Semi-trimagic square with 3 pairs of possible diagonals

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1	10	50	51	59	60	80	88	93	99	137	142
18	106	96	27	13	44	122	139	41	63	109	92
28	72	143	83	64	5	100	48	103	15	78	131
56	71	111	26	12	91	124	115	136	20	75	33
68	128	22	43	114	87	37	29	121	126	11	84
69	120	90	141	38	7	16	110	113	47	40	79
76	25	55	4	107	138	129	35	32	98	105	66
77	17	123	102	31	58	108	116	24	19	134	61
89	74	34	119	133	54	21	30	9	125	70	112
117	73	2	62	81	140	45	97	42	130	67	14
127	39	49	118	132	101	23	6	104	82	36	53
144	135	95	94	86	85	65	57	52	46	8	3

A **possible diagonal** is a set of 12 entries of a semi-trimagic square which
(a) is a trimagic series and (b) has exactly one entry in common with each row and each column.

As we consider only axially symmetric semi-trimagic squares, the set with the complementary entries also is a possible diagonal. Therefore possible diagonals always occur pairwise.
In the square matrix on the left only one possible diagonal of each pair is colored.

In order to obtain a trimagic square you only have to permute columns.
When the main diagonal is trimagic then also the other diagonal is trimagic, because of the axially symmetry.

By symmetric permutations of rows and columns we can transform each square x' in a variant x with standard arrangement of the diagonal entries.

Permutation of the columns in order to obtain a certain main diagonal

5a'

51	80	60	88	142	59	10	50	1	99	137	93
27	122	44	139	92	13	106	96	18	63	109	41
83	100	5	48	131	64	72	143	28	15	78	103
26	124	91	115	33	12	71	111	56	20	75	136
43	37	87	29	84	114	128	22	68	126	11	121
141	16	7	110	79	38	120	90	69	47	40	113
4	129	138	35	66	107	25	55	76	98	105	32
102	108	58	116	61	31	17	123	77	19	134	24
119	21	54	30	112	133	74	34	89	125	70	9
62	45	140	97	14	81	73	2	117	130	67	42
118	23	101	6	53	132	39	49	127	82	36	104
94	65	85	57	3	86	135	95	144	46	8	52

5b'

137	93	10	50	80	1	99	60	59	142	88	51
109	41	106	96	122	18	63	44	13	92	139	27
78	103	72	143	100	28	15	5	64	131	48	83
75	136	71	111	124	56	20	91	12	33	115	26
11	121	128	22	37	68	126	87	114	84	29	43
40	113	120	90	16	69	47	7	38	79	110	141
105	32	25	55	129	76	98	138	107	66	35	4
134	24	17	123	108	77	19	58	31	61	116	102
70	9	74	34	21	89	125	54	133	112	30	119
67	42	73	2	45	117	130	140	81	14	97	62
36	104	39	49	23	127	82	101	132	53	6	118
8	52	135	95	65	144	46	85	86	3	57	94

5c'

10	51	1	60	59	137	80	88	99	93	142	50
106	27	18	44	13	109	122	139	63	41	92	96
72	83	28	5	64	78	100	48	15	103	131	143
71	26	56	91	12	75	124	115	20	136	33	111
128	43	68	87	114	11	37	29	126	121	84	22
120	141	69	7	38	40	16	110	47	113	79	90
25	4	76	138	107	105	129	35	98	32	66	55
17	102	77	58	31	134	108	116	19	24	61	123
74	119	89	54	133	70	21	30	125	9	112	34
73	62	117	140	81	67	45	97	130	42	14	2
39	118	127	101	132	36	23	6	82	104	53	49
135	94	144	85	86	8	65	57	46	52	3	95

5a

5	72	78	83	131	28	48	143	103	100	64	15
138	25	105	4	66	76	35	55	32	129	107	98
101	39	36	118	53	127	6	49	104	23	132	82
60	10	137	51	142	1	88	50	93	80	59	99
87	128	11	43	84	68	29	22	121	37	114	126
54	74	70	119	112	89	30	34	9	21	133	125
91	71	75	26	33	56	115	111	136	124	12	20
58	17	134	102	61	77	116	123	24	108	31	19
85	135	8	94	3	144	57	95	52	65	86	46
44	106	109	27	92	18	139	96	41	122	13	63
7	120	40	141	79	69	110	90	113	16	38	47
140	73	67	62	14	117	97	2	42	45	81	130

5b

6	53	23	127	118	49	132	36	82	101	39	104
97	14	45	117	62	2	81	67	130	140	73	42
29	84	37	68	43	22	114	11	126	87	128	121
110	79	16	69	141	90	38	40	47	7	120	113
57	3	65	144	94	95	86	8	46	85	135	52
115	33	124	56	26	111	12	75	20	91	71	136
30	112	21	89	119	34	133	70	125	54	74	9
88	142	80	1	51	50	59	137	99	60	10	93
35	66	129	76	4	55	107	105	98	138	25	32
116	61	108	77	102	123	31	134	19	58	17	24
48	131	100	28	83	143	64	78	15	5	72	103
139	92	122	18	27	96	13	109	63	44	106	41

5c

10	51	1	137	60	59	88	99	80	93	142	50
106	27	18	109	44	13	139	63	122	41	92	96
72	83	28	78	5	64	48	15	100	103	131	143
120	141	69	40	7	38	110	47	16	113	79	90
71	26	56	75	91	12	115	20	124	136	33	111
128	43	68	11	87	114	29	126	37	121	84	22
17	102	77	134	58	31	116	19	108	24	61	123
74	119	89	70	54	133	30	125	21	9	112	34
25	4	76	105	138	107	35	98	129	32	66	55
73	62	117	67	140	81	97	130	45	42	14	2
39	118	127	36	101	132	6	82	23	104	53	49
135	94	144	8	85	86	57	46	65	52	3	95

The axially symmetric trimagic squares 5a, 5b and 5c can be transformed into each other by permutations of rows and columns. Compare with trimagic square 1a and 1b.

Miguel Amela and Francis Gaspalou suggested to search for squares with more than two possible diagonals.