

MEHRASL

MANUFACTURING CORPORATION

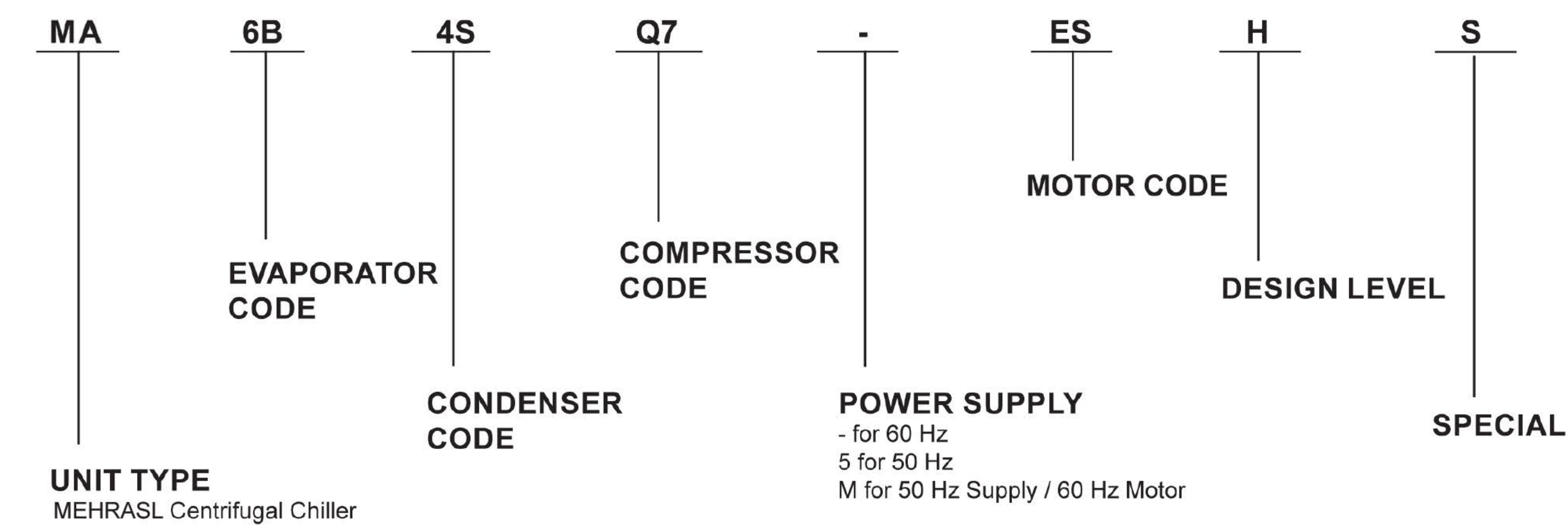
Model MA Style H Centrifugal Liquid Chillers



250 ton to 3,000 ton, 5,274 kW to 10,500 kW, with R-134a or R-513A Refrigerant



Nomenclature



Approvals

See [Codes and standards](#).

Dimensions shown in this manual are in English, (SI) where possible.

Water flow rate limits

The following water flow rate limits are based on standard tubes at design full load conditions. MTI numbers are as follows for:

- Condenser: 3/4 in. = 471 and 1 in. = 266
- Evaporator: 3/4 in. = 481 and 1 in. = 656

Water flow rate limits, gpm (L/s)

Evaporator							Condenser						
Model	1 Pass		2 Pass		3 Pass		Model	1 Pass		2 Pass		3 Pass	
	Min	Max	Min	Max	Min	Max		Min	Max	Min	Max	Min	Max
2C	489 (31)	1956 (123)	244 (15)	745 (47)	—	—	2P	500 (32)	1801 (114)	250 (16)	834 (53)	167 (11)	563 (36)
2D	575 (36)	2299 (145)	287 (18)	867 (55)	—	—	2Q	630 (40)	2269 (143)	315 (20)	1029 (65)	210 (13)	705 (44)
2E	679 (43)	2718 (171)	340 (21)	1010 (64)	—	—	2R	701 (44)	2526 (159)	351 (22)	1131 (71)	234 (15)	782 (49)
—	—	—	—	—	—	—	2S	792 (50)	2854 (180)	396 (25)	1254 (79)	—	—
—	—	—	—	—	—	—	22	604 (38)	2175 (137)	302 (19)	1088 (69)	201 (13)	725 (46)
—	—	—	—	—	—	—	23	839 (53)	3024 (191)	420 (26)	1512 (95)	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—
4C	743 (47)	2972 (187)	371 (23)	1141 (72)	—	—	4P	828 (52)	2983 (188)	414 (26)	1388 (88)	276 (17)	915 (58)
4D	835 (53)	3340 (211)	417 (26)	1275 (80)	—	—	4Q	948 (60)	3415 (215)	474 (30)	1574 (99)	316 (20)	1038 (65)
4E	883 (56)	3530 (223)	441 (28)	1344 (85)	—	—	4R	1178 (74)	4246 (268)	589 (37)	1914 (121)	393 (25)	1264 (80)
4F	918 (58)	3670 (232)	459 (29)	1394 (88)	—	—	4S	1464 (92)	5275 (333)	732 (46)	2303 (145)	—	—
4G	1029 (65)	4115 (260)	514 (32)	1551 (98)	—	—	42	941 (59)	3390 (214)	470 (30)	1695 (107)	314 (20)	1130 (71)
4H	1079 (68)	4318 (272)	540 (34)	1621 (102)	—	—	43	1089 (69)	3926 (248)	545 (34)	1963 (124)	—	—
4I	1156 (73)	4623 (292)	578 (36)	1725 (109)	—	—	44	1220 (77)	4395 (277)	610 (38)	2197 (139)	—	—
—	—	—	—	—	—	—	45	1350 (85)	4864 (307)	675 (43)	2432 (153)	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—
6A	994 (63)	3975 (251)	497 (31)	1535 (97)	—	—	6P	1152 (73)	4152 (262)	576 (36)	1946 (123)	384 (24)	1289 (81)
6B	1079 (68)	4318 (272)	540 (34)	1663 (105)	—	—	6Q	1383 (87)	4983 (314)	691 (44)	2309 (146)	461 (29)	1534 (97)
6C	1267 (80)	5067 (320)	633 (40)	1938 (122)	—	—	6R	1629 (103)	5872 (370)	815 (51)	2683 (169)	543 (34)	1789 (113)
6D	1365 (86)	5461 (345)	683 (43)	2080 (131)	—	—	6S	1801 (114)	6491 (410)	901 (57)	2934 (185)	600 (38)	1962 (124)
6E	1505 (95)	6020 (380)	752 (47)	2279 (144)	—	—	6T	2003 (126)	7217 (455)	1001 (63)	3217 (203)	—	—

Water flow rate limits, gpm (L/s)

Evaporator							Condenser						
Model	1 Pass		2 Pass		3 Pass		Model	1 Pass		2 Pass		3 Pass	
	Min	Max	Min	Max	Min	Max		Min	Max	Min	Max	Min	Max
6F	1581 (100)	6324 (399)	791 (50)	2386 (151)	—	—	63	1387 (88)	4998 (315)	693 (44)	2499 (158)	462 (29)	1666 (105)
—	—	—	—	—	—	—	64	1709 (108)	6160 (389)	855 (54)	3080 (194)	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—
AC	489 (31)	1956 (123)	244 (15)	746 (47)	—	—	AC	500 (32)	1801 (114)	250 (16)	836 (53)	167 (11)	564 (36)
AD	521 (33)	2083 (131)	260 (16)	792 (50)	—	—	AD	630 (40)	2269 (143)	315 (20)	1031 (65)	210 (13)	706 (45)
AE	568 (36)	2273 (143)	284 (18)	859 (54)	—	—	AE	669 (42)	2409 (152)	334 (21)	1088 (69)	223 (14)	748 (47)
AF	603 (38)	2413 (152)	302 (19)	908 (57)	—	—	AF	737 (46)	2655 (168)	368 (23)	1184 (75)	246 (15)	820 (52)
—	—	—	—	—	—	—	AG	792 (50)	2854 (180)	396 (25)	1259 (79)	—	—
—	—	—	—	—	—	—	A1	542 (34)	1952 (123)	271 (17)	976 (62)	181 (11)	651 (41)
—	—	—	—	—	—	—	A3	653 (41)	2354 (149)	327 (21)	1177 (74)	—	—
—	—	—	—	—	—	—	A8	777 (49)	2801 (177)	389 (25)	1400 (88)	—	—
—	—	—	—	—	—	—	A9	839 (53)	3024 (191)	420 (26)	1512 (95)	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—
BC	489 (31)	1956 (123)	244 (15)	692 (44)	—	—	BC	500 (32)	1801 (114)	250 (16)	772 (49)	167 (11)	519 (33)
BD	521 (33)	2083 (131)	260 (16)	734 (46)	—	—	BD	630 (40)	2269 (143)	315 (20)	955 (60)	210 (13)	650 (41)
BE	568 (36)	2273 (143)	284 (18)	797 (50)	—	—	BE	669 (42)	2409 (152)	334 (21)	1009 (64)	223 (14)	689 (43)
BF	603 (38)	2413 (152)	302 (19)	843 (53)	—	—	BF	737 (46)	2655 (168)	368 (23)	1099 (69)	246 (15)	757 (48)
—	—	—	—	—	—	—	BG	792 (50)	2854 (180)	396 (25)	1171 (74)	—	—
—	—	—	—	—	—	—	B1	542 (34)	1952 (123)	271 (17)	976 (62)	181 (11)	651 (41)
—	—	—	—	—	—	—	B3	653 (41)	2354 (149)	327 (21)	1177 (74)	—	—
—	—	—	—	—	—	—	B8	777 (49)	2801 (177)	389 (25)	1400 (88)	—	—
—	—	—	—	—	—	—	B9	839 (53)	3024 (191)	420 (26)	1512 (95)	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—
CC	600 (38)	2400 (151)	300 (19)	928 (59)	200 (13)	579 (37)	CC	828 (52)	2983 (188)	414 (26)	1388 (88)	276 (17)	916 (58)
CD	657 (41)	2629 (166)	329 (21)	1014 (64)	219 (14)	627 (40)	CD	964 (61)	3474 (219)	482 (30)	1598 (101)	321 (20)	1056 (67)
CE	692 (44)	2768 (175)	346 (22)	1066 (67)	231 (15)	656 (41)	CE	1003 (63)	3614 (228)	501 (32)	1657 (105)	334 (21)	1095 (69)

Water flow rate limits, gpm (L/s)

Evaporator							Condenser						
Model	1 Pass		2 Pass		3 Pass		Model	1 Pass		2 Pass		3 Pass	
	Min	Max	Min	Max	Min	Max		Min	Max	Min	Max	Min	Max
CG	730 (46)	2921 (184)	365 (23)	1122 (71)	243 (15)	686 (43)	CF	1045 (66)	3766 (238)	523 (33)	1720 (108)	348 (22)	1137 (72)
CH	765 (48)	3061 (193)	383 (24)	1173 (74)	255 (16)	713 (45)	CG	1097 (69)	3953 (249)	549 (35)	1796 (113)	366 (23)	1188 (75)
CK	810 (51)	3238 (204)	405 (26)	1238 (78)	—	—	CI	1133 (71)	4082 (258)	566 (36)	1848 (117)	378 (24)	1223 (77)
CL	851 (54)	3403 (215)	425 (27)	1298 (82)	—	—	CK	1178 (74)	4246 (268)	589 (37)	1913 (121)	393 (25)	1267 (80)
CN	883 (56)	3530 (223)	441 (28)	1344 (85)	—	—	CL	1227 (77)	4421 (279)	613 (39)	1982 (125)	—	—
CP	921 (58)	3683 (232)	460 (29)	1398 (88)	—	—	CN	1366 (86)	4924 (311)	683 (43)	2173 (137)	—	—
CQ	1038 (65)	4153 (262)	519 (33)	1563 (99)	—	—	CP	1464 (92)	5275 (333)	732 (46)	2301 (145)	—	—
C1	749 (47)	2997 (189)	375 (24)	1415 (89)	—	—	C1	891 (56)	3211 (203)	446 (28)	1606 (101)	297 (19)	1070 (68)
C5	870 (55)	3480 (220)	435 (27)	1626 (103)	—	—	C2	953 (60)	3434 (217)	477 (30)	1717 (108)	—	—
C9	985 (62)	3939 (249)	492 (31)	1819 (115)	—	—	C3	1021 (64)	3680 (232)	511 (32)	1840 (116)	—	—
—	—	—	—	—	—	—	C4	1089 (69)	3926 (248)	545 (34)	1963 (124)	—	—
—	—	—	—	—	—	—	C6	1220 (77)	4395 (277)	610 (38)	2197 (139)	—	—
—	—	—	—	—	—	—	C7	1282 (81)	4618 (291)	641 (40)	2309 (146)	—	—
—	—	—	—	—	—	—	C9	1350 (85)	4864 (307)	675 (43)	2432 (153)	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—
DC	600 (38)	2400 (151)	300 (19)	859 (54)	200 (13)	540 (34)	DC	828 (52)	2983 (188)	414 (26)	1281 (81)	276 (17)	845 (53)
DD	657 (41)	2629 (166)	329 (21)	938 (59)	219 (14)	585 (37)	DD	964 (61)	3474 (219)	482 (30)	1478 (93)	321 (20)	976 (62)
DE	692 (44)	2768 (175)	346 (22)	987 (62)	231 (15)	612 (39)	DE	1003 (63)	3614 (228)	501 (32)	1533 (97)	334 (21)	1013 (64)
DG	730 (46)	2921 (184)	365 (23)	1039 (66)	243 (15)	641 (40)	DF	1045 (66)	3766 (238)	523 (33)	1592 (100)	348 (22)	1052 (66)
DH	765 (48)	3061 (193)	383 (24)	1087 (69)	255 (16)	667 (42)	DG	1097 (69)	3953 (249)	549 (35)	1664 (105)	366 (23)	1100 (69)
DK	810 (51)	3238 (204)	405 (26)	1147 (72)	—	—	DI	1133 (71)	4082 (258)	566 (36)	1713 (108)	378 (24)	1133 (71)
DL	851 (54)	3403 (215)	425 (27)	1203 (76)	—	—	DK	1178 (74)	4246 (268)	589 (37)	1774 (112)	393 (25)	1174 (74)
DN	883 (56)	3530 (223)	441 (28)	1246 (79)	—	—	DL	1227 (77)	4421 (279)	613 (39)	1839 (116)	—	—
DP	921 (58)	3683 (232)	460 (29)	1297 (82)	—	—	DN	1366 (86)	4924 (311)	683 (43)	2021 (127)	—	—
DQ	1038 (65)	4153 (262)	519 (33)	1452 (92)	—	—	DP	1464 (92)	5275 (333)	732 (46)	2143 (135)	—	—

Water flow rate limits, gpm (L/s)

Evaporator							Condenser						
Model	1 Pass		2 Pass		3 Pass		Model	1 Pass		2 Pass		3 Pass	
	Min	Max	Min	Max	Min	Max		Min	Max	Min	Max	Min	Max
D1	749 (47)	2997 (189)	375 (24)	1315 (83)	—	—	D1	891 (56)	3211 (203)	446 (28)	1606 (101)	297 (19)	1070 (68)
D5	870 (55)	3480 (220)	435 (27)	1512 (95)	—	—	D2	953 (60)	3434 (217)	477 (30)	1717 (108)	—	—
D9	985 (62)	3939 (249)	492 (31)	1694 (107)	—	—	D3	1021 (64)	3680 (232)	511 (32)	1840 (116)	—	—
—	—	—	—	—	—	—	D4	1089 (69)	3926 (248)	545 (34)	1963 (124)	—	—
—	—	—	—	—	—	—	D6	1220 (77)	4395 (277)	610 (38)	2197 (139)	—	—
—	—	—	—	—	—	—	D7	1282 (81)	4618 (291)	641 (40)	2309 (146)	—	—
—	—	—	—	—	—	—	D9	1350 (85)	4864 (307)	675 (43)	2432 (153)	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—
EC	873 (55)	3492 (220)	437 (28)	1353 (85)	291 (18)	874 (55)	—	—	—	—	—	—	—
ED	918 (58)	3670 (232)	459 (29)	1420 (90)	306 (19)	916 (58)	—	—	—	—	—	—	—
EE	984 (62)	3937 (248)	492 (31)	1521 (96)	328 (21)	979 (62)	—	—	—	—	—	—	—
EH	1064 (67)	4254 (268)	532 (34)	1639 (103)	355 (22)	1052 (66)	—	—	—	—	—	—	—
EI	1108 (70)	4432 (280)	554 (35)	1705 (108)	369 (23)	1093 (69)	—	—	—	—	—	—	—
EJ	1140 (72)	4559 (288)	570 (36)	1752 (111)	380 (24)	1121 (71)	—	—	—	—	—	—	—
EK	1172 (74)	4686 (296)	586 (37)	1799 (113)	391 (25)	1150 (73)	—	—	—	—	—	—	—
EM	1267 (80)	5067 (320)	633 (40)	1938 (122)	—	—	—	—	—	—	—	—	—
EP	1365 (86)	5461 (345)	683 (43)	2081 (131)	—	—	—	—	—	—	—	—	—
ER	1441 (91)	5766 (364)	721 (45)	2190 (138)	—	—	—	—	—	—	—	—	—
E1	767 (48)	3069 (194)	384 (24)	1477 (93)	256 (16)	951 (60)	—	—	—	—	—	—	—
E3	1069 (67)	4277 (270)	535 (34)	2032 (128)	356 (22)	1290 (81)	—	—	—	—	—	—	—
E5	1251 (79)	5002 (316)	625 (39)	2354 (148)	—	—	—	—	—	—	—	—	—
E9	1432 (90)	5727 (361)	716 (45)	2665 (168)	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—
FC	873 (55)	3492 (220)	437 (28)	1252 (79)	291 (18)	810 (51)	—	—	—	—	—	—	—
FD	918 (58)	3670 (232)	459 (29)	1314 (83)	306 (19)	850 (54)	—	—	—	—	—	—	—

Water flow rate limits, gpm (L/s)

Evaporator							Condenser						
Model	1 Pass		2 Pass		3 Pass		Model	1 Pass		2 Pass		3 Pass	
	Min	Max	Min	Max	Min	Max		Min	Max	Min	Max	Min	Max
FE	984 (62)	3937 (248)	492 (31)	1407 (89)	328 (21)	908 (57)	—	—	—	—	—	—	—
FH	1064 (67)	4254 (268)	532 (34)	1517 (96)	355 (22)	977 (62)	—	—	—	—	—	—	—
FI	1108 (70)	4432 (280)	554 (35)	1579 (100)	369 (23)	1015 (64)	—	—	—	—	—	—	—
FJ	1140 (72)	4559 (288)	570 (36)	1622 (102)	380 (24)	1042 (66)	—	—	—	—	—	—	—
FK	1172 (74)	4686 (296)	586 (37)	1666 (105)	391 (25)	1069 (67)	—	—	—	—	—	—	—
FM	1267 (80)	5067 (320)	633 (40)	1796 (113)	—	—	—	—	—	—	—	—	—
FP	1365 (86)	5461 (345)	683 (43)	1929 (122)	—	—	—	—	—	—	—	—	—
FR	1441 (91)	5766 (364)	721 (45)	2031 (128)	—	—	—	—	—	—	—	—	—
F1	767 (48)	3069 (194)	384 (24)	1369 (86)	256 (16)	884 (56)	—	—	—	—	—	—	—
F3	1069 (67)	4277 (270)	535 (34)	1886 (119)	356 (22)	1202 (76)	—	—	—	—	—	—	—
F5	1251 (79)	5002 (316)	625 (39)	2187 (138)	—	—	—	—	—	—	—	—	—
F9	1432 (90)	5727 (361)	716 (45)	2480 (156)	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—
GK	1111 (70)	4445 (280)	556 (35)	1710 (108)	370 (23)	1126 (71)	EC	1224 (77)	4410 (278)	612 (39)	2060 (130)	408 (26)	1365 (86)
GL	1206 (76)	4826 (304)	603 (38)	1850 (117)	402 (25)	1220 (77)	EE	1402 (88)	5053 (319)	701 (44)	2339 (148)	467 (29)	1554 (98)
GN	1270 (80)	5080 (320)	635 (40)	1942 (123)	423 (27)	1281 (81)	EG	1548 (98)	5579 (352)	774 (49)	2561 (162)	—	—
GP	1365 (86)	5461 (345)	683 (43)	2080 (131)	455 (29)	1374 (87)	EH	1629 (103)	5872 (370)	815 (51)	2683 (169)	—	—
GC	1460 (92)	5842 (369)	730 (46)	2216 (140)	—	—	EJ	1801 (114)	6491 (410)	901 (57)	2934 (185)	—	—
GE	1540 (97)	6159 (389)	770 (49)	2328 (147)	—	—	EK	1905 (120)	6866 (433)	953 (60)	3082 (194)	—	—
GF	1559 (98)	6235 (393)	779 (49)	2355 (149)	—	—	EL	2061 (130)	7427 (469)	1031 (65)	3297 (208)	—	—
G5	906 (57)	3625 (229)	453 (29)	1735 (109)	302 (19)	1142 (72)	E1	1483 (94)	5344 (337)	741 (47)	2672 (169)	494 (31)	1781 (112)
G7	1027 (65)	4108 (259)	514 (32)	1955 (123)	342 (22)	1289 (81)	E3	1594 (101)	5746 (362)	797 (50)	2873 (181)	531 (34)	1915 (121)
G9	1148 (72)	4592 (290)	574 (36)	2172 (137)	383 (24)	1435 (91)	E5	1718 (108)	6192 (391)	859 (54)	3096 (195)	573 (36)	2064 (130)
G1	1269 (80)	5075 (320)	634 (40)	2385 (150)	—	—	E6	1842 (116)	6639 (419)	921 (58)	3320 (209)	—	—
G3	1444 (91)	5776 (364)	722 (46)	2685 (169)	—	—	E7	1966 (124)	7086 (447)	983 (62)	3543 (224)	—	—

Water flow rate limits, gpm (L/s)

Evaporator							Condenser						
Model	1 Pass		2 Pass		3 Pass		Model	1 Pass		2 Pass		3 Pass	
	Min	Max	Min	Max	Min	Max		Min	Max	Min	Max	Min	Max
—	—	—	—	—	—	—	E9	2097 (132)	7555 (477)	1048 (66)	3778 (238)	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—
HK	1111 (70)	4445 (280)	556 (35)	1583 (100)	370 (23)	1042 (66)	FC	1224 (77)	4410 (278)	612 (39)	1901 (120)	408 (26)	1259 (79)
HL	1206 (76)	4826 (304)	603 (38)	1713 (108)	402 (25)	1129 (71)	FE	1402 (88)	5053 (319)	701 (44)	2161 (136)	467 (29)	1434 (90)
HN	1270 (80)	5080 (320)	635 (40)	1800 (114)	423 (27)	1186 (75)	FG	1548 (98)	5579 (352)	774 (49)	2369 (149)	—	—
HP	1365 (86)	5461 (345)	683 (43)	1928 (122)	455 (29)	1272 (80)	FK	1905 (120)	6866 (433)	953 (60)	2860 (180)	—	—
HC	1460 (92)	5842 (369)	730 (46)	2056 (130)	—	—	FL	2061 (130)	7427 (469)	1031 (65)	3064 (193)	—	—
HE	1540 (97)	6159 (389)	770 (49)	2161 (136)	—	—	F1	1483 (94)	5344 (337)	741 (47)	2672 (169)	494 (31)	1781 (112)
HF	1559 (98)	6235 (393)	779 (49)	2186 (138)	—	—	F3	1594 (101)	5746 (362)	797 (50)	2873 (181)	531 (34)	1915 (121)
H5	906 (57)	3625 (229)	453 (29)	1608 (101)	302 (19)	1058 (67)	F5	1718 (108)	6192 (391)	859 (54)	3096 (195)	573 (36)	2064 (130)
H7	1027 (65)	4108 (259)	514 (32)	1814 (114)	342 (22)	1195 (75)	F6	1842 (116)	6639 (419)	921 (58)	3320 (209)	—	—
H9	1148 (72)	4592 (290)	574 (36)	2017 (127)	383 (24)	1331 (84)	F7	1966 (124)	7086 (447)	983 (62)	3543 (224)	—	—
H1	1269 (80)	5075 (320)	634 (40)	2216 (140)	—	—	F9	2097 (132)	7555 (477)	1048 (66)	3778 (238)	—	—
H3	1444 (91)	5776 (364)	722 (46)	2499 (158)	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—
JK	1111 (70)	4445 (280)	556 (35)	1480 (93)	370 (23)	974 (61)	JC	1224 (77)	4410 (278)	612 (39)	1771 (112)	408 (26)	1172 (74)
JL	1206 (76)	4826 (304)	603 (38)	1602 (101)	402 (25)	1055 (67)	JE	1402 (88)	5053 (319)	701 (44)	2016 (127)	467 (29)	1336 (84)
JN	1270 (80)	5080 (320)	635 (40)	1684 (106)	423 (27)	1109 (70)	JG	1548 (98)	5579 (352)	774 (49)	2212 (140)	—	—
JP	1365 (86)	5461 (345)	683 (43)	1805 (114)	455 (29)	1190 (75)	JH	1629 (103)	5872 (370)	815 (51)	2319 (146)	—	—
JC	1460 (92)	5842 (369)	730 (46)	1925 (121)	—	—	JJ	1801 (114)	6491 (410)	901 (57)	2543 (160)	—	—
JE	1540 (97)	6159 (389)	770 (49)	2024 (128)	—	—	JK	1905 (120)	6866 (433)	953 (60)	2676 (169)	—	—
JF	1559 (98)	6235 (393)	779 (49)	2047 (129)	—	—	JL	2061 (130)	7427 (469)	1031 (65)	2871 (181)	—	—
J5	906 (57)	3625 (229)	453 (29)	1505 (95)	302 (19)	990 (62)	J1	1483 (94)	5344 (337)	741 (47)	2672 (169)	494 (31)	1781 (112)
J7	1027 (65)	4108 (259)	514 (32)	1699 (107)	342 (22)	1119 (71)	J3	1594 (101)	5746 (362)	797 (50)	2873 (181)	531 (34)	1915 (121)
J9	1148 (72)	4592 (290)	574 (36)	1890 (119)	383 (24)	1246 (79)	J5	1718 (108)	6192 (391)	859 (54)	3096 (195)	573 (36)	2064 (130)

Water flow rate limits, gpm (L/s)

Evaporator							Condenser						
Model	1 Pass		2 Pass		3 Pass		Model	1 Pass		2 Pass		3 Pass	
	Min	Max	Min	Max	Min	Max		Min	Max	Min	Max	Min	Max
J1	1269 (80)	5075 (320)	634 (40)	2078 (131)	—	—	J6	1842 (116)	6639 (419)	921 (58)	3320 (209)	—	—
J3	1444 (91)	5776 (364)	722 (46)	2346 (148)	—	—	J7	1966 (124)	7086 (447)	983 (62)	3543 (224)	—	—
—	—	—	—	—	—	—	J9	2097 (132)	7555 (477)	1048 (66)	3749 (236)	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—
KC	1651 (104)	6604 (417)	825 (52)	2349 (148)	550 (35)	1526 (96)	KC	1983 (125)	7146 (451)	992 (63)	3060 (193)	661 (42)	2037 (129)
KE	1841 (116)	7366 (465)	921 (58)	2609 (165)	614 (39)	1692 (107)	KE	2194 (138)	7907 (499)	1097 (69)	3362 (212)	731 (46)	2244 (142)
KG	1965 (124)	7861 (496)	983 (62)	2776 (175)	—	—	KG	2389 (151)	8609 (543)	1194 (75)	3635 (229)	796 (50)	2433 (153)
KK	2127 (134)	8509 (537)	1064 (67)	2992 (189)	709 (45)	1934 (122)	KK	2584 (163)	9310 (587)	1292 (81)	3903 (246)	—	—
KL	2314 (146)	9258 (584)	1157 (73)	3239 (204)	—	—	KL	2934 (185)	10574 (667)	1467 (93)	4369 (276)	—	—
K1	1510 (95)	6042 (381)	755 (48)	2666 (168)	503 (32)	1727 (109)	K0	1920 (121)	6920 (437)	960 (61)	3460 (218)	640 (40)	2307 (146)
K3	1631 (103)	6525 (412)	816 (51)	2868 (181)	544 (34)	1855 (117)	K1	2106 (133)	7590 (479)	1053 (66)	3795 (239)	702 (44)	2530 (160)
K5	1873 (118)	7491 (473)	936 (59)	3266 (206)	—	—	K2	2230 (141)	8037 (507)	1115 (70)	4018 (254)	743 (47)	2679 (169)
K7	1951 (123)	7806 (492)	976 (62)	3394 (214)	—	—	K3	2354 (149)	8483 (535)	1177 (74)	4242 (268)	785 (50)	2828 (178)
K9	2392 (151)	9570 (604)	1196 (75)	4087 (258)	—	—	K5	2478 (156)	8930 (563)	1239 (78)	4465 (282)	—	—
—	—	—	—	—	—	—	K7	2646 (167)	9533 (601)	1323 (83)	4767 (301)	—	—
—	—	—	—	—	—	—	K9	2931 (185)	10561 (666)	1465 (92)	5280 (333)	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—
LC	1651 (104)	6604 (417)	825 (52)	2196 (139)	550 (35)	1429 (90)	LC	1983 (125)	7146 (451)	992 (63)	2854 (180)	661 (42)	1897 (120)
LE	1841 (116)	7366 (465)	921 (58)	2441 (154)	614 (39)	1585 (100)	LE	2194 (138)	7907 (499)	1097 (69)	3138 (198)	731 (46)	2091 (132)
LG	1965 (124)	7861 (496)	983 (62)	2598 (164)	—	—	LG	2389 (151)	8609 (543)	1194 (75)	3396 (214)	796 (50)	2268 (143)
LK	2127 (134)	8509 (537)	1064 (67)	2802 (177)	709 (45)	1814 (114)	LK	2584 (163)	9310 (587)	1292 (81)	3649 (230)	—	—
LL	2314 (146)	9258 (584)	1157 (73)	3035 (191)	—	—	LL	2934 (185)	10574 (667)	1467 (93)	4092 (258)	—	—
L1	1510 (95)	6042 (381)	755 (48)	2496 (157)	503 (32)	1620 (102)	L0	1920 (121)	6920 (437)	960 (61)	3460 (218)	640 (40)	2307 (146)
L3	1631 (103)	6525 (412)	816 (51)	2687 (170)	544 (34)	1741 (110)	L1	2106 (133)	7590 (479)	1053 (66)	3795 (239)	702 (44)	2530 (160)
L5	1873 (118)	7491 (473)	936 (59)	3063 (193)	—	—	L2	2230 (141)	8037 (507)	1115 (70)	4018 (254)	743 (47)	2679 (169)

Water flow rate limits, gpm (L/s)

Evaporator							Condenser						
Model	1 Pass		2 Pass		3 Pass		Model	1 Pass		2 Pass		3 Pass	
	Min	Max	Min	Max	Min	Max		Min	Max	Min	Max	Min	Max
L7	1951 (123)	7806 (492)	976 (62)	3184 (201)	—	—	L3	2354 (149)	8483 (535)	1177 (74)	4242 (268)	785 (50)	2828 (178)
L9	2392 (151)	9570 (604)	1196 (75)	3842 (242)	—	—	L5	2478 (156)	8930 (563)	1239 (78)	4465 (282)	—	—
—	—	—	—	—	—	—	L7	2646 (167)	9533 (601)	1323 (83)	4767 (301)	—	—
—	—	—	—	—	—	—	L9	2931 (185)	10561 (666)	1465 (92)	5264 (332)	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—
MC	2095 (132)	8382 (529)	1048 (66)	2950 (186)	698 (44)	1954 (123)	—	—	—	—	—	—	—
ME	2222 (140)	8890 (561)	1111 (70)	3118 (197)	741 (47)	2068 (130)	—	—	—	—	—	—	—
MG	2384 (150)	9537 (602)	1192 (75)	3330 (210)	—	—	—	—	—	—	—	—	—
M1	2054 (130)	8216 (518)	1027 (65)	3558 (224)	685 (43)	2367 (149)	—	—	—	—	—	—	—
M3	2266 (143)	9062 (572)	1133 (71)	3891 (245)	—	—	—	—	—	—	—	—	—
M5	2435 (154)	9739 (614)	1217 (77)	4151 (262)	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—
NC	2095 (132)	8382 (529)	1048 (66)	2762 (174)	698 (44)	1827 (115)	—	—	—	—	—	—	—
NE	2222 (140)	8890 (561)	1111 (70)	2921 (184)	741 (47)	1934 (122)	—	—	—	—	—	—	—
NG	2384 (150)	9537 (602)	1192 (75)	3121 (197)	—	—	—	—	—	—	—	—	—
N1	2054 (130)	8216 (518)	1027 (65)	3340 (211)	685 (43)	2218 (140)	—	—	—	—	—	—	—
N3	2266 (143)	9062 (572)	1133 (71)	3656 (231)	—	—	—	—	—	—	—	—	—
N5	2435 (154)	9739 (614)	1217 (77)	3903 (246)	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—
OC	2222 (140)	8890 (561)	1111 (70)	3118 (197)	741 (47)	2068 (130)	OC	2921 (184)	10527 (664)	1461 (92)	4444 (280)	974 (61)	2935 (185)
OE	2413 (152)	9652 (609)	1206 (76)	3367 (212)	804 (51)	2238 (141)	OE	3116 (197)	11228 (708)	1558 (98)	4712 (297)	1039 (66)	3113 (196)
OG	2556 (161)	10223 (645)	1278 (81)	3551 (224)	—	—	OG	3311 (209)	11930 (753)	1655 (104)	4975 (314)	—	—
OK	2699 (170)	10794 (681)	1349 (85)	3733 (236)	—	—	OK	3505 (221)	12632 (797)	1753 (111)	5232 (330)	—	—
OL	3042 (192)	12166 (768)	1521 (96)	4158 (262)	—	—	OL	3810 (240)	13732 (866)	1905 (120)	5626 (355)	—	—
O1	2326 (147)	9304 (587)	1163 (73)	3985 (251)	775 (49)	2662 (168)	O1	2742 (173)	9881 (623)	1371 (86)	4941 (312)	914 (58)	3294 (208)
O3	2417 (152)	9666 (610)	1208 (76)	4124 (260)	806 (51)	2759 (174)	O3	3114 (196)	11221 (708)	1557 (98)	5611 (354)	1038 (65)	3740 (236)

Water flow rate limits, gpm (L/s)

Evaporator							Condenser						
Model	1 Pass		2 Pass		3 Pass		Model	1 Pass		2 Pass		3 Pass	
	Min	Max	Min	Max	Min	Max		Min	Max	Min	Max	Min	Max
O5	2640 (167)	10561 (666)	1320 (83)	4459 (281)	—	—	O5	3362 (212)	12115 (764)	1681 (106)	6057 (382)	—	—
O7	2900 (183)	11600 (732)	1450 (91)	4836 (305)	967 (61)	3262 (206)	O7	3610 (228)	13008 (821)	1805 (114)	6504 (410)	—	—
O9	3184 (201)	12736 (803)	1592 (100)	5232 (330)	—	—	O9	3926 (248)	14147 (893)	1963 (124)	7074 (446)	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—
PC	2222 (140)	8890 (561)	1111 (70)	2921 (184)	741 (47)	1934 (122)	PC	2921 (184)	10527 (664)	1461 (92)	4152 (262)	974 (61)	2741 (173)
PE	2413 (152)	9652 (609)	1206 (76)	3156 (199)	804 (51)	2094 (132)	PE	3116 (197)	11228 (708)	1558 (98)	4405 (278)	1039 (66)	2909 (184)
PG	2556 (161)	10223 (645)	1278 (81)	3330 (210)	—	—	PG	3311 (209)	11930 (753)	1655 (104)	4655 (294)	—	—
PK	2699 (170)	10794 (681)	1349 (85)	3502 (221)	—	—	PK	3505 (221)	12632 (797)	1753 (111)	4900 (309)	—	—
PL	3042 (192)	12166 (768)	1521 (96)	3907 (246)	—	—	PL	3810 (240)	13732 (866)	1905 (120)	5275 (333)	—	—
P1	2326 (147)	9304 (587)	1163 (73)	3745 (236)	775 (49)	2496 (157)	P1	2742 (173)	9881 (623)	1371 (86)	4941 (312)	914 (58)	3294 (208)
P3	2417 (152)	9666 (610)	1208 (76)	3877 (245)	806 (51)	2588 (163)	P3	3114 (196)	11221 (708)	1557 (98)	5611 (354)	1038 (65)	3740 (236)
P5	2640 (167)	10561 (666)	1320 (83)	4198 (265)	—	—	P5	3362 (212)	12115 (764)	1681 (106)	6057 (382)	—	—
P7	2900 (183)	11600 (732)	1450 (91)	4559 (288)	967 (61)	3065 (193)	P7	3610 (228)	13008 (821)	1805 (114)	6463 (408)	—	—
P9	3184 (201)	12736 (803)	1592 (100)	4940 (312)	—	—	P9	3926 (248)	14147 (893)	1963 (124)	6926 (437)	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—
QC	2413 (152)	9652 (609)	1206 (76)	3407 (215)	804 (51)	2264 (143)	QC	2986 (188)	10761 (679)	1493 (94)	4534 (286)	995 (63)	3062 (193)
QE	2603 (164)	10414 (657)	1302 (82)	3662 (231)	868 (55)	2439 (154)	QE	3635 (229)	13100 (826)	1818 (115)	5402 (341)	1212 (76)	3690 (233)
QG	2794 (176)	11175 (705)	1397 (88)	3913 (247)	931 (59)	2612 (165)	QG	3830 (242)	13802 (871)	1915 (121)	5651 (357)	—	—
QK	3016 (190)	12064 (761)	1508 (95)	4201 (265)	1005 (63)	2813 (177)	QK	4057 (256)	14620 (922)	2029 (128)	5935 (374)	—	—
QL	3210 (203)	12839 (810)	1605 (101)	4449 (281)	0 (0)	0 (0)	QL	4255 (268)	15334 (967)	2128 (134)	6177 (390)	—	—
Q3	2537 (160)	10150 (640)	1269 (80)	4391 (277)	846 (53)	2944 (186)	Q1	3300 (208)	11891 (750)	1650 (104)	5946 (375)	1100 (69)	3964 (250)
Q5	2900 (183)	11600 (732)	1450 (91)	4957 (313)	967 (61)	3345 (211)	Q3	3548 (224)	12785 (807)	1774 (112)	6392 (403)	1183 (75)	4262 (269)
Q7	3081 (194)	12325 (778)	1541 (97)	5232 (330)	1027 (65)	3543 (224)	Q5	3796 (239)	13678 (863)	1898 (120)	6839 (431)	1265 (80)	4559 (288)
Q9	3317 (209)	13267 (837)	1658 (105)	5581 (352)	—	—	Q7	4044 (255)	14572 (919)	2022 (128)	7286 (460)	—	—
—	—	—	—	—	—	—	Q9	4273 (270)	15398 (971)	2137 (135)	7699 (486)	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—

Water flow rate limits, gpm (L/s)

Evaporator							Condenser						
Model	1 Pass		2 Pass		3 Pass		Model	1 Pass		2 Pass		3 Pass	
	Min	Max	Min	Max	Min	Max		Min	Max	Min	Max	Min	Max
RC	2413 (152)	9652 (609)	1206 (76)	3189 (201)	804 (51)	2115 (133)	RC	2986 (188)	10761 (679)	1493 (94)	4237 (267)	995 (63)	2852 (180)
RE	2603 (164)	10414 (657)	1302 (82)	3428 (216)	868 (55)	2279 (144)	RE	3635 (229)	13100 (826)	1818 (115)	5061 (319)	1212 (76)	3442 (217)
RG	2794 (176)	11175 (705)	1397 (88)	3665 (231)	931 (59)	2441 (154)	RG	3830 (242)	13802 (871)	1915 (121)	5299 (334)	—	—
RK	3016 (190)	12064 (761)	1508 (95)	3938 (248)	1005 (63)	2630 (166)	RK	4057 (256)	14620 (922)	2029 (128)	5571 (351)	—	—
RL	3210 (203)	12839 (810)	1605 (101)	4173 (263)	—	—	RL	4255 (268)	15334 (967)	2128 (134)	5803 (366)	—	—
R3	2537 (160)	10150 (640)	1269 (80)	4122 (260)	846 (53)	2756 (174)	R1	3300 (208)	11891 (750)	1650 (104)	5946 (375)	1100 (69)	3964 (250)
R4	2640 (167)	10561 (666)	1320 (83)	4276 (270)	880 (56)	2864 (181)	R3	3548 (224)	12785 (807)	1774 (112)	6370 (402)	1183 (75)	4262 (269)
R5	2900 (183)	11600 (732)	1450 (91)	4659 (294)	967 (61)	3134 (198)	R5	3796 (239)	13678 (863)	1898 (120)	6738 (425)	1265 (80)	4559 (288)
R7	3081 (194)	12325 (778)	1541 (97)	4922 (311)	1027 (65)	3321 (210)	R7	4044 (255)	14572 (919)	2022 (128)	7092 (447)	—	—
R9	3317 (209)	13267 (837)	1658 (105)	5256 (332)	—	—	R9	4273 (270)	15398 (971)	2137 (135)	7407 (467)	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—
SC	3765 (238)	15061 (950)	1883 (119)	4935 (311)	1255 (79)	3281 (207)	SC	3950 (249)	14234 (898)	1975 (125)	5695 (359)	1317 (83)	3761 (237)
SE	4007 (253)	16027 (1011)	2003 (126)	5231 (330)	1336 (84)	3484 (220)	SE	4310 (272)	15533 (980)	2155 (136)	6184 (390)	1437 (91)	4087 (258)
SG	4270 (269)	17081 (1078)	2135 (135)	5550 (350)	—	—	SG	4495 (284)	16199 (1022)	2248 (142)	6433 (406)	—	—
SH	4442 (280)	17766 (1121)	2221 (140)	5755 (363)	—	—	SK	4667 (294)	16819 (1061)	2334 (147)	6662 (420)	—	—
SK	4991 (315)	19963 (1259)	2495 (157)	6400 (404)	—	—	S1	3458 (218)	12461 (786)	1729 (109)	6231 (393)	1153 (73)	4154 (262)
S1	2815 (178)	11261 (710)	1408 (89)	4623 (292)	938 (59)	3067 (193)	S2	3613 (228)	13020 (821)	1807 (114)	6510 (411)	1204 (76)	4340 (274)
S2	2972 (188)	11890 (750)	1486 (94)	4866 (307)	991 (63)	3233 (204)	S3	3762 (237)	13556 (855)	1881 (119)	6778 (428)	1254 (79)	4519 (285)
S3	3293 (208)	13171 (831)	1646 (104)	5356 (338)	1098 (69)	3569 (225)	S4	3917 (247)	14114 (890)	1958 (124)	7057 (445)	1306 (82)	4705 (297)
S4	3413 (215)	13654 (861)	1707 (108)	5538 (349)	1138 (72)	3694 (233)	S5	4041 (255)	14561 (919)	2020 (127)	7281 (459)	1347 (85)	4854 (306)
S5	3661 (231)	14645 (924)	1831 (115)	5907 (373)	1220 (77)	3951 (249)	S7	4351 (274)	15678 (989)	2175 (137)	7839 (495)	—	—
S7	3999 (252)	15998 (1009)	2000 (126)	6402 (404)	—	—	S9	4915 (310)	17711 (1117)	2457 (155)	8855 (559)	—	—
S9	4157 (262)	16626 (1049)	2078 (131)	6627 (418)	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—
TC	3765 (238)	15061 (950)	1883 (119)	4657 (294)	1255 (79)	3091 (195)	TC	3950 (249)	14234 (898)	1975 (125)	5350 (338)	1317 (83)	3532 (223)

Water flow rate limits, gpm (L/s)

Evaporator							Condenser						
Model	1 Pass		2 Pass		3 Pass		Model	1 Pass		2 Pass		3 Pass	
	Min	Max	Min	Max	Min	Max		Min	Max	Min	Max	Min	Max
TE	4007 (253)	16027 (1011)	2003 (126)	4938 (312)	1336 (84)	3283 (207)	TE	4310 (272)	15533 (980)	2155 (136)	5813 (367)	1437 (91)	3840 (242)
TG	4270 (269)	17081 (1078)	2135 (135)	5242 (331)	—	—	TG	4495 (284)	16199 (1022)	2248 (142)	6048 (382)	—	—
TH	4442 (280)	17766 (1121)	2221 (140)	5437 (343)	—	—	TK	4667 (294)	16819 (1061)	2334 (147)	6266 (395)	—	—
TK	4991 (315)	19963 (1259)	2495 (157)	6053 (382)	—	—	T1	3458 (218)	12461 (786)	1729 (109)	6194 (391)	1153 (73)	4084 (258)
T1	2815 (178)	11261 (710)	1408 (89)	4363 (275)	938 (59)	2891 (182)	T2	3613 (228)	13020 (821)	1807 (114)	6463 (408)	1204 (76)	4263 (269)
T2	2972 (188)	11890 (750)	1486 (94)	4595 (290)	991 (63)	3048 (192)	T3	3762 (237)	13556 (855)	1881 (119)	6719 (424)	1254 (79)	4435 (280)
T3	3293 (208)	13171 (831)	1646 (104)	5061 (319)	1098 (69)	3366 (212)	T4	3917 (247)	14114 (890)	1958 (124)	6983 (441)	1306 (82)	4612 (291)
T4	3413 (215)	13654 (861)	1707 (108)	5234 (330)	1138 (72)	3485 (220)	T5	4041 (255)	14561 (919)	2020 (127)	7193 (454)	1347 (85)	4752 (300)
T5	3661 (231)	14645 (924)	1831 (115)	5586 (352)	1220 (77)	3728 (235)	T7	4351 (274)	15678 (989)	2175 (137)	7710 (486)	—	—
T7	3999 (252)	15998 (1009)	2000 (126)	6059 (382)	—	—	T9	4915 (310)	17711 (1117)	2457 (155)	8625 (544)	—	—
T9	4157 (262)	16626 (1049)	2078 (131)	6274 (396)	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—
UC	3857 (243)	15430 (973)	1929 (122)	5110 (322)	1286 (81)	3359 (212)	UC	4836 (305)	17428 (1100)	2418 (153)	6886 (434)	1612 (102)	4555 (287)
UE	4759 (300)	19036 (1201)	2380 (150)	6242 (394)	1586 (100)	4109 (259)	UE	5252 (331)	18925 (1194)	2626 (166)	7428 (469)	1751 (110)	4919 (310)
UG	5070 (320)	20281 (1280)	2535 (160)	6624 (418)	1690 (107)	4363 (275)	UG	5573 (352)	20083 (1267)	2786 (176)	7841 (495)	1858 (117)	5196 (328)
UK	5619 (355)	22478 (1418)	2810 (177)	7288 (460)	—	—	UK	6105 (385)	22001 (1388)	3053 (193)	8509 (537)	—	—
U1	3999 (252)	15998 (1009)	2000 (126)	6528 (412)	1333 (84)	4297 (271)	U1	5113 (323)	18425 (1162)	2557 (161)	9213 (581)	1704 (108)	6142 (387)
U2	4138 (261)	16554 (1044)	2069 (131)	6740 (425)	1379 (87)	4438 (280)	U3	5584 (352)	20123 (1270)	2792 (176)	10062 (635)	1861 (117)	6708 (423)
U3	4416 (279)	17665 (1115)	2208 (139)	7160 (452)	—	—	U9	6402 (404)	23071 (1456)	3201 (202)	11440 (722)	—	—
U5	4622 (292)	18487 (1166)	2311 (146)	7466 (471)	—	—	—	—	—	—	—	—	—
U7	5123 (323)	20493 (1293)	2562 (162)	8199 (517)	—	—	—	—	—	—	—	—	—
U8	5238 (330)	20952 (1322)	2619 (165)	8364 (528)	—	—	—	—	—	—	—	—	—
U9	5673 (358)	22692 (1432)	2836 (179)	8979 (567)	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—
VC	3857 (243)	15430 (973)	1929 (122)	4816 (304)	1286 (81)	3165 (200)	VC	4836 (305)	17428 (1100)	2418 (153)	6478 (409)	1612 (102)	4283 (270)

Water flow rate limits, gpm (L/s)

Evaporator							Condenser						
Model	1 Pass		2 Pass		3 Pass		Model	1 Pass		2 Pass		3 Pass	
	Min	Max	Min	Max	Min	Max		Min	Max	Min	Max	Min	Max
VE	4759 (300)	19036 (1201)	2380 (150)	5889 (372)	—	—	VE	5252 (331)	18925 (1194)	2626 (166)	6993 (441)	1751 (110)	4628 (292)
VG	5070 (320)	20281 (1280)	2535 (160)	6253 (394)	1690 (107)	4116 (260)	VG	5573 (352)	20083 (1267)	2786 (176)	7386 (466)	1858 (117)	4891 (309)
VK	5619 (355)	22478 (1418)	2810 (177)	6885 (434)	—	—	VK	6105 (385)	22001 (1388)	3053 (193)	8023 (506)	—	—
V1	3999 (252)	15998 (1009)	2000 (126)	6166 (389)	1333 (84)	4057 (256)	V1	5113 (323)	18425 (1162)	2557 (161)	8938 (564)	1704 (108)	5928 (374)
V2	4138 (261)	16554 (1044)	2069 (131)	6367 (402)	1379 (87)	4191 (264)	V3	5584 (352)	20123 (1270)	2792 (176)	9664 (610)	1861 (117)	6420 (405)
V3	4416 (279)	17665 (1115)	2208 (139)	6767 (427)	—	—	V9	6402 (404)	23071 (1456)	3201 (202)	10861 (685)	—	—
V5	4622 (292)	18487 (1166)	2311 (146)	7059 (445)	—	—	—	—	—	—	—	—	—
V7	5123 (323)	20493 (1293)	2562 (162)	7760 (490)	—	—	—	—	—	—	—	—	—
V8	5238 (330)	20952 (1322)	2619 (165)	7918 (500)	—	—	—	—	—	—	—	—	—
V9	5673 (358)	22692 (1432)	2836 (179)	8508 (537)	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—
WC	3857 (243)	15430 (973)	1929 (122)	4816 (304)	1286 (81)	3165 (200)	WC	6183 (390)	22282 (1406)	3092 (195)	8267 (522)	2061 (130)	5487 (346)
WE	4537 (286)	18147 (1145)	2268 (143)	5627 (355)	1512 (95)	3701 (234)	WG	6842 (432)	24656 (1556)	3421 (216)	9078 (573)	—	—
WG	5070 (320)	20281 (1280)	2535 (160)	6253 (394)	1690 (107)	4116 (260)	W1	4526 (286)	16312 (1029)	2263 (143)	8048 (508)	1509 (95)	5323 (336)
WK	5512 (348)	22046 (1391)	2756 (174)	6761 (427)	—	—	W3	4892 (309)	17630 (1112)	2446 (154)	8675 (547)	1631 (103)	5748 (363)
W1	3999 (252)	15998 (1009)	2000 (126)	6166 (389)	1333 (84)	4057 (256)	W4	5177 (327)	18657 (1177)	2589 (163)	9157 (578)	1726 (109)	6074 (383)
W2	4138 (261)	16554 (1044)	2069 (131)	6367 (402)	1379 (87)	4191 (264)	W5	5512 (348)	19863 (1253)	2756 (174)	9713 (613)	1837 (116)	6453 (407)
W3	4416 (279)	17665 (1115)	2208 (139)	6767 (427)	1472 (93)	4456 (281)	W6	5803 (366)	20913 (1319)	2902 (183)	10189 (643)	1934 (122)	6779 (428)
W5	4767 (301)	19067 (1203)	2383 (150)	7264 (458)	1589 (100)	4787 (302)	W7	6460 (408)	23281 (1469)	3230 (204)	11235 (709)	2153 (136)	7498 (473)
W6	4990 (315)	19961 (1259)	2495 (157)	7576 (478)	1663 (105)	4996 (315)	W9	7142 (451)	25738 (1624)	3571 (225)	12278 (775)	—	—
W7	5123 (323)	20493 (1293)	2562 (162)	7760 (490)	1708 (108)	5119 (323)	—	—	—	—	—	—	—
W9	5498 (347)	21991 (1387)	2749 (173)	8272 (522)	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—
YC	3857 (243)	15430 (973)	1929 (122)	4349 (274)	1286 (81)	2857 (180)	ZC	6183 (390)	22282 (1406)	3092 (195)	7440 (469)	2061 (130)	4931 (311)
YE	4537 (286)	18147 (1145)	2268 (143)	5088 (321)	1512 (95)	3345 (211)	ZG	6842 (432)	24656 (1556)	3421 (216)	8181 (516)	—	—

Water flow rate limits, gpm (L/s)

Evaporator							Condenser						
Model	1 Pass		2 Pass		3 Pass		Model	1 Pass		2 Pass		3 Pass	
	Min	Max	Min	Max	Min	Max		Min	Max	Min	Max	Min	Max
YG	5070 (320)	20281 (1280)	2535 (160)	5660 (357)	1690 (107)	3723 (235)	Z1	4526 (286)	16312 (1029)	2263 (143)	7255 (458)	1509 (95)	4793 (302)
YK	5512 (348)	22046 (1391)	2756 (174)	6126 (386)	—	—	Z3	4892 (309)	17630 (1112)	2446 (154)	7828 (494)	1631 (103)	5179 (327)
Y1	3999 (252)	15998 (1009)	2000 (126)	5586 (352)	1333 (84)	3673 (232)	Z4	5177 (327)	18657 (1177)	2589 (163)	8270 (522)	1726 (109)	5478 (346)
Y2	4138 (261)	16554 (1044)	2069 (131)	5771 (364)	1379 (87)	3796 (239)	Z5	5512 (348)	19863 (1253)	2756 (174)	8782 (554)	1837 (116)	5824 (367)
Y3	4416 (279)	17665 (1115)	2208 (139)	6137 (387)	1472 (93)	4039 (255)	Z6	5803 (366)	20913 (1319)	2902 (183)	9221 (582)	1934 (122)	6123 (386)
Y5	4767 (301)	19067 (1203)	2383 (150)	6594 (416)	1589 (100)	4342 (274)	Z7	6460 (408)	23281 (1469)	3230 (204)	10190 (643)	2153 (136)	6784 (428)
Y6	4990 (315)	19961 (1259)	2495 (157)	6882 (434)	1663 (105)	4534 (286)	Z9	7142 (451)	25738 (1624)	3571 (225)	11164 (704)	—	—
Y7	5123 (323)	20493 (1293)	2562 (162)	7052 (445)	1708 (108)	4647 (293)	—	—	—	—	—	—	—
Y9	5498 (347)	21991 (1387)	2749 (173)	7526 (475)	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—
XC	4880 (308)	19519 (1231)	2440 (154)	6031 (380)	1627 (103)	3969 (250)	YC	7569 (478)	27276 (1721)	3785 (239)	9951 (628)	2523 (159)	6631 (418)
XE	5927 (374)	23710 (1496)	2964 (187)	7234 (456)	1976 (125)	4769 (301)	YG	8575 (541)	30902 (1950)	4288 (271)	11119 (702)	—	—
XG	6756 (426)	27024 (1705)	3378 (213)	8151 (514)	—	—	Y1	5512 (348)	19863 (1253)	2756 (174)	9713 (613)	1837 (116)	6453 (407)
X1	4990 (315)	19961 (1259)	2495 (157)	7576 (478)	1663 (105)	4996 (315)	Y2	5803 (366)	20913 (1319)	2902 (183)	10189 (643)	1934 (122)	6779 (428)
X3	5474 (345)	21894 (1381)	2737 (173)	8239 (520)	1825 (115)	5440 (343)	Y3	6398 (404)	23057 (1455)	3199 (202)	11138 (703)	2133 (135)	7431 (469)
X5	5975 (377)	23900 (1508)	2988 (188)	8910 (562)	1992 (126)	5890 (372)	Y4	7000 (442)	25224 (1591)	3500 (221)	12064 (761)	2333 (147)	8072 (509)
X6	6205 (391)	24819 (1566)	3102 (196)	9210 (581)	2068 (130)	6092 (384)	Y5	7539 (476)	27167 (1714)	3769 (238)	12864 (812)	2513 (159)	8631 (545)
X7	6597 (416)	26389 (1665)	3299 (208)	9714 (613)	—	—	Y7	8103 (511)	29200 (1842)	4052 (256)	13672 (863)	2701 (170)	9199 (580)
X9	6887 (435)	27549 (1738)	3444 (217)	10079 (636)	—	—	Y9	8679 (548)	31277 (1973)	4340 (274)	14465 (913)	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—
ZC	7207 (455)	28828 (1819)	3603 (227)	8637 (545)	2402 (152)	5709 (360)	—	—	—	—	—	—	—
ZE	7874 (497)	31495 (1987)	3937 (248)	9338 (589)	2625 (166)	6181 (390)	—	—	—	—	—	—	—
ZG	8512 (537)	34047 (2148)	4256 (269)	9987 (630)	—	—	—	—	—	—	—	—	—
Z1	7310 (461)	29241 (1845)	3655 (231)	10598 (669)	2437 (154)	7032 (444)	—	—	—	—	—	—	—
Z2	7552 (476)	30208 (1906)	3776 (238)	10889 (687)	2517 (159)	7230 (456)	—	—	—	—	—	—	—

Water flow rate limits, gpm (L/s)

Evaporator							Condenser						
Model	1 Pass		2 Pass		3 Pass		Model	1 Pass		2 Pass		3 Pass	
	Min	Max	Min	Max	Min	Max		Min	Max	Min	Max	Min	Max
Z3	7794 (492)	31174 (1967)	3897 (246)	11174 (705)	2598 (164)	7425 (468)	—	—	—	—	—	—	—
Z5	8035 (507)	32141 (2028)	4018 (253)	11455 (723)	2678 (169)	7617 (481)	—	—	—	—	—	—	—
Z7	8277 (522)	33108 (2089)	4138 (261)	11731 (740)	2759 (174)	7806 (492)	—	—	—	—	—	—	—
Z9	8730 (551)	34920 (2203)	4365 (275)	12236 (772)	—	—	—	—	—	—	—	—	—

① **Note:** — Not available at this time.

Brine applications

Various types of brine can be used in both the evaporator and condenser in lieu of water. The OptiView™ Control panel is programmed in the factory to allow extending the evaporator leaving brine temperature setpoint below 36°F (2.2°C). The low evaporator pressure cutout is factory programmed to the appropriate value depending on the percent (%) concentration and type of brine solution.

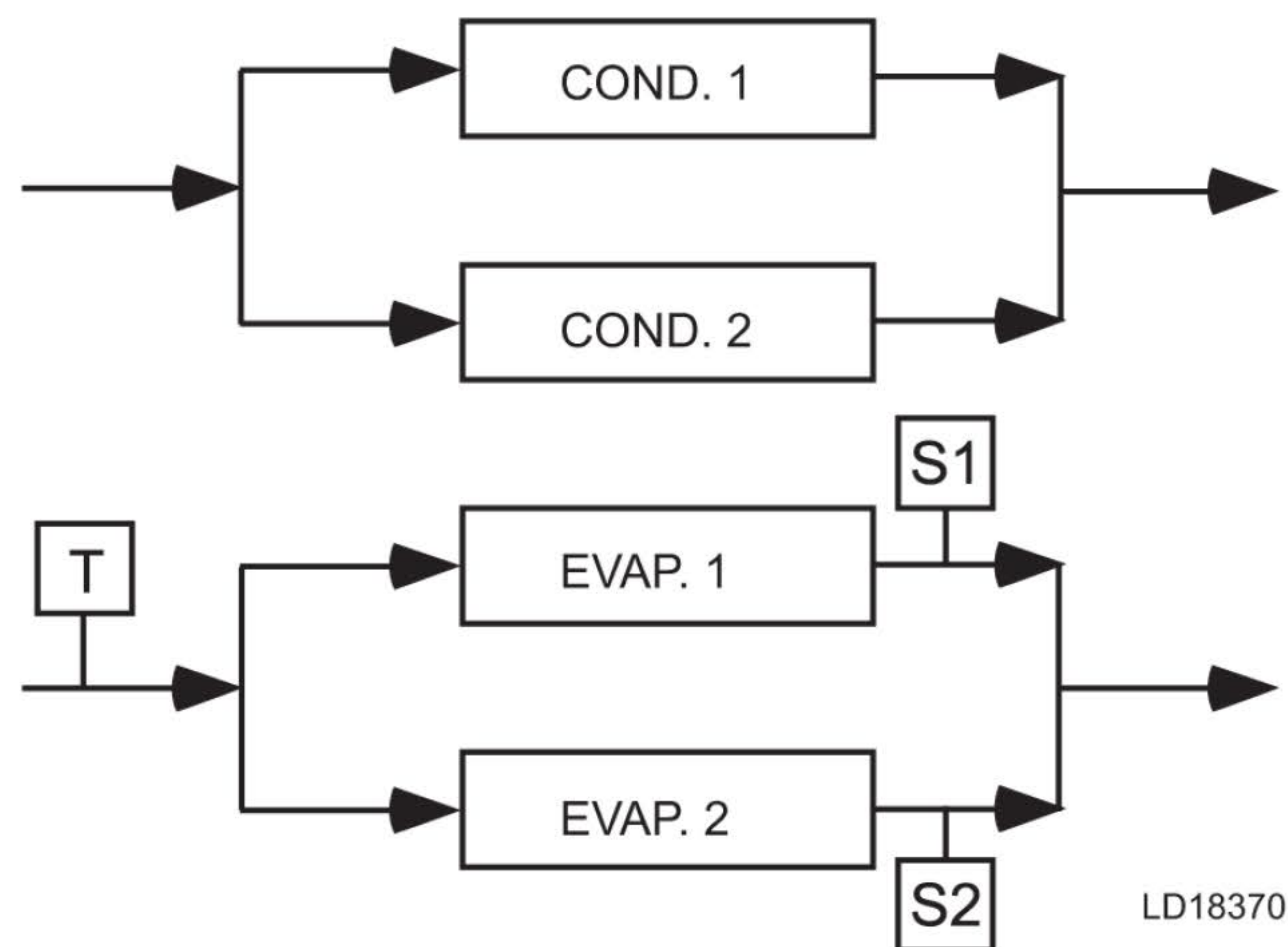
When the chiller is not running, brine should not be run through the evaporator. However, if there is brine running through the evaporator, there must be flow through the condenser to prevent tubes from freezing. In brine applications the condenser pump control will close when the condenser saturation temperature reaches 35°F (1.7°C) and the pump will shut off when the temperature increases to 40°F (4.4°C). This is applicable if tied to the condenser pump control.

Multiple units

Selection – Many applications require multiple units to meet the total capacity requirements as well as to provide flexibility and some degree of protection against equipment shutdown. There are several common unit arrangements for this type of application. The chiller has been designed to be readily adapted to the requirements of these various arrangements.

Parallel Arrangement – Chillers may be applied in multiples with chilled and condenser water circuits connected in parallel between the units. Figure 16 represents a parallel arrangement with two chillers. Parallel chiller arrangements may consist of equally or unequally sized units. When multiple units are in operation, they load and unload at equal percentages of design full load for the chiller.

Parallel evaporators parallel condensers

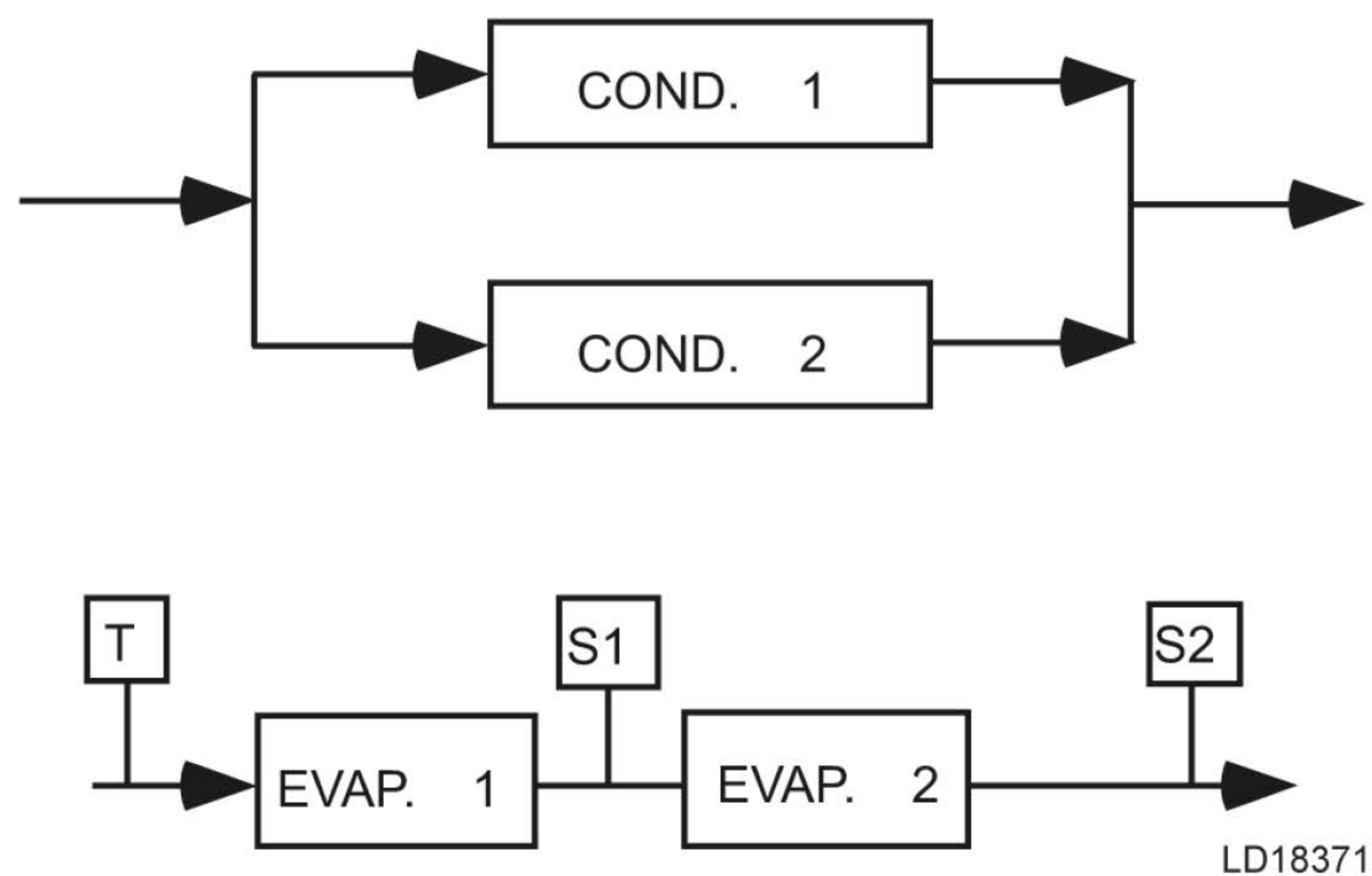


Callout	Description
S	Temperature sensor for chiller capacity control
T	Thermostat for chiller capacity control

Depending on the number of units and operating characteristics of the units, loading and unloading schemes should be designed to optimize the overall efficiency of the chiller plant. Use an evaporator bypass piping arrangement to bypass fluid around evaporator of any unit that has cycled off at reduced load conditions. Alternate the chiller cycling order to equalize chiller starts and run hours.

Series Arrangement – Chillers may be applied in pairs with chilled water circuits connected in series and condenser water circuits connected in parallel. All of the chilled water flows through both evaporators with each unit handling approximately one half of the total load. When the load decreases to a customer selected load value, one of the units will be shut down by a sequence control. Since all water is flowing through the operating unit, that unit will cool the water to the required temperature.

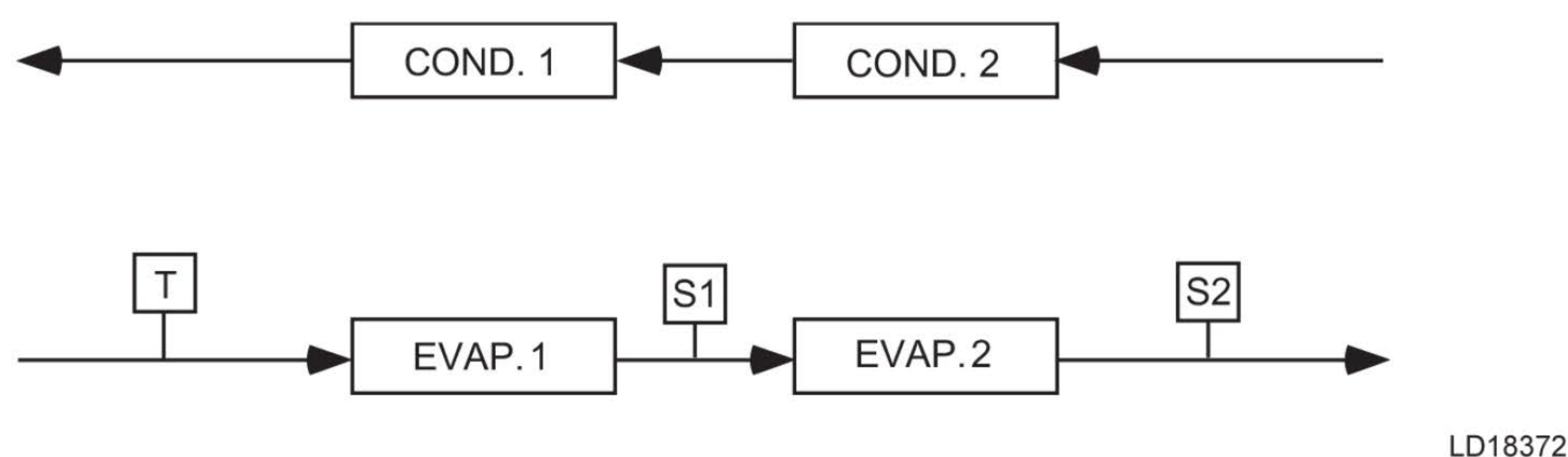
Series evaporators parallel condensers



Series Counter Flow Arrangement - Chillers may be applied in pairs with chilled water circuits connected in series and with the condenser water in series counter flow. All of the chilled water

flows through both evaporators. All of the condenser water flows through both condensers. The water ranges are split, which allows a lower temperature difference or "head" on each chiller, than multiple units in parallel. For equal chillers, the machine at higher temperature level will typically provide slightly more than half the capacity. The compressor motors and gear codes on the two chillers are often matched, such that the high temperature machine can operate at the low temperature conditions when one unit is cycled off at part loads (as compared to series-parallel chillers which are typically not identical).

Series evaporators series-counter flow condensers



Callout	Description
S	Temperature sensor for chiller capacity control
T	Thermostat for chiller capacity control

Series counter flow application can provide a significant building energy savings for large capacity plants which have chilled and condenser water temperature ranges greater than typical AHRI.

Refrigerant relief piping

Each chiller is equipped with dual pressure relief valves on the condenser and two dual relief valves on the evaporator, or two single relief valves on the evaporator if the optional refrigerant isolation valves are ordered. The dual relief valves on the condenser are redundant and allow changing of either valve while the unit is fully charged. The purpose of the relief valves is to quickly relieve excess pressure of the refrigerant charge to the atmosphere, as a safety precaution in the event of an emergency such as fire. They are set to relieve at an internal pressure as noted on the pressure vessel data plate, and are provided in accordance with ASHRAE 15 safety code and ASME or applicable pressure vessel code.

Sized to the requirements of applicable codes, a vent line must run from the relief device to the outside of the building. This refrigerant relief piping must include a cleanable, vertical leg dirt trap to catch vent stack condensation. Vent piping must be arranged to avoid imposing a strain on the relief connection and should include one flexible connection.

Sound and vibration considerations

A MA chiller is not a source of objectionable sound and vibration in normal air conditioning applications. Neoprene isolation mounts are furnished as standard with each unit. Optional level adjusting spring isolator assemblies designed for 1 in. (25 mm) static deflection are available from Johnson Controls.

Control of sound and vibration transmission must be taken into account in the equipment room construction as well as in the selection and installation of the equipment.

MA chiller sound pressure level ratings will be furnished on request.

Thermal insulation

No appreciable operating economy can be achieved by thermally insulating the chiller. However, the chiller's cold surfaces should be insulated with vapor barrier insulation sufficient to prevent condensation. A chiller can be factory-insulated with 3/4 in (19 mm) or 1 1/2 in. (38 mm) thick insulation, as an option. This insulation will normally prevent condensation in environments with dry bulb temperatures of 50°F to 90°F (10°C to 32°C) and relative humidities up to 75% [3/4 in. (19 mm) thickness] or 90% [1 1/2 in. (38 mm) thickness]. The insulation is painted and the surface is flexible and reasonably resistant to wear. It is intended for a chiller installed indoors and, therefore, no protective covering of the insulation is usually required. If insulation is applied to the waterboxes at the job site, it must be removable to permit access to the tubes for routine maintenance.

Ventilation

The ASHRAE Standard 15 Safety Code for Mechanical Refrigeration requires that all machinery rooms be vented to the outdoors using mechanical ventilation by one or more power driven fans. This standard, plus National Fire Protection Association Standard 90A, state, local and any other related codes should be reviewed for specific requirements. Since the MA chiller motor is air-cooled, ventilation should allow for the removal of heat from the motor.

Motor voltage variations

Frequency	Rated voltage	Nameplate voltage*	Operating voltage	
			Minimum	Maximum
60 Hz	200	200/208	180	220
	230	220/240	208	254
	380	380	342	415
	416	416	375	457
	460	440/460/480	414	508
	575	575/600	520	635
	2300	2300	2070	2530
	3300	3300	2970	3630
	4000	4000/4160	3600	4576
50 Hz	346	346	311	381
	380	380/400	342	423
	415	415	374	440
	3300	3300	2970	3630

In addition, the ASHRAE Standard 15 requires a refrigerant vapor detector to be employed for all refrigerants. It is to be located in an area where refrigerant from a leak would be likely to concentrate. An alarm is to be activated and the mechanical ventilation started at a value no greater than the TLV (Threshold Limit Value) of the refrigerant.

Electrical considerations

Motor Voltage – Low voltage motors (200 V to 600 V) are furnished with six leads. Medium voltage (2300 V to 13800 V) motors may have three leads or six leads. Motor circuit conductor size must be in accordance with the National Electrical Code (NEC), or other applicable codes, for the motor full load amperes (FLA). Flexible conduit should be used for the last several feet to the chiller in order to provide vibration isolation. Table 7 on page lists the allowable variation in voltage supplied to the

chiller motor. The unit name plate is stamped with the specific motor voltage, and frequency for the appropriate motor.

Starters – A separate starter is not required if the chiller is equipped with a Variable Speed Drive (VSD). The Chillers are also available with a factory mounted and wired MEHRASL Solid-State Starter for low and medium voltage applications. Other types of remote mounted starters are available. Electromechanical starters must be furnished in accordance with MEHRASL Standard Specifications (R-1132). This will ensure that starter components, controls, circuits, and terminal markings will be suitable for required overall system performance. Remote-mounted medium voltage MEHRASL Solid-State Starters are also available.

Controls – A 115 V, single-phase, 60 or 50 Hz 2 KVA power supply must be furnished to the chiller from a separate, fused disconnect or from a control transformer included as an option with electromechanical starters. No field control wiring is required when the low voltage MEHRASL Variable Speed Drive or Solid-State Starter is supplied.

Oil Pump Power Supply – A separate 3 phase power supply with a fused disconnect for the factory-mounted oil pump variable speed drive is required unless the low voltage VSD or SSS is supplied. Power can also be supplied through an electromechanical starter, remote mounted Medium Voltage Solid-State Starter (MVSSS) or Medium Voltage Variable Speed Drive (MVVSD).

Copper Conductors – Only copper conductors should be connected to compressor motors and starters. Aluminum conductors have proven to be unsatisfactory when connected to copper lugs. Aluminum oxide and the difference in thermal conductivity between copper and aluminum cannot guarantee the required tight connection over a long period of time.

Displacement Power-factor Correction Capacitors – When the chiller is equipped with a VSD, automatic displacement power factor correction to a minimum of 0.95 is provided at all operating conditions, so additional capacitors are not required. For other starting methods, capacitors can be applied to a chiller for the purpose of displacement power factor correction. For remote-mounted electromechanical starters, the capacitors should be located on the load side of the starter. For MEHRASL Solid-State Starters the capacitors must be located on the line side of the starter. The capacitors must be sized and installed to meet the National Electrical Code and be verified by Johnson Controls.

Ampacity on Load Side of Starter – Electrical power wire size to the chiller is based on the minimum unit ampacity. For Solid-State Starters or Variable Speed Drive, this wiring is done at the factory. For remote starters, the National Electrical Code defines the calculation of ampacity, as summarized below. More specific information on actual amperage ratings will be supplied with the submittal drawings:

- Six lead type of starting (Star Delta) Minimum circuit ampacity per conductor (1 of 6):

$$\text{Ampacity} = .721 \times \text{compressor motor amps.}$$

- Three lead type of starting (Across the Line, Autotransformer and Primary Reactor) Minimum circuit ampacity per conductor (1 of 3):

$$\text{Ampacity} = 1.25 \times \text{compressor motor amps.}$$

Ampacity on Line Side of Starter – The only additional load on the circuit for the chiller would be the control transformer and oil pump motor unless they are supplied by a separate source.

$$\text{Minimum Circuit Ampacity} = 125\% \text{ of compressor motor amps} + \text{FLA of all other loads on the circuit.}$$

Branch Circuit Overcurrent Protection – The branch circuit overcurrent protection device(s) should be a time delay type, with a minimum rating equal to the next standard fuse/breaker rating above the calculated value. It is calculated taking into account the compressor motor amps and

may also include control transformer and oil pump motor. Refer to submittal drawings for the specific calculations for each application. For information on motor starters, see Table 16.

For motor voltage above 4160 V / 60 Hz and 3300 V / 50 Hz, contact the JCI Sales Office for a specific selection.

Motor electrical data

The smallest motor available which equals or exceeds the input power (kW) from the chiller rating program is selected from Table 8, Table 9, Table 10, and Table 11. The full load amperes (FLA) listed in the tables is maximum values and corresponds to the maximum motor kW listed. When the input power (kW) is less than maximum motor kW, the FLA should be reduced per the following equation:

$$FLA = \frac{\text{Motor kW} \times \text{MAXIMUM Motor FLA}}{\text{MAXIMUM Motor kW}}$$

This equation assumes the motor is running at full speed. When running with a VSD the FLA will increase as speed and VSD output voltage are reduced.

The benefit from the FLA correction is the possible use of smaller power wiring and/or starter size. The locked rotor amperes (LRA) are read directly from Table 8 for specific Motor Code and voltage.

This is because the LRA is dependent only on motor size and voltage and is independent of input power (kW). Inrush amperes (IRA) depend on LRA and the type of starter applied. The inrush can be calculated using a percentage of LRA shown in Table 17 to Table 21.

60 Hz electrical data

60 Hz electrical data, motor codes CF–CW

Motor code	CF	CG	CH	CJ	CK	CL	CM	CN	CP	CR	CS	CT	CU	CV	CW	
Shaft hp (max)	154	177	201	237	270	302	327	351	385	424	468	503	554	608	655	
Input kW (max)	123	140	161	190	214	240	257	276	302	333	367	395	435	477	514	
F.L. eff. - % ¹	93.6	94.5	93.3	93	94	94	95	95	95	95	95	95	95	95	95	
F.L. power factor ¹	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.87	0.87	0.87	0.87	0.87	0.87	
Volts	Amperes (maximum)															
2300	FLA	36	41.1	46	55	63	70	73.9	80	87	95	106	113	124	135	146
	LRA	240	267	298	340	409	435	480	520	543	617	669	719	791	867	935
3300	FLA	25.5	29	33	39	44	49	52	55.3	61	67	72.8	79	86.1	94.4	102
	LRA	160	175	210	240	286	310	310	343	382	436	466	501	551	576	652
4000	FLA	21	24	26.7	32	36	40	42.5	46	50.1	55	60.1	65.2	71	77.9	84
	LRA	135	154	166	195	234	240	270	283	315	356	384	413	455	499	538
4160	FLA	20.2	23	25.7	30.8	34.6	38.5	40.9	44.2	48.2	52.9	57.8	62.7	68.3	74.9	80.8
	LRA	140	160	173	203	244	250	270	294	328	370	399	430	473	519	560

¹ High voltage and special motor designs may not meet efficiency, power factor, or amperes values shown for standard motors.

60 Hz electrical data, motor codes CX-DL

Motor code	CX	CY	CZ	CA	CB	DA	DB	DC	DD	DE	DF	DH	DJ	DK	DL
Shaft hp (max)	690	740	790	845	900	1000	1100	1200	1300	1400	1500	1750	2000	2250	2500
Input kW (max)	542	578	618	660	703	781	859	937	1015	1093	1171	1359	1554	1748	1942
F.L. eff. - % ¹	95	95.5	95.3	95.5	95.5	95.5	95.5	95.5	95.5	95.5	95.5	96	96	96	96
F.L. power factor ¹	0.87	0.88	0.88	0.89	0.89	0.87	0.87	0.87	0.88	0.88	0.88	0.87	0.89	0.89	0.89
Volts	Amperes (maximum)														
2300	FLA	154	165	176	186	198	225	248	267	290	312	334	383	438	548
	LRA	960	1008	1100	1230	1230	1350	1592	1592	1882	2031	2171	2390	2879	3356
3300	FLA	108	115	123	130	138	157	173	186	202	217	233	267	306	382
	LRA	702	719	744	858	858	942	1110	1110	1311	1416	1514	1661	2011	2388
4000	FLA	88.6	94.8	101	107	114	130	143	154	166	179	192	220	252	315
	LRA	552	554	631	713	713	780	923	923	1077	1177	1246	1428	1669	2047
4160	FLA	85.2	91.1	97.1	102	110	125	137	148	160	172	185	212	242	303
	LRA	574	576	656	742	742	811	960	960	1120	1224	1296	1485	1736	1968

1 High voltage and special motor designs may not meet efficiency, power factor, or amperes values shown for standard motors.

50 Hz electrical data

50 Hz electrical data, motor codes 5CC-5CS

Motor code	5CC	5CD	5CE	5CF	5CG	5CH	5CI	5CJ	5CK	5CL	5CM	5CN	5CO	5CP	5CQ	5CR	5CS
Shaft hp (max)	148	168	198	225	252	272	292	321	353	390	419	462	507	546	575	617	658
Input kW (max)	119	135	158	179	201	215	231	254	279	309	332	363	398	429	451	484	516
F.L. eff. - % ¹	93	93	93.4	93.7	93.7	94.2	94.2	94.2	94.2	94.2	94.2	95	95	95	95	95	95
F.L. power factor ¹	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.88
Volts	Amperes (maximum)																
3300	FLA	24.1	27.4	32.2	36.4	40.8	43.8	47	51.7	56.2	62.1	66.7	72.9	80	86.2	90.8	103
	LRA	159	162	209	236	241	274	305	318	361	388	423	455	499	516	572	644

1 High voltage and special motor designs may not meet efficiency, power factor, or amperes values shown for standard motors.

50 Hz electrical data, motor codes 5CT-5DL

Motor code	5CT	5CU	5CV	5CW	5CX	5DA	5DB	5DC	5DD	5DE	5DF	5DG	5DH	5DJ ¹	5DK	5DL
Shaft hp (max)	704	750	800	850	900	1000	1100	1200	1300	1400	1500	1650	1750	2000	2250	2500
Input kW (max)	553	589	628	667	706	785	863	942	1015	1093	1171	1288	1359	1554	1748	1942
F.L. eff. - % ²	95	95	95	95	95	95	95	95	95.5	95.5	95.5	95.5	96	96	96	96
F.L. power factor ²	0.88	0.89	0.89	0.89	0.89	0.88	0.87	0.88	0.88	0.88	0.88	0.88	0.89	0.89	0.89	0.89
Volts	Amperes (maximum)															
3300	FLA	110	116	123	131	139	156	174	187	202	217	233	256	267	306	382
	LRA	725	725	744	819	875	871	1135	1135	1135	1415	1415	1415	1667	1836	2233

1 Min. reduced voltage tap 80%.
2 High voltage and special motor designs may not meet efficiency, power factor, or amperes values shown for standard motors.

60 Hz electrical data, premium efficiency

60 Hz electrical data - premium efficiency, motor code EF-EV

Motor code	EF	EG	EH	EJ	EK	EL	EM	EN	EP	ER	ES	ET	EU	EV
Shaft hp (max)	154	177	201	237	270	302	327	351	385	424	468	503	554	608
Input kW (max)	122	139	158	185	211	236	256	274	300	330	363	390	431	473
F.L. eff. - % ¹	94.5	95	95	95.4	95.4	95.4	95.4	95.4	95.8	95.8	96.2	96.2	95.8	95.8
F.L. powerfactor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Volts	Amperes (maximum)													
200	FLA	399	456	518	608	692	774	838	900	983	1083	1190	—	—
	LRA	2815	3128	3128	3979	4550	4900	5635	5865	6686	7350	7935	—	—
208	FLA	383	438	498	584	666	745	806	865	945	1041	1144	—	—
	LRA	2928	3235	3235	4138	4732	5096	5860	6100	6953	7644	8252	—	—
230	FLA	347	396	450	528	602	673	729	783	855	941	1035	1112	—
	LRA	2598	2720	2865	3460	3788	4260	4900	5162	5814	6200	6900	8513	—
240	FLA	332	380	431	506	577	645	699	750	819	902	992	1066	—
	LRA	2711	2838	2990	3610	3953	4445	5113	5386	6067	6470	7200	8883	—
380	FLA	210	240	272	320	364	408	441	474	517	570	626	673	745
	LRA	1482	1646	1730	2153	2500	2578	2966	3254	3637	3810	4179	4480	4671
416	FLA	192	219	249	292	333	372	403	433	473	521	572	615	680
	LRA	1385	1504	1638	1967	2190	2356	2709	2976	3536	3637	3815	3826	4270
440	FLA	181	207	235	276	315	352	381	409	447	492	541	581	643
	LRA	1177	1301	1320	1655	1865	2037	2485	2485	2976	2976	3300	3348	3644
460	FLA	173	198	225	264	301	337	365	391	427	471	517	556	615
	LRA	1230	1360	1380	1730	1950	2130	2598	2598	3111	3111	3450	3500	3810
480	FLA	166	190	216	253	288	323	349	375	410	451	496	533	589
	LRA	1283	1419	1440	1805	2035	2223	2711	2711	3246	3246	3600	3652	3976
575	FLA	139	159	180	211	241	269	292	313	342	377	414	445	492
	LRA	979	1088	1100	1384	1556	1704	1960	2066	2326	2413	2760	2960	3089
600	FLA	133	152	173	203	231	258	279	300	328	361	397	426	472
	LRA	1021	1135	1148	1444	1624	1778	2045	2156	2427	2518	2880	3089	3223

¹ High voltage and special motor designs may not meet efficiency, power factor, or amperes values shown for standard motors.

60 Hz electrical data - premium efficiency, motor code EW-FD

Motor code		EW	EX	EY	EZ	EA	EB	FA	FB	FC	FD
Shaft hp (max)		655	690	740	790	845	900	1000	1100	1200	1300
Input kW (max)		508	535	574	612	655	698	775	853	930	1008
F.L. eff. - % ¹		96.2	96.2	96.2	96.2	96.2	96.2	96.2	96.2	96.2	96.2
F.L. powerfactor		0.87	0.87	0.88	0.87	0.88	0.88	0.87	0.87	0.87	0.87
Volts	Amperes (maximum)										
200	FLA	—	—	—	—	—	—	—	—	—	—
	LRA	—	—	—	—	—	—	—	—	—	—
208	FLA	—	—	—	—	—	—	—	—	—	—
	LRA	—	—	—	—	—	—	—	—	—	—
230	FLA	—	—	—	—	—	—	—	—	—	—
	LRA	—	—	—	—	—	—	—	—	—	—
240	FLA	—	—	—	—	—	—	—	—	—	—
	LRA	—	—	—	—	—	—	—	—	—	—
380	FLA	887	934	990	1069	1131	1204	1354	1489	1624	—
	LRA	5780	5859	6244	6644	7106	7513	7794	8491	9431	—
416	FLA	810	853	905	977	1033	1100	1237	1360	1484	—
	LRA	5640	5670	5704	6069	6489	6863	7120	7755	8618	—
440	FLA	766	807	855	924	977	1040	1169	1286	1403	1520
	LRA	4668	4744	5050	5098	5529	5782	6160	6709	7455	9003
460	FLA	732	772	818	883	934	995	1118	1230	1342	1454
	LRA	4880	4960	5280	5330	5780	6045	6440	7014	7794	9412
480	FLA	702	739	784	847	895	954	1072	1179	1286	1393
	LRA	5092	5175	5510	5562	6031	6308	6720	7319	8133	9821
575	FLA	586	617	654	707	747	796	895	984	1074	1163
	LRA	4039	4100	4200	4200	4694	4963	5148	5610	6232	7527
600	FLA	562	592	627	677	716	763	857	943	1029	1115
	LRA	4214	4278	4383	4383	5452	5179	5372	5854	6503	7854

1 High voltage and special motor designs may not meet efficiency, power factor, or amperes values shown for standard motors.

50 Hz electrical data, premium efficiency

50 Hz electrical data - premium efficiency, motor code 5EC-5EO

Motor code	5EC	5ED	5EE	5EF	5EG	5EH	5EI	5EJ	5EK	5EL	5EM	5EN	5EO	
Shaft hp (max)	148	168	198	225	252	272	292	321	353	390	419	462	507	
Input kW (max)	117	133	156	177	198	214	229	252	277	305	328	361	396	
F.L. eff. - %	94.3	94.5	94.7	94.9	95	95	95	95	95	95.4	95.4	95.4	95.4	
F.L. powerfactor	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	
Volts	Amperes (maximum)													
346	FLA	222	251	296	335	375	405	435	478	525	578	621	685	751
	LRA	1521	1721	1790	2208	2467	2706	2840	3081	3350	3706	3810	4177	5150
380	FLA	202	229	269	305	342	369	396	435	478	526	565	623	684
	LRA	1385	1385	1640	1890	2144	2464	2590	2806	3050	3375	3700	3810	4690
400	FLA	192	217	256	290	324	350	376	413	454	500	537	592	650
	LRA	1458	1458	1726	1989	2257	2594	2726	2954	3211	3553	3895	4011	4937
415	FLA	185	210	246	280	313	338	362	398	438	482	518	571	627
	LRA	1283	1385	1502	1700	2031	2175	2366	2569	2794	3088	3402	3478	4027

① **Note:** These motors are designed to meet or exceed NEMA Premium (MG1-2006) and European IE2 efficiency requirements.

50 Hz electrical data - premium efficiency, motor code 5EP-5FB

Motor code	5EP	5EQ	5ER	5ES	5ET	5EU	5EV	5EW	5EX	5FA	5FB	
Shaft hp (max)	546	575	617	658	704	750	800	850	900	1000	1100	
Input kW (max)	425	448	480	512	548	584	623	662	701	778	856	
F.L. eff. - %	95.8	95.8	95.8	95.8	95.8	95.8	95.8	95.8	95.8	95.8	95.8	
F.L. powerfactor	0.87	0.87	0.87	0.87	0.88	0.88	0.87	0.87	0.87	0.87	0.87	
Volts	Amperes (maximum)											
346	FLA	815	858	921	982	1039	1107	1194	1269	1344	1493	1642
	LRA	5063	5373	5780	5780	6615	6931	7356	7794	8319	8559	8759
380	FLA	742	782	839	894	946	1008	1087	1155	1223	1359	1495
	LRA	4610	4892	5600	5491	5491	6313	6694	7113	7404	7794	7975
400	FLA	705	743	797	850	899	958	1033	1098	1162	1291	1421
	LRA	4853	5149	5895	5780	5780	6645	7046	7487	7794	8204	8395
415	FLA	680	716	768	819	866	923	996	1058	1120	1245	1369
	LRA	4221	4480	5130	5108	5512	5780	6131	6513	6938	7138	7302

① **Note:** These motors are designed to meet or exceed NEMA Premium (MG1-2006) and European IE2 efficiency requirements.

Motor starters

Motor starters

Type starter	Solid-state starter	Star delta	Auto transformer			Across-the-line	Primary reactor	
Voltage	Low/medium	Low	Low	Low/medium	Low/medium	Low/medium	Medium	Medium
60 Hz	200-4160	200-600	200-600	200-4160	200-4160	200-4160	2300-4160	2300-4160
50 Hz	380-3300	346-415	346-415	346-3300	346-3300	346-3300	2300-3300	2300-3300
Transition % tap inrush as a % of LRA	-	Closed	Closed	Closed	Closed	-	Closed	Closed
	-	-	57.7	65	80	-	65	80
	45	33	33	42.3	64	100	65	80

Note:

- For motor starters above 4160 V / 60 Hz and 3300/50 Hz, contact the Johnson Controls Sales Office for a specific selection.
- Minimum tap for 5DJ motor is 80%.

Low voltage variable speed models

Low voltage variable speed models

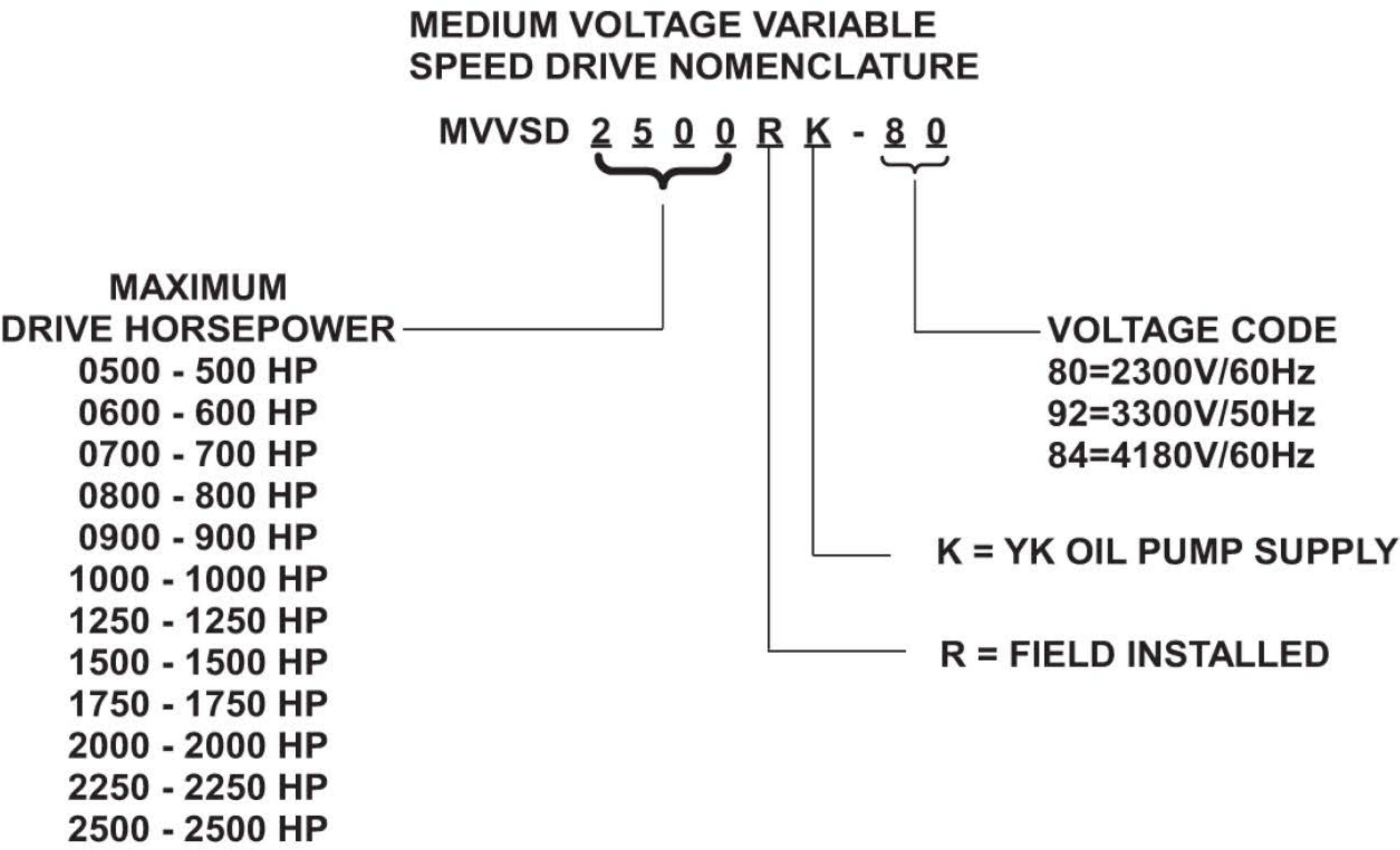
Maximum LRA	Maximum motor hp	Minimum FLA	Maximum FLA	Rated voltage	Actual voltage	Phase	Hz
2500	270	80	364	380	380	3	60
3637	385	120	517				
5326	608	200	817				
7513	882	300	1180				
7527	1100 ¹	300	984				
2598	351	80	380	460	440/ 460/ 480		
3652	503	120	565				
5330	790	200	880				
7014	1055	300	1180				
7527	1300 ¹	300	1163				
2413	424	80	377	575	575/600		
3550	608	120	540				
2727	292	80	380	380	380/400	3	50
3895	419	120	565				
5780	658	200	880				
8204	914	300	1180				
7527	1100 ¹	300	984				
2366	292	80	362	415	415		
3402	419	120	518				
5512	704	200	876				
7138	948	300	1180				
7527	1100 ¹	300	984				

1 1100/1300 hp LV VSD have 575 V / 60 Hz motor. LFA and LRA are for the motor (VSD output).

Medium voltage variable speed drive models

Medium voltage variable speed drive models

MV-VSD	Maximum motor hp	Maximum FLA	Voltage	Phase	Hz
MVVSD0500RK-80	500	107	2300	3	60
MVVSD0600RK-80	600	129			
MVVSD0700RK-80	700	157			
MVVSD0800RK-80	800	172			
MVVSD0900RK-80	900	202			
MVVSD1000RK-80	1000	224			
MVVSD1250RK-80	1250	280			
MVVSD1500RK-80	1500	336			
MVVSD1750RK-80	1750	392			
MVVSD2000RK-80	2000	438			
MVVSD2250RK-80	2250	494			
MVVSD2500RK-80	2500	561			
MVVSD0500RK-94	500	78	3300	3	60
MVVSD0600RK-94	600	93			
MVVSD0700RK-94	700	110			
MVVSD0800RK-94	800	124			
MVVSD0900RK-94	900	141			
MVVSD1000RK-94	1000	156			
MVVSD1250RK-94	1250	195			
MVVSD1500RK-94	1500	235			
MVVSD1750RK-94	1750	274			
MVVSD2000RK-94	2000	312			
MVVSD2250RK-94	2250	345			
MVVSD2500RK-94	2500	391			
MVVSD0500RK-92S	500	62	4160	3	60
MVVSD0600RK-92S	600	74			
MVVSD0700RK-92S	700	87			
MVVSD0800RK-92S	800	99			
MVVSD0900RK-92S	900	112			
MVVSD1000RK-92S	1000	125			
MVVSD1250RK-92S	1250	155			
MVVSD1500RK-92S	1500	186			
MVVSD1750RK-92S	1750	217			
MVVSD2000RK-92S	2000	248			
MVVSD2250RK-92S	2250	274			
MVVSD2500RK-92S	2500	310			
MVVSD0500RK-92	500	78	3300	3	50
MVVSD0600RK-92	600	93			
MVVSD0700RK-92	700	110			
MVVSD0800RK-92	800	124			
MVVSD0900RK-92	900	141			
MVVSD1000RK-92	1000	156			
MVVSD1250RK-92	1250	195			
MVVSD1500RK-92	1500	235			
MVVSD1750RK-92	1750	274			
MVVSD2000RK-92	2000	312			
MVVSD2250RK-92	2250	345			
MVVSD2500RK-92	2500	391			



Low voltage solid-state starter models

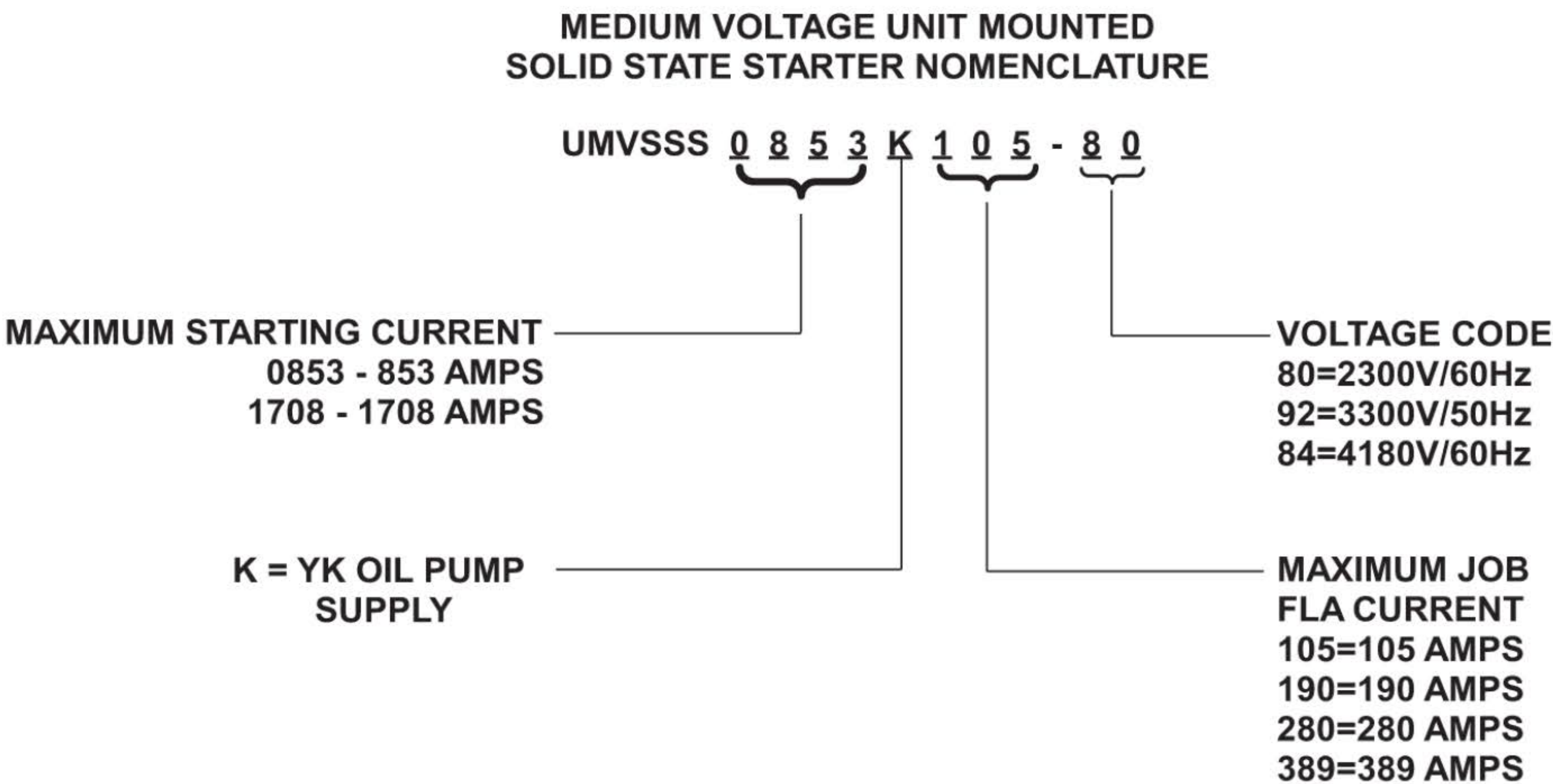
Low voltage solid-state starter models

Model SSS-	Maximum LRA	Minimum FLA	Maximum FLA	Rated voltage	Actual voltage	Phase	Hz
7L-46B	1556	35	260	460	440/460/480	3	60
7L-40B	1556	35	260	380	380	3	60
7L-50B	1556	35	260	400	380/440/415	3	50
7L-58B	1556	35	260	575	575/600	3	60
14L-17B	3111	65	510	200	200/208	3	60
14L-28B	3111	65	510	230	230/240	3	60
14L-40B	3111	65	510	380	380	3	60
14L-46B	3111	65	510	460	440/460/480	3	60
14L-50B	3111	65	510	400	380/400/415	3	50
14L-58B	3111	65	510	575	575/600	3	60
26L-17B	5780	125	850	200	200/208	3	60
26L-28B	5780	125	850	230	230/240	3	60
26L-40B	5780	125	850	380	380	3	60
26L-46B	5780	125	850	460	440/460/480	3	60
26L-50B	5780	125	850	400	380/400/415	3	50
26L-58B	5780	125	850	575	575/600	3	60
33L-17B	7333	215	1050	200	200/240	3	60
33L-40B	7333	215	1050	380	380	3	60
33L-46B	7333	215	1050	230	230/240	3	60
33L-50B	7333	215	1050	400	380/400/415	3	50
33L-58B	7333	215	1050	460	440/460/480	3	60

Medium voltage unit-mounted solid-state starter models

Medium voltage unit mounted solid-state starter models

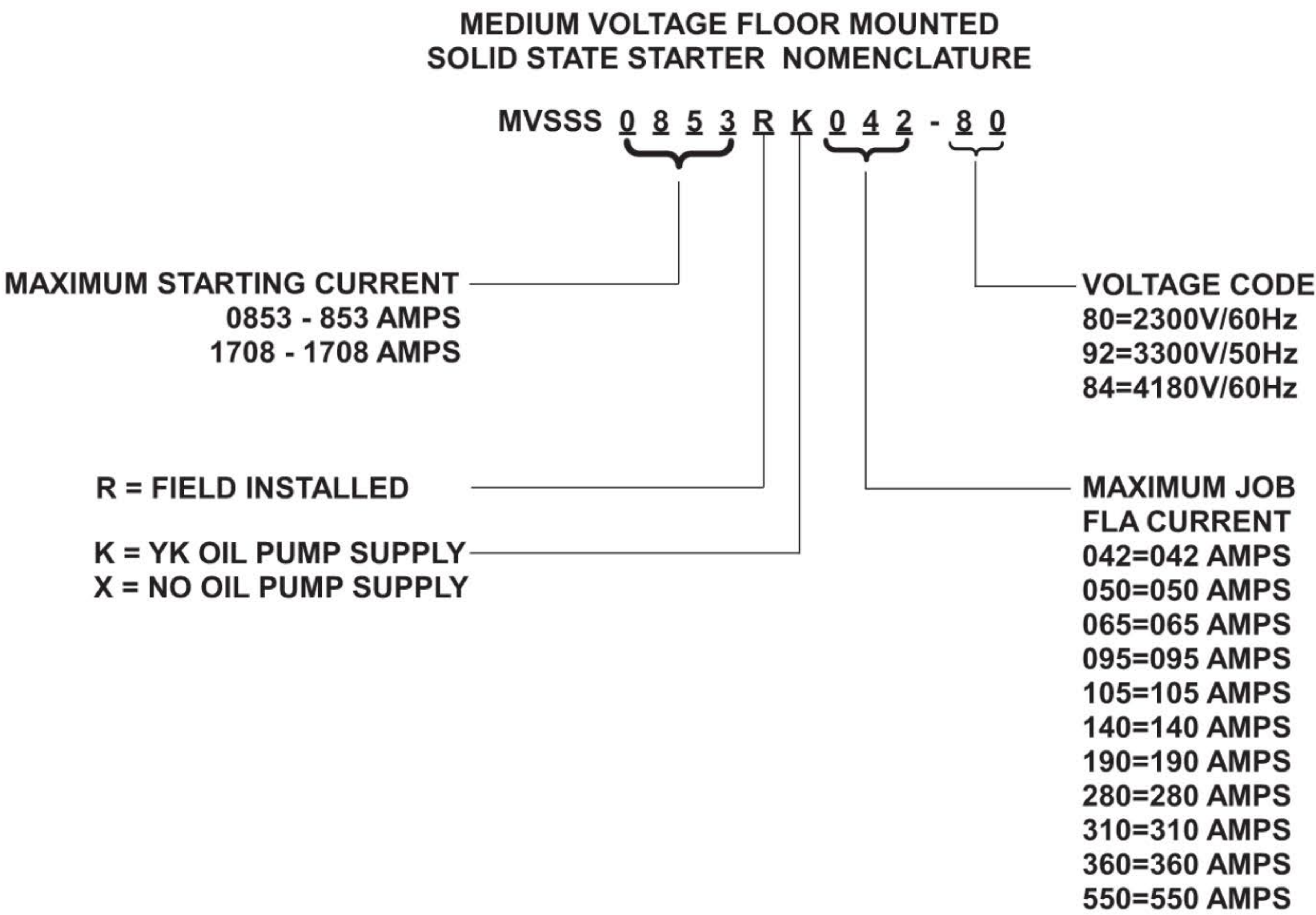
Model unit mounted MV-SSS	Maximum FLA	Maximum LRA	Rated voltage and frequency		
UMVSSS0853K105-V V	105	1896	2300/60 Hz	3300/50 Hz	4160/60 Hz
UMVSSS0853K190-V V	190	1896			
UMVSSS0853K280-V V	280	1896			
UMVSSS0853K389-V V	389	1896			
UMVSSS1708K389-V V	389	3796			



Medium voltage floor-mounted solid-state starter models

Medium voltage floor mounted solid-state starter models

Model floor mounted MV-SSS	Maximum FLA	Maximum LRA
36 in. cabinet unit model reference chart		
MVSSS0853R_042-V	42	1896
MVSSS0853R_050-V	50	1896
MVSSS0853R_065-V	65	1896
MVSSS0853R_095-V	95	1896
MVSSS0853R_105-V	105	1896
MVSSS0853R_140-V	140	1896
MVSSS0853R_190-V	190	1896
MVSSS0853R_280-V	280	1896
MVSSS0853R_310-V	310	1896
MVSSS0853R_360-V	360	1896
MVSSS1708R_360-V	360	3796
72 in. cabinet unit model reference chart		
MVSSS1708R_550-V	550	3796



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