
C3—C4	1.539 (12)	C12—H12C	0.9800
C3—H3A	0.9900	C13—C14	1.519 (11)
C3—H3B	0.9900	C13—H13A	0.9900
C4—H4A	0.9800	C13—H13B	0.9900
C4—H4B	0.9800	C14—C15	1.522 (12)
C4—H4C	0.9800	C14—H14A	0.9900
C5—C6	1.544 (11)	C14—H14B	0.9900
C5—H5A	0.9900	C15—C16	1.500 (12)
C5—H5B	0.9900	C15—H15A	0.9900
C6—C7	1.478 (12)	C15—H15B	0.9900
C6—H6A	0.9900	C16—H16A	0.9800
C6—H6B	0.9900	C16—H16B	0.9800
C7—C8	1.502 (14)	C16—H16C	0.9800
N1—Pd1—Br2	176.6 (2)	C8—C7—H7B	108.5
N1—Pd1—Br1	85.4 (2)	H7A—C7—H7B	107.5
Br2—Pd1—Br1	94.39 (4)	C7—C8—H8A	109.5
N1—Pd1—Br3	85.7 (2)	C7—C8—H8B	109.5
Br2—Pd1—Br3	94.61 (4)	H8A—C8—H8B	109.5
Br1—Pd1—Br3	170.88 (5)	C7—C8—H8C	109.5
Se1 ⁱ —N1—Se1	97.9 (3)	H8A—C8—H8C	109.5
Se1 ⁱ —N1—Pd1	130.5 (4)	H8B—C8—H8C	109.5
Se1—N1—Pd1	130.2 (4)	C10—C9—N2	116.2 (7)
N1 ⁱ —Se1—N1	82.1 (3)	C10—C9—H9A	108.2
C5—N2—C13	111.3 (7)	N2—C9—H9A	108.2
C5—N2—C1	108.9 (6)	C10—C9—H9B	108.2
C13—N2—C1	108.7 (6)	N2—C9—H9B	108.2

C5—N2—C9	108.1 (6)	H9A—C9—H9B	107.4
C13—N2—C9	109.3 (6)	C9—C10—C11	112.1 (7)
C1—N2—C9	110.6 (6)	C9—C10—H10A	109.2
C2—C1—N2	117.6 (6)	C11—C10—H10A	109.2
C2—C1—H1A	107.9	C9—C10—H10B	109.2
N2—C1—H1A	107.9	C11—C10—H10B	109.2
C2—C1—H1B	107.9	H10A—C10—H10B	107.9
N2—C1—H1B	107.9	C10—C11—C12	114.0 (8)
H1A—C1—H1B	107.2	C10—C11—H11A	108.8
C1—C2—C3	108.5 (7)	C12—C11—H11A	108.8
C1—C2—H2A	110.0	C10—C11—H11B	108.8
C3—C2—H2A	110.0	C12—C11—H11B	108.8
C1—C2—H2B	110.0	H11A—C11—H11B	107.7
C3—C2—H2B	110.0	C11—C12—H12A	109.5
H2A—C2—H2B	108.4	C11—C12—H12B	109.5
C2—C3—C4	111.8 (7)	H12A—C12—H12B	109.5
C2—C3—H3A	109.2	C11—C12—H12C	109.5
C4—C3—H3A	109.2	H12A—C12—H12C	109.5
C2—C3—H3B	109.2	H12B—C12—H12C	109.5
C4—C3—H3B	109.2	N2—C13—C14	115.7 (7)
H3A—C3—H3B	107.9	N2—C13—H13A	108.4
C3—C4—H4A	109.5	C14—C13—H13A	108.4
C3—C4—H4B	109.5	N2—C13—H13B	108.4
H4A—C4—H4B	109.5	C14—C13—H13B	108.4
C3—C4—H4C	109.5	H13A—C13—H13B	107.4
H4A—C4—H4C	109.5	C13—C14—C15	111.8 (7)
H4B—C4—H4C	109.5	C13—C14—H14A	109.3
N2—C5—C6	116.2 (7)	C15—C14—H14A	109.3
N2—C5—H5A	108.2	C13—C14—H14B	109.3
C6—C5—H5A	108.2	C15—C14—H14B	109.3
N2—C5—H5B	108.2	H14A—C14—H14B	107.9
C6—C5—H5B	108.2	C16—C15—C14	111.1 (8)
H5A—C5—H5B	107.4	C16—C15—H15A	109.4
C7—C6—C5	111.4 (7)	C14—C15—H15A	109.4
C7—C6—H6A	109.3	C16—C15—H15B	109.4
C5—C6—H6A	109.3	C14—C15—H15B	109.4
C7—C6—H6B	109.3	H15A—C15—H15B	108.0
C5—C6—H6B	109.3	C15—C16—H16A	109.5
H6A—C6—H6B	108.0	C15—C16—H16B	109.5
C6—C7—C8	115.3 (8)	H16A—C16—H16B	109.5
C6—C7—H7A	108.5	C15—C16—H16C	109.5
C8—C7—H7A	108.5	H16A—C16—H16C	109.5
C6—C7—H7B	108.5	H16B—C16—H16C	109.5
Br1—Pd1—N1—Se1 ⁱ	-10.2 (5)	C9—N2—C5—C6	178.0 (7)
Br3—Pd1—N1—Se1 ⁱ	171.8 (5)	N2—C5—C6—C7	174.7 (8)
Br1—Pd1—N1—Se1	-173.1 (5)	C5—C6—C7—C8	-172.6 (10)
Br3—Pd1—N1—Se1	9.0 (5)	C5—N2—C9—C10	64.2 (9)

Se1 ⁱ —N1—Se1—N1 ⁱ	0.0	C13—N2—C9—C10	-174.6 (7)
Pd1—N1—Se1—N1 ⁱ	166.9 (8)	C1—N2—C9—C10	-54.9 (10)
Pd1—N1—Se1—Se1 ⁱ	166.9 (8)	N2—C9—C10—C11	-179.3 (8)
C5—N2—C1—C2	-167.7 (8)	C9—C10—C11—C12	172.4 (8)
C13—N2—C1—C2	71.0 (9)	C5—N2—C13—C14	51.4 (9)
C9—N2—C1—C2	-49.1 (10)	C1—N2—C13—C14	171.3 (7)
N2—C1—C2—C3	-179.0 (7)	C9—N2—C13—C14	-67.9 (9)
C1—C2—C3—C4	-173.8 (8)	N2—C13—C14—C15	176.7 (7)
C13—N2—C5—C6	58.0 (9)	C13—C14—C15—C16	175.2 (8)
C1—N2—C5—C6	-61.8 (9)		

Symmetry code: (i) $-x+1, -y+1, -z+2$.