

## Supplement to COLOURED DOUBLE STARS

by Michel Duval (Montréal, Québec) 2023 May 8

This is a supplement to Table 1 of coloured double stars given in the RASC's *Observer's Handbook*. It contains coloured double stars that are more difficult to observe because of small angular separation and/or a large difference in magnitudes between the components. Such stars may be easier to observe with magnifications higher than 60x and/or in instruments larger than 125 mm.

The abbreviations used for colours are: B—Blue; G—Green; Gd—Gold; O—Orange; R—Red; Y—Yellow; W—White. Different observers may perceive colours differently depending on their eye physiology, telescope optics, and local seeing conditions. Space in the Tables has been provided to record observations when available, using subjective appreciations concerning their beauty (!!!—very beautiful; !!—beautiful; !—nice) and the difficulty to separate them in the telescope (T—Tight; VT—Very Tight, F—Faint).

SAO # are provided for use with Go To telescope databases, from the Smithsonian Astrophysical Observatory. The SAO Star Catalogue contains details on 258,996 stars, see [tdc-www.harvard.edu/catalogs/sao.html](http://tdc-www.harvard.edu/catalogs/sao.html).

Corrections to SAO #, RA, components (A,B,C) and magnitudes in Tables 1 and 2 have been made by François Chevretils in 2019. Double stars in Tables 1 and 2 with a component B of magnitude < 8.0 are not indicated as double stars in the Sky Atlas 2000. It is suggested to mark them with a pencil in your Atlas with the usual double star symbol.

NOTES to TABLE 2 of this Supplement:

SPRING:  $\Sigma$  1327 Cnc (9h15) in Table 2 is a coloured triple star. Its characteristics have been determined by Blake Nancarrow, using a 14-inch telescope because of their low magnitudes and separations. Its star components AC are used in Table 2, not AB.

SPRING:  $\mu$  Boo (15h24) and SUMMER:  $\delta$  Her (17h15), 61 Cyg (21h07) in Table 2 have been observed by Claude Germain in 2018 with a 16-inch telescope, and their coordinates obtained by François Chevretils, both members of the Centre francophone de Montreal de la SRAC.

SUMMER: 60 Cep (in Cepheus) has been proposed by F. Chevretils, requiring at least a 10-inch telescope. It has no SAO number.

NOTES to TABLE 1 in the *Observer's Handbook* by F. Chevretils:

SUMMER: 26 Cyg (20h01) in Table 1. There is a variable star nearby (Z Cyg) on the South, RA 20h01, Dec +50°.03', magnitude varying from 8.7 to 13.3, spectra M5 to M6e III (red, see Figure 1 below Table 2), with a period of 282 days in 2019. It is a variable of the Mira-type. Components of the double star itself are yellow and blue.

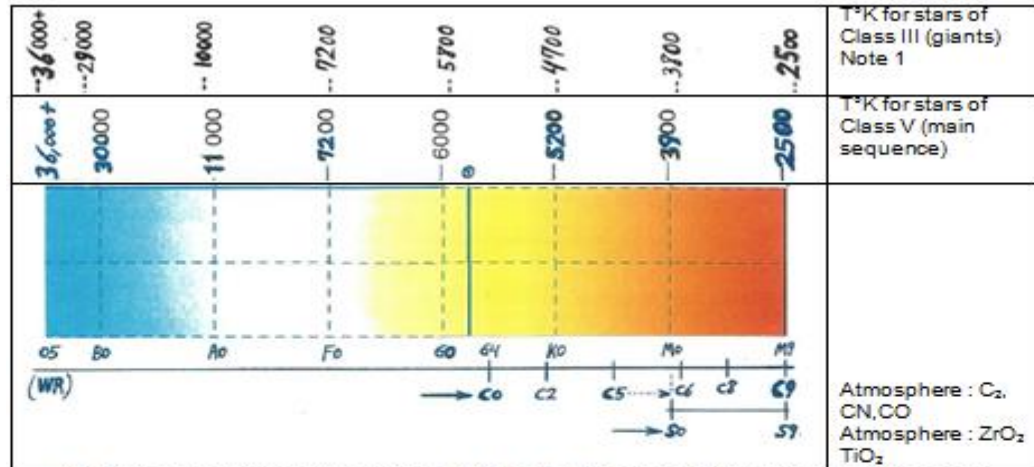
AUTUMN: O $\Sigma\Sigma$  254 Cas (00h01) in Table 1: component A is a variable star (WZ Cas) of magnitude varying from 6.5 to 8.4 according to visual observations. At its minimum magnitude, it is reported to be very red and beautiful. It is a carbon star of spectra C5 to C9 III, i.e., its colour varies from orange to deep red (see Figure 1 below Table 2), with a period of 186 days (variable type: semiregular). It has a carbon atmosphere and is listed in the section on carbon stars of the *Observer's Handbook*, page 294. Component B is blue (spectrum A0 III). An article on this unique coloured double star is in the *Journal* of The Royal Astronomical Society of Canada in February 2022.

Supplement TABLE 2 to TABLE 1 OF COLOURED DOUBLE STARS IN THE *OBSERVER'S HANDBOOK*

Star	SAO #	RA (2000)		Dec		Magnitudes		Sep. "	Colour		Notes	
		h	m	°	'	A	B		A	B	Beauty	Difficulty
<b>WINTER</b>												
30 Tau	93611	3	48	+11	09	5.1	10.0	9	Y	B		
Σ 476 Per	56902	4	01	+38	40	8.0	9.2	25	Y	B		
<b>SPRING</b>												
Σ 1327 Cnc	80723	9	15	+27	55	8.2	C 9.3	26	Y	B		(AC)
Σ 1604 Crv	157111	12	09	-11	51	6.9	9.4	9	O	B		
δ Crv	157323	12	30	-16	31	3.0	8.5	25	Y	R		
54 Vir	157798	13	13	-18	50	6.8	7.2	5	Y	B		
π Boo	101138	14	41	+16	25	4.9	5.8	5	B	O		
μ Boo	64686	15	24	+37	22	4.3	7.1	107	Y	O	!!	
δ Ser	101624	15	35	+10	32	4.2	5.2	4	B	O		
<b>SUMMER</b>												
δ Her	84951	17	15	24	50	3.1	8.3	11	W	B	!	
ο Oph	185238	17	18	-24	17	5.2	6.8	10	O	Y	!	
ρ Her	66001	17	24	+37	09	4.5	5.5	4	G	G		
Σ 2348 Dra	31051	18	34	+52	21	5.5	C 8.7	25	Y	B		(AC)
61 Cyg	70919	21	07	+38	45	5.2	6.0	31	R	R	!!	
Kruger 60 Cep	-	22	28	+57	42	9.8	11.4	3	R	R		
<b>AUTUMN</b>												
ΟΣΣ 252 Peg	91574	23	55	+29	29	6.8	7.6	111	Y	R		
Σ 24 And	73883	00	18	+26	08	7.8	8.4	5	Y	B		
<b>SOUTHERN</b>												
Δ 31 Pup	218093	6	38	-48	13	5.1	7.4	13	Y	B		
γ Vol	256374	7	09	-70	30	3.9	5.7	14	Gd	Y		
h 4038 Pup	219339	8	03	-41	19	5.5	8.5	25	Y	R		
S 568 Pup	175783	8	25	-24	03	5.5	8.4	42	O	R		
h 4191 Vel	220978	9	14	-43	14	5.3	9.2	6	B	O		z Vela

h 4245 Vel	221480	9	46	-45	55	6.8	9.6	9	O	B		
Jc 16 Crt	179935	11	29	-24	28	5.8	8.6	8	Y	B		
$\alpha$ Cru	251904	12	26	-63	06	1.3	C 4,8	90	B	Y		(AC)
$\gamma$ Cru	240019	12	31	-57	07	1.6	6.5	127	O	B		
h 4548 Cru	240235	12	46	-56	29	5.0	8.9	52	Y	B		
Q Cen	241076	13	42	-54	34	5.2	6.5	6	Y	B		
$\alpha$ Cir	252853	14	42	-64	59	3.2	8.5	16	Y	R		
$\Delta$ 191 Nor	242913	15	45	-58	41	7.8	C 8,1	32	Y	B		(AC)

Figure 1: Spectra of stars vs temperature and colour, from blue to red (Ref.: F.Chevrefils)



Note 1: for class III stars, temperature is different for the same colour (e.g. for A0 or M0), because density and pressure in the stars are lower.

Note 2: there is also a third scale of temperatures, based on the maximum intensity of spectral lines: 36,000; 25,000; 11,000, 7,500; 6,000, 5,100; 3,700 and 2,500°K, for stars O5, B0, A0, F0, G0, K0, M0 and M9, respectively.



