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Product No.	101
Lot No.	A17-2


**CTS** Collaborative Transplant Study

## WORKING INSTRUCTION

### HLA-A\* CTS-PCR-SSP TRAY KIT

#### LOCUS- AND LOT-SPECIFIC MANUAL

To be applied to the following product:

Product No.	Description
101	HLA-A* CTS-PCR-SSP TRAY KIT 

#### 1. Main differences

- **Between Lot A17-2 (the current lot) and Lot A17-1**  
 The kit was updated to cover new alleles included in the IMGT/HLA Sequence Database of January 2023. Deleted and renamed alleles were taken into consideration.

#### 2. Introduction

- **Intended use:** This kit provides reagents for low/intermediate resolution HLA-A typing using the PCR-SSP method. All serologically detectable HLA-A alleles as well as their splits can be assigned. In addition, some of the DNA-specificities which so far could not be identified by serology can be detected.
- **Allele coverage:** IMGT/HLA Sequence Database Release 3.51.0, January 2023, except HLA-A\*01:01:65-01:01:66/01:01:131/01:38/01:72/01:102/01:139/01:167/01:221/01:267/01:284/ 01:390/01:399/01:418N, A\*02:644, A\*11:01:35/11:01:57/11:01:104/11:23/11:25:03/11:31/11:35/ 11:40/11:45/11:50Q/11:78N/11:98/11:111-11:112/11:176/11:183/11:191/11:211/11:223/11:226/ 11:229/11:250/11:258/11:269/11:290/11:310N/11:346/11:380/11:389/11:392/11:396-11:397N/ 11:432N/11:435, A\*24:129, A\*25:01:09/25:01:17/25:81, A\*26:01:59/26:01:65/26:60N/26:85/ 26:125/26:131/ 26:143-26:144/26:204:01:01-26:204:01:02, A\*29:01:07/29:02:36/29:60/29:111, A\*30:12:02/30:26/ 30:82/30:84/30:184Q/30:189/30:206, A\*31:01:07/31:01:47/31:21-31:22/31:75/ 31:90/31:104/31:109/31:202N/31:204/31:210, A\*32:01:07/32:01:12/32:01:48/32:28/32:33:02/ 32:34/32:66/32:71/32:75/32:94/32:158, A\*33:01:05/33:03:26-33:03:27/33:03:31/33:03:56/33:03:58/ 33:18:02-33:19/33:30/33:32:0133:32:02/33:35/33:66/33:81/33:89/33:122/33:130/33:135/33:140N/ 33:152/33:158-33:159/33:175Q/33:188/33:215, A\*34:24, A\*68:01:11/68:01:25/68:02:07/68:48-68:50:02/68:137/68:184/ 68:218/68:230/68:234/68:236N/68:251N/68:258/68:286/68:293Q, A\*74:16:01, A\*80:02/80:04  
 These alleles are considered to be rare.
- This manual is only valid for **Lot No. A17-2**
- This manual should be used together with the Main Manual (General Information) which is the 'Working instruction for the CTS-PCR-SSP **TRAY and MINITRAY KITS**' (Manual No. 100A).

### 3. Content

1.	Main differences .....	1
2.	Introduction.....	1
3.	Content.....	2
4.	Kit Composition .....	3
5.	Materials, Reagents and Equipment not supplied .....	3
6.	Sample Requirements, PCR and Gel Electrophoresis .....	3
7.	Result Evaluation.....	3
8.	Interpretation Hints.....	3
9.	Special notes .....	3
10.	Troubleshooting .....	4
11.	Precaution .....	4
12.	Contact .....	4
13.	Appendix .....	5
14.	Certificate of Analysis.....	24
Table 1:	Allele specificities and sizes of the PCR products of each HLA-A* CTS-PCR-SSP primer mix (Lot No. A17-2) based on IMGT/HLA Sequence Database Release 3.51.0, January 2023 .....	5
Table 2:	Amplification patterns for all HLA-A* alleles detected by the HLA-A* CTS-PCR-SSP reagents (Lot-No A17-2) based on IMGT/HLA Sequence Database Release 3.51.0, January 2023 .....	13

#### 4. Kit Composition

- Number of PCR primer mixes per test: 24 HLA-specific mixes
- Number of tests per tray: 4
- Number of trays per kit: 10
- The primer mixes are aliquoted and lyophilized in PCR trays.
- PCR buffer: 3.0 ml of Mastermix SSP (without Taq polymerase)

For storage condition, please refer to Section 1 of the 'Working instruction for the CTS-PCR-SSP TRAY and MINITRAY KITS' (Manual No.: 100A) supplied along with this product.

#### 5. Materials, Reagents and Equipment not supplied

Please refer to Section 2 of the 'Working instruction for the CTS-PCR-SSP TRAY and MINITRAY KITS' (Manual No.: 100A) supplied along with this product.

#### 6. Sample Requirements, PCR and Gel Electrophoresis

Please refer to Section 3 to 6 of the 'Working instruction for the CTS-PCR-SSP TRAY and MINITRAY KITS' (Manual No.: 100A) supplied along with this product.

#### 7. Result Evaluation

- Check the approximate size of the PCR product against the Primer Mix Specificity Table (Appendix / Table 1) to confirm the correct product size.
- Use the Amplification Pattern Table (Appendix / Table 2) to make the allele assignments or use the SCORE Software for detailed result interpretation.

#### 8. Interpretation Hints

- Weak or false positive reactions can occur if you use a different Taq polymerase. Also the quality and quantity of DNA is a crucial factor and can affect the mix reactivities.
- Alleles that are known to amplify weakly are listed with "w" (= weak) in the tables (Appendix). Under suboptimal test conditions, some mixes of this lot are particularly prone to give false positive reactions and are indicated in Section 9.
- Please also refer to Section 7 and 8 of the 'Working instruction for the CTS-PCR-SSP TRAY and MINITRAY KITS' (Manual No.: 100A) supplied along with this product.

#### 9. Special notes

- The following mixes will give **short** PCR products (<200 bp): Mixes **5, 17, 20, 23 and 24**. These PCR products might be difficult to distinguish from the 90 bp amplification control (internal positive control)!  
In general, these specific products will give a much stronger signal than that of the controls. Furthermore, they will not have migrated as far into the gel as the control bands. If you are not sure whether the strong signal is due to a specific or a generic PCR product, you might let the gel run for additional 15 minutes at a lower voltage. By this way the specific band will be separated from the control band, and you will be able to clearly see a double signal at this position: a very strong specific band, and a weaker, shorter amplification control band.
- Since mix **5** corresponds to A\*23 and mix **23** to A\*02 (both alleles/allele groups are common), it is recommended to start the interpretation by checking these reactions very carefully first!
- Some mixes contain specific primers which may give rise to PCR fragments of **two or more** different sizes simultaneously (see Table 1).
- **Mix 4**: 225 bp and 235 bp (these two bands tend to merge into a single band). An additional weak band of 740 bp may occur, but is usually invisible.
- The following mixes could give false positive reactions: Mixes **2, 7, 8, 21**.

## **10. Troubleshooting**

Please refer to Section 8 of the 'Working instruction for the CTS-PCR-SSP TRAY and MINITRAY KITS' (Manual No.: 100A) supplied along with this product.

## **11. Precaution**

Please refer to Material Safety Data Sheet for the CTS-PCR-SSP TRAY and MINITRAY KITS (Manual No.:100B) supplied along with this product.

## **12. Contact**

If you have any particular questions concerning this kit, which are not answered in this or the Main Manual, please do not hesitate to contact us at:

Phone: +49 6221 564013

Fax: +49 6221 564200

E-mail: [dna.labor@med.uni-heidelberg.de](mailto:dna.labor@med.uni-heidelberg.de)

### 13. Appendix

**Table 1:** Allele specificities and sizes of the PCR products of each **HLA-A\*** CTS-PCR-SSP primer mix (**Lot No. A17-2**) based on IMGT/HLA Sequence Database Release 3.51.0, January 2023

Position				Mix	Allele	Serology	Size
H1	H4	H7	H10	Mix 1	A*01:01:01:01:01:01:64/01:01:67-01:01:130/01:01:131?/01:01:132-01:04:01:02N/01:06-01:33/01:35-01:37:01:02/01:39-01:71/01:73-01:101/01:103-01:138/01:140-01-01:166/01:168-01:199/01:201-01:220/01:222-01:243/01:245-01:266:02/01:267w/01:268-01:283/01:285N-01:379N/01:381-01:389/01:391-01:398/01:399?/01:400N-01:417N/01:419-01:426, A*11:27/11:38-11:39/11:94/11:209/11:271/11:326, A*23:31/23:45/23:55/23:128, A*24:15/24:41/24:51/24:92/24:235/24:499/24:504/24:551/24:557, A*25:36/25:59/25:65, A*26:29/26:49/26:205, A*32:13, A*66:10, B*07:64, B*15:12:01-15:12:03/15:19/15:270/15:298/15:304N/15:649	A1, Null, -, A26(10), B76(15)	225 bp
G1	G4	G7	G10	Mix 2	A*01:200/01:244/01:380:01:01-01:380:01:02/01:427, A*02:609w/02:1022, A*03:107/03:164/03:413, A*11:17, A*26:72, A*32:24, A*36:01:01:01-36:13	-, A36	580 bp
F1	F4	F7	G10	Mix 3	A*02:01:01:01:02:01:07/02:01:09-02:01:15/02:01:18-02:01:19/02:01:21-02:01:25/02:01:27-02:01:51/02:01:53-02:01:63/02:01:65w/02:01:66-02:01:68/02:01:70-02:01:73/02:01:75w/02:01:76-02:01:80/02:01:83-02:01:94/02:01:96-02:03:06/02:03:08-02:05:02/02:05:04-02:05:08/02:05:09w/02:05:10-02:06:11/02:06:13-02:06:18/02:06:20-02:06:30/02:06:31?/02:07:01:01-02:07:14/02:07:16-02:08:01/02:09:01:01-02:22:02/02:24:01-02:35:01/02:35:03-02:47/02:49:01-02:49:02/02:51/02:53N-02:54/02:56:01/02:57-02:59/02:60:01w-02:60:02w/02:61-02:63/02:66-02:71/02:73-02:79/02:81-02:87/02:89:01-02:97:02/02:99:01-02:99:02/02:101:01-02:102/02:104/02:106-02:113:02N/02:115-02:116/02:118/02:120-02:121/02:123-02:128/02:130-02:134/02:136-02:151/02:153:01-02:168/02:170-02:177/02:179-02:184/02:186-02:187/02:189-02:192/02:193w/02:194/02:196-02:222N/02:224-02:228/02:230-02:245/02:247-02:253/02:254w/02:255-02:274/02:276-02:278/02:280-02:285/02:286w/02:287/02:289:01/02:290-02:297/02:299-02:300/02:302-02:303/02:305N-02:307/02:308w/02:310/02:311w/02:312-02:338/02:340-02:347/02:349-02:376/02:378-02:382/02:384-02:405/02:407-02:411/02:413-02:453/02:455-02:487/02:488w/02:489-02:490N/02:492-02:503/02:505-02:509/02:511-02:526/02:528:01-02:570:02/02:572-02:581Q/02:583-02:590/02:591:02-02:593/02:594w/02:595-02:600/02:602-02:621/02:623-02:640/02:642/02:645-02:648:02/02:649w/02:650-02:661/02:663-02:675N/02:677/02:679-02:680/02:682-02:710N/02:711w/02:712-02:780/02:782-02:788N/02:790-02:825/02:827Q/02:830:01-02:830:02/02:832N-02:871N/02:873-02:875/02:877-02:922/02:924-02:926/02:928-02:943/02:945N-02:984/02:986-02:991/02:993-02:1020/02:1021?/02:1022/02:1023?/02:1024-02:1027/02:1031N-02:1032/02:1033?/02:1034-02:1045Q/02:1047-02:1086/02:1087?/02:1088-02:1089, A*23:01:21, A*24:02:76/24:310:02, B*07:02:80, B*15:10:07	A2, Low A2, -, A203, A210, Null	455 bp

Position				Mix	Allele	Serology	Size
E1	E4	E7	E10	Mix 4	A*01:13/01:176/01:194/01:427, A*02:34w-02:35:03w/02:56:01w-02:56:02w/02:62w/02:103w/02:237w/02:580w/02:741w/02:809w/02:907w/02:927w, A*03:01:01:01-03:193/03:195-03:199/03:201-03:259/03:261-03:458Q, A*11:130/11:199:01/11:199:02w-11:199:03w/11:222, A*30:55/30:89/30:186, A*32:04/32:17w/32:52, A*34:08, A*36:02, A*68:71, A*69:07, A*74:13/74:42?	-, A2, A3, Null	see below
				Mix 4	A*01:13/01:176/01:194, A*02:34w-02:35:03w/02:56:01w-02:56:02w/02:62w/02:103w/02:580w/02:741w/02:907w, A*03:01:01:01-03:01:07/03:01:09-03:01:11/03:01:13-03:01:22/03:01:24-03:01:68/03:01:70-03:01:82/03:01:84-03:01:93/03:01:95-03:07:02/03:10-03:11N/03:13-03:31/03:33-03:35/03:37-03:40/03:42-03:56:01:02/03:58/03:60-03:71/03:73-03:87/03:90-03:106/03:110/03:112-03:127/03:129N-03:141/03:143-03:148/03:150-03:151/03:153-03:171/03:174-03:175/03:177/03:181-03:193/03:195/03:197:01N-03:197:02N/03:201-03:202/03:204/03:206-03:210/03:212-03:215/03:217-03:218/03:220/03:222-03:242/03:244/03:246-03:251/03:253-03:258/03:261-03:266N/03:268-03:272/03:274-03:299/03:301-03:318/03:320-03:329N/03:331-03:381N/03:383-03:395/03:397/03:399-03:412/03:414-03:428/03:430-03:458Q, A*11:199:01/11:199:02w-11:199:03w/11:222, A*30:55/30:186, A*32:17w, A*34:08, A*68:71, A*69:07, A*74:13/74:42?	-, A2, A3, Null	225 bp
				Mix 4	A*01:427, A*02:237w/02:809w/02:927w, A*03:01:01:01-03:01:11/03:01:13-03:01:29/03:01:31-03:01:34/03:01:36-03:01:49/03:01:51-03:01:89/03:01:91-03:01:105/03:01:107-03:04:03/03:07:01:01-03:09/03:11N/03:13-03:17:02/03:19-03:39/03:41/03:43-03:58/03:60-03:71/03:73-03:87/03:89:02-03:96/03:99-03:104/03:106-03:121/03:123:01-03:134/03:136-03:148/03:150-03:166/03:168N-03:178N/03:181-03:186/03:188-03:193/03:195/03:197:01N-03:199/03:201-03:204/03:206-03:207/03:209-03:220/03:222-03:224/03:226-03:242/03:244/03:246-03:259/03:261-03:288/03:290-03:299/03:301-03:318/03:320-03:325/03:327-03:331/03:333-03:395/03:397-03:451/03:453-03:458Q, A*32:04/32:52, A*36:02	-, A3, Null	740 bp
				Mix 4	A*01:427, A*03:01:01:01-03:01:05/03:01:07-03:01:29/03:01:31-03:01:34/03:01:36-03:01:48/03:01:51-03:01:89/03:01:91-03:01:105/03:01:107-03:04:03/03:07:01:01-03:09/03:11N-03:17:02/03:19-03:39/03:41/03:43-03:74/03:76-03:83/03:85-03:94/03:96/03:99-03:104/03:107-03:121/03:123:01-03:134/03:136-03:166/03:168N-03:176/03:178N-03:186/03:188-03:193/03:195-03:199/03:201-03:203/03:205-03:207/03:209-03:214/03:216-03:224/03:226-03:234Q/03:236-03:248/03:250-03:259/03:261-03:287/03:290-03:321/03:323N-03:325/03:327-03:331/03:333-03:342N/03:344:01-03:346/03:348-03:376/03:378-03:413/03:415-03:417/03:419-03:451/03:453-03:458Q, A*11:130, A*30:89, A*32:04, A*36:02	-, A3, Null	235 bp
D1	D4	D7	D10	Mix 5	A*23:01:01:01-23:17:02/23:17:03?/23:18-23:23/23:25-23:33/23:35-23:56/23:58-23:65/23:67-23:68/23:70-23:103N/23:105-23:112/23:114-23:127/23:129, A*24:24/24:71/24:315/24:392/24:527, A*29:07/29:49, A*31:29, A*32:170, A*33:187, B*18:27	A23(9), -, Null	195 bp

Position				Mix	Allele	Serology	Size
C1	C4	C7	C10	Mix 6	A*02:46/02:48/02:70/02:129/02:571/02:1050, A*03:30/03:152/03:273, A*11:325, A*23:01:01:01-23:02/23:04-23:08N/23:10:01-23:22/23:24-23:27/23:29-23:36/23:38N-23:50/23:52-23:60/23:62-23:68/23:70-23:79/23:81-23:82/23:84N-23:99/23:101-23:112/23:114-23:127/23:129, A*24:02:01:01-24:02:16/24:02:18-24:02:48/24:02:50-24:02:63/24:02:64w/24:02:65/24:02:66w/24:02:67-24:02:88/24:02:90-24:07:04/24:09N-24:11N/24:13:01-24:15/24:17:01:01-24:20:02/24:22-24:23/24:25-24:28/24:30/24:32-24:41/24:43-24:64/24:66/24:68-24:76/24:78-24:88/24:90:01N-24:128/24:130-24:155N/24:157/24:159-24:190/24:192-24:199/24:201-24:210/24:212-24:236/24:238-24:272/24:274-24:289/24:291-24:308/24:311-24:325/24:327-24:341/24:343w/24:344-24:358/24:360-24:369/24:371-24:388N/24:390-24:391/24:393-24:414/24:415w/24:416-24:427N/24:428Nw/24:429N-24:470/24:472-24:488/24:490-24:505/24:507-24:521/24:522?/24:523-24:561:02/24:563-24:589, A*25:77/25:82, A*31:08, A*32:79, A*33:21/33:53, A*68:249	A2, -, A23(9), Null, A24(9), Low A24(9), A2403, A9, A24(9)/A3	see below
				Mix 6	A*03:30/03:152/03:273, A*11:325, A*23:31/23:45/23:53/23:70, A*24:17:01:01-24:17:01:02/24:41/24:62/24:106/24:208:01-24:208:02:02/24:296/24:330/24:488/24:499/24:503/24:535/24:551/24:555/24:557, A*25:77/25:82, A*31:08, A*32:79, A*33:21/33:53, A*68:249	-, A24(9)	435 bp
				Mix 6	A*02:46/02:48/02:70/02:129/02:571/02:1050, A*23:01:01:01-23:02/23:04-23:08N/23:10:01-23:22/23:24-23:27/23:29-23:36/23:38N-23:50/23:52-23:60/23:62-23:68/23:71-23:79/23:81-23:82/23:84N-23:99/23:101-23:112/23:114-23:127/23:129, A*24:02:01:01-24:02:16/24:02:18-24:02:48/24:02:50-24:02:63/24:02:64w/24:02:65/24:02:66w/24:02:67-24:02:88/24:02:90-24:07:04/24:09N-24:11N/24:13:01-24:15/24:17:01:01-24:20:02/24:22-24:23/24:25-24:28/24:30/24:32-24:41/24:43-24:64/24:66/24:68-24:76/24:78-24:88/24:90:01N-24:128/24:130-24:155N/24:157/24:159-24:190/24:192-24:199/24:201-24:207:02/24:209-24:210/24:212-24:236/24:238-24:272/24:274-24:289/24:291-24:308/24:311-24:325/24:327-24:341/24:343w/24:344-24:358/24:360-24:369/24:371-24:388N/24:390-24:391/24:393-24:414/24:415w/24:416-24:427N/24:428Nw/24:429N-24:470/24:472-24:488/24:490-24:498/24:500-24:505/24:507-24:521/24:522?/24:523-24:550/24:552-24:554/24:556N-24:561:02/24:563-24:589, A*68:249	A2, -, A23(9), Null, A24(9), Low A24(9), A2403, A9, A24(9)/A3	470 bp
B1	B4	B7	B10	Mix 7	A*11:178/11:190, A*23:105, A*24:02:01:01-24:02:73/24:02:75-24:02:145/24:02:147-24:03:04/24:05:01-24:05:02/24:07:01:01-24:11N/24:14:01:01-24:15/24:17:01:01-24:17:01:02/24:20:01:01-24:21:03/24:23/24:25-24:27/24:29-24:43/24:45N-24:64/24:66-24:86N/24:88/24:90:01N-24:93/24:95-24:106/24:108/24:110-24:128/24:130-24:137/24:139-24:166/24:168-24:187/24:189-24:203/24:205-24:206/24:208:01-24:210/24:212/24:214-24:226:02/24:229-24:284/24:286-24:288/24:291-24:298/24:300-24:314/24:316-24:338/24:340-24:354/24:356-24:372/24:374-24:376/24:377w/24:378Q/24:380/24:382-24:391/24:393-24:404/24:407-24:423/24:425N-24:445N/24:447Q-24:470/24:472-24:477/24:479Q-24:514N/24:516-24:555/24:556N?/24:557-24:559/24:560?/24:561:01-24:568N/24:570-24:571/24:573-24:589, A*25:04/25:44, A*32:02/32:22, B*51:55, B*57:129	-, A24(9), Low A24(9), A2403, A9, Null, A32(19)	510 bp

Position				Mix	Allele	Serology	Size
A1	A4	A7	A10	Mix 8	A*02:06:31/02:52/02:135/02:309/02:454/02:992, A*25:01:01:01-25:01:01:12/25:01:02w/25:01:03-25:01:08/25:01:10-25:01:16/25:01:18-25:10/25:11w/25:12N-25:23/25:25-25:32/25:34-25:42N/25:44-25:58/25:60-25:74/25:75w/25:76:01-25:80/25:83-25:84, A*30:01:01:01-30:04:01:03/30:04:03-30:04:04/30:06-30:12:01/30:13-30:20/30:22-30:25/30:27N-30:81/30:83/30:85-30:89/30:91-30:95/30:97-30:123N/30:125-30:151/30:153-30:183/30:185-30:188/30:189?/30:190-30:205/30:206?, A*32:101Q, B*07:02:74w/07:225w/07:260w, B*57:148?, C*04:01:49, C*12:328, C*15:222	-, A25(10), Null, A30(19)	see below
					A*02:52/02:992, A*30:01:01:01-30:02:09/30:02:11-30:04:01:03/30:04:03-30:04:04/30:06-30:12:01/30:13-30:20/30:22-30:25/30:27N-30:81/30:83/30:85-30:89/30:91-30:95/30:97-30:123N/30:125-30:151/30:153-30:183/30:185-30:188/30:189?/30:190-30:205/30:206?, B*57:148?, C*12:328, C*15:222	-, A30(19), Null	550 bp
					A*02:06:31/02:135/02:309/02:454, A*30:02:10, C*04:01:49	-	560 bp
					A*32:101Q, B*07:225w/07:260w	-	395 bp
					A*25:01:01:01-25:01:01:12/25:01:02w/25:01:03-25:01:08/25:01:10-25:01:16/25:01:18-25:10/25:11w/25:12N-25:23/25:25-25:32/25:34-25:42N/25:44-25:58/25:60-25:74/25:75w/25:76:01-25:80/25:83-25:84, B*07:02:74w	A25(10), -, Null	405 bp
H2	H5	H8	H11	Mix 9	A*02:06:31/02:135/02:309/02:454, A*25:01:01:01-25:01:07/25:01:08w/25:01:10-25:01:16/25:01:18-25:13/25:15-25:38/25:39w/25:40-25:42N/25:44-25:58/25:60-25:76:02/25:78-25:80/25:83-25:84, A*26:01:01:01-26:01:26/26:01:28-26:01:37/26:01:38w/26:01:39-26:01:58/26:01:60-26:01:64/26:01:66-26:03:01:02/26:03:03-26:18/26:20:01-26:30/26:31w/26:32-26:43:02/26:45-26:59/26:61-26:71N/26:73-26:75/26:76w/26:77-26:83/26:86-26:124/26:126-26:130/26:132-26:142/26:143w/26:145N-26:169/26:170w/26:171-26:183/26:185-26:203/26:205-26:229, A*34:01:01:01-34:11/34:13-34:18/34:20-34:22/34:23w-34:24w/34:25-34:30N, A*66:01:01:01-66:22/66:24-66:29/66:31-66:40/66:41w/66:42-66:47, A*68:294, B*07:02:74, B*18:02:02, B*38:02:04	-, A25(10), Null, A26(10), A10, A34(10), A66(10)	see below
					A*02:06:31/02:135/02:309/02:454, A*25:46/25:83, A*26:07:01-26:07:02/26:92, A*66:42	-, A26(10)	450 bp
					A*25:01:01:01-25:01:07/25:01:08w/25:01:10-25:01:16/25:01:18-25:13/25:15-25:38/25:39w/25:40-25:42N/25:44-25:45/25:47-25:58/25:60-25:76:02/25:78-25:80/25:84, A*26:01:01:01-26:01:26/26:01:28-26:01:37/26:01:38w/26:01:39-26:01:58/26:01:60-26:01:64/26:01:66-26:03:01:02/26:03:03-26:06/26:08:01:01-26:18/26:20:01-26:30/26:31w/26:32-26:43:02/26:45-26:59/26:61-26:71N/26:73-26:75/26:76w/26:77-26:83/26:86-26:91/26:93-26:124/26:126-26:130/26:132-26:142/26:143w/26:145N-26:169/26:170w/26:171-26:183/26:185-26:203/26:205-26:229, A*34:01:01:01-34:11/34:13-34:18/34:20-34:22/34:23w-34:24w/34:25-34:30N, A*66:01:01:01-66:22/66:24-66:29/66:31-66:40/66:41w/66:43-66:47, A*68:294, B*07:02:74, B*18:02:02, B*38:02:04	A25(10), -, Null, A26(10), A10, A34(10), A66(10)	445 bp
G2	G5	G8	G11	Mix 10	A*01:01:56, A*02:06:31/02:135/02:309/02:454, A*25:11/25:81?-25:82?, A*26:01:01:01-26:01:01:53/26:01:03-26:01:12/26:01:14-26:01:58/26:01:60-26:01:62/26:01:64/26:01:66-26:03:01:02/26:03:03-26:32/26:34-26:43:02/26:45-26:59/26:61-26:84/26:86-26:109/26:111-26:124/26:126-26:130/26:132-26:142/26:143w/26:145N-26:203/26:205-26:224/26:225?/26:226/26:228-26:229, A*30:02:10, A*43:01-43:03	-, A26(10), Null, A10, A43	see below
					A*02:06:31/02:135/02:309/02:454, A*25:11, A*26:03:01:01-26:03:01:02/26:03:03/26:06/26:21/26:30/26:36/26:78/26:92/26:111/26:146/26:177/26:193/26:229	-, A26(10)	415 bp
					A*01:01:56, A*25:81?-25:82?, A*26:01:01:01-26:01:01:53/26:01:03-26:01:12/26:01:14-26:01:58/26:01:60-26:01:62/26:01:64/26:01:66-26:02:02/26:04-26:05/26:07:01-26:20:02/26:22-26:29/26:31-26:32/26:34-26:35/26:37-26:43:02/26:45-26:59/26:61-26:77/26:79-26:84/26:86-26:91/26:93-26:109/26:112:01-26:124/26:126-26:130/26:132-26:142/26:143w/26:145N/26:147-26:176/26:178-26:192/26:194-26:203/26:205-26:224/26:225?/26:226/26:228, A*30:02:10, A*43:01-43:03	-, A26(10), Null, A10, A43	405 bp



Position				Mix	Allele	Serology	Size
F2	F5	F8	F11	Mix 11	A*02:741, A*26:48/26:69, A*33:183, A*34:01:01:01-34:01:07/34:05/34:11-34:12/34:14/34:16-34:18/34:23/34:27	-, A34(10)	580 bp
E2	E5	E8	E11	Mix 12	A*03:103:01-03:103:02/03:282, A*11:116/11:140/11:372, A*25:02/25:75, A*26:13/26:19/26:33/26:226, A*29:32, A*31:89/31:115, A*32:17, A*33:125/33:131, A*34:01:01:01-34:01:07/34:05-34:06/34:11-34:12/34:14/34:16-34:19/34:23/34:27, A*66:01:01:01-66:02:01:03/66:04/66:06-66:14/66:16-66:27N/66:29-66:38/66:40-66:47, A*68:262/68:294, A*74:13/74:42	-, A25(10), A34(10), A66(10), Null	415 bp
D2	D5	D8	D11	Mix 13	A*01:51, A*03:24, A*11:10, A*25:43, A*30:163, A*33:49/33:144, A*34:02:01:01-34:04/34:07-34:10N/34:13/34:15/34:20-34:22/34:25-34:26N/34:28?/34:29N-34:30N, A*68:103:01-68:103:02, B*35:08:14w/35:14:03w	-, A3, A11, A34(10), Null	385 bp
C2	C5	C8	C11	Mix 14	A*02:12-02:13/02:19/02:27/02:37-02:38/02:44/02:49:01/02:54/02:142/02:226N/02:271/02:280/02:417/02:543/02:630/02:662/02:682-02:683/02:723/02:804/02:840/02:948, A*03:02:01:01w-03:02:06w/03:10/03:31w-03:32w/03:65w/03:69Nw/03:73w/03:76w/03:82w/03:90w/03:106w/03:113w/03:160w/03:167/03:198w/03:218w/03:223w/03:225/03:236w-03:237w/03:242w/03:244w/03:253w/03:274w-03:275Nw/03:281w/03:285w/03:309w/03:314w/03:318w-03:319w/03:333w/03:348w/03:356w/03:385w/03:453w/03:458Qw, A*11:01:01:01-11:01:34/11:01:36-11:01:56/11:01:58-11:01:103/11:01:104w/11:01:105-11:16/11:18-11:22/11:23w/11:26-11:27/11:29-11:30/11:32:01-11:34/11:36-11:39/11:41-11:44/11:46-11:49/11:51-11:52Q/11:54:01-11:77/11:79-11:93/11:95-11:97/11:98w/11:99N-11:110/11:113-11:129/11:130w/11:131-11:157/11:159-11:175/11:177/11:179-11:182Q/11:184-11:189/11:192-11:210N/11:212-11:222/11:224-11:225/11:227-11:228/11:229w/11:230-11:249/11:250w/11:251N-11:257/11:258w/11:259-11:268/11:270/11:272Q-11:289/11:291-11:309/11:311-11:325/11:327-11:345/11:346w/11:347N-11:371/11:373-11:379/11:381-11:388N/11:389?/11:390-11:391/11:392?/11:393-11:395/11:396?-11:397N?/11:398-11:431/11:432N?/11:433N-11:434/11:435?/11:436N-11:438, A*24:19/24:28/24:44/24:89/24:290/24:379/24:406/24:424, A*30:164, A*31:24w/31:97w/31:136w, A*33:19w/33:59w/33:102w/33:150w/33:177w/33:190w, A*66:19, A*68:09/68:26/68:28/68:129/68:134/68:171:02N/68:204, A*69:03	A2, -, Null, A3, A11, A9, A24(9), A28	520 bp
B2	B5	B8	B11	Mix 15	<b>A*03:01:39, A*29:01:01:01-29:01:06/29:01:08-29:02:35/29:02:37-29:59/29:61-29:110/29:111w/29:112N-29:172, A*32:30:01-32:30:02/32:32, A*68:01:28/68:01:36/68:130:02, A*74:10/74:41-74:42</b>	-, A29(19), Null	<b>see below</b>
					A*29:01:01:01-29:01:06/29:01:08-29:02:35/29:02:37-29:12/29:14-29:18/29:20-29:38/29:40-29:47/29:49-29:59/29:61-29:97/29:99-29:110/29:111w/29:112N-29:158/29:160-29:171, A*74:10/74:41-74:42	A29(19), Null, -	160 bp
					A*03:01:39, A*29:01:01:01-29:01:06/29:01:08/29:01:10-29:02:35/29:02:37-29:31/29:33-29:59/29:61-29:110/29:111w/29:112N-29:172, A*32:30:01-32:30:02/32:32, A*68:01:28/68:01:36/68:130:02	-, A29(19), Null	515 bp
A2	A5	A8	A11	Mix 16	A*30:01:01:01-30:01:07/30:01:08w/30:01:09-30:02:09/30:02:11-30:04:04/30:06-30:11:02/30:13-30:17/30:19-30:20/30:22-30:25/30:27N-30:40/30:42-30:54/30:56-30:81/30:83/30:85-30:151/30:153-30:165/30:167-30:183/30:185-30:188/30:189?/30:190-30:205/30:206?	A30(19), -, Null	570 bp
H3	H6	H9	H12	Mix 17	A*29:14, A*30:152, A*31:01:02:01-31:01:06/31:01:08-31:01:46/31:01:47?/31:01:48-31:07/31:09-31:20/31:23-31:74/31:76-31:88/31:91-31:103/31:104w/31:105-31:108/31:110-31:201N/31:202N?/31:203/31:204?/31:205-31:209/31:211-31:219	-, A31(19), Null	185 bp
G3	G6	G9	G12	Mix 18	<b>A*02:829, A*03:152/03:219, A*23:03:01/23:83, A*24:18/24:21:03/24:204/24:208:01/24:213, A*29:13, A*31:07-31:08/31:10, A*32:01:01:01-32:01:06/32:01:08-32:01:11/32:01:13-32:01:47/32:01:49-32:27N/32:29-32:30:01/32:31-32:33:01/32:33:03/32:35-32:65/32:67-32:70/32:72-32:74/32:75w/32:76-32:93/32:94w/32:95-32:100/32:102-32:157/32:159-32:173</b>	-, A24(9)/A3, A31(19), A32(19), Null	<b>see below</b>
					A*02:829, A*23:03:01/23:83, A*24:21:03/24:208:01, A*29:13, A*31:07-31:08/31:10, A*32:01:01:01-32:01:06/32:01:08-32:01:11/32:01:13-32:01:47/32:01:49-32:03:01:02/32:05-32:27N/32:29-32:30:01/32:31-32:33:01/32:33:03/32:35-32:65/32:67-32:70/32:72-32:74/32:75w/32:76-32:93/32:94w/32:95-32:100/32:102-32:157/32:159-32:173	-, A31(19), A32(19), Null	410 bp
					A*03:152/03:219, A*24:18/24:204/24:213, A*32:04/32:52	-, A24(9)/A3	520 bp

Position				Mix	Allele	Serology	Size
F3	F6	F9	F12	Mix 19	A*02:24:02/02:65/02:152/02:507, A*29:48/29:105/29:164, A*32:15/32:93, A*33:01:01:01-33:01:04/33:01:06-33:01:18/33:03:01:01-33:03:25/33:03:26w/33:03:28-33:03:30/33:03:31w/33:03:32-33:03:55/33:03:56?/33:03:57/33:03:59-33:18:01/33:20/33:22-33:29/33:31/33:33-33:34/33:36-33:37/33:39-33:52/33:54-33:65/33:66w/33:67-33:80N/33:82-33:88/33:90-33:121/33:123N-33:129N/33:131-33:134/33:136-33:139/33:140Nw/33:141-33:151/33:153-33:157N/33:158w/33:160-33:174N/33:176N-33:187/33:188w/33:189-33:214/33:215?/33:216-33:234, A*74:04/74:21/74:43, B*07:02:40, B*08:01:07, B*15:02:07, B*55:02:10	-, A2/19, A33(19), A19, Null, B8	see below
					A*02:24:02/02:65/02:152/02:507, A*29:48, A*32:93, A*33:08-33:09, A*74:04/74:21/74:43	-, A2/19, A33(19), A19	475 bp
					A*29:105/29:164, A*32:15, A*33:01:01:01-33:01:04/33:01:06-33:01:18/33:03:01:01-33:03:25/33:03:26w/33:03:28-33:03:30/33:03:31w/33:03:32-33:03:55/33:03:56?/33:03:57/33:03:59-33:07/33:10-33:18:01/33:20/33:22-33:29/33:31/33:33-33:34/33:36-33:37/33:39-33:52/33:54-33:65/33:66w/33:67-33:80N/33:82-33:88/33:90-33:121/33:123N-33:129N/33:131-33:134/33:136-33:139/33:140Nw/33:141-33:151/33:153-33:157N/33:158w/33:160-33:174N/33:176N-33:187/33:188w/33:189-33:214/33:215?/33:216-33:234, B*07:02:40, B*08:01:07, B*15:02:07, B*55:02:10	-, A33(19), Null, B8	470 bp
E3	E6	E9	E12	Mix 20	A*02:01:165, A*03:01:39, A*29:19/29:39/29:48/29:159, A*68:01:28/68:01:36/68:130:02, A*74:01:01:01-74:09/74:11-74:15/74:16:02-74:40/74:43-74:44	-, A74(19), Null	160 bp
D3	D6	D9	D12	Mix 21	A*02:01:09/02:05:05/02:06:07/02:07:12/02:11:02/02:35:03/02:50/02:76:02-02:76:03/02:122/02:243:02-02:243:03/02:528:02/02:570:01/02:591:01, A*03:171/03:271/03:373/03:428/03:442, A*11:57/11:158/11:359, A*24:94/24:138/24:188/24:228/24:293/24:515, A*29:51/29:69/29:73, A*32:109, A*68:01:01:01-68:01:10/68:01:12-68:01:24/68:01:26-68:02:06/68:02:08-68:47/68:51-68:128/68:130:01-68:136/68:138-68:183/68:185-68:217/68:219-68:229/68:231-68:233/68:235/68:237-68:250/68:252-68:257/68:258?/68:259-68:285/68:287-68:292N/68:294-68:298, A*69:01:01:01-69:06/69:08-69:09, B*44:497	A2, -, A68(28), A28, Null, A69(28)	645 bp
C3	C6	C9	C12	Mix 22	A*02:34-02:35:03/02:56:01-02:56:02/02:62/02:78/02:103/02:741/02:907, A*03:241/03:343, A*69:01:01:01-69:09, 07:1034?	A2, -, A69(28)	390 bp

Position				Mix	Allele	Serology	Size
B3	B6	B9	B12	Mix 23	A*02:01:01:01-02:01:07/02:01:10-02:01:11/02:01:12w/02:01:13-02:01:15/02:01:17-02:01:19/02:01:21-02:01:32/02:01:33w/02:01:34-02:01:39/02:01:41-02:01:81/02:01:83-02:03:10/02:04:01-02:05:04/02:05:06-02:06:06/02:06:08-02:07:11/02:07:13-02:11:01:06/02:11:03-02:22:02/02:24:01-02:35:01/02:35:02w/02:36-02:42:01/02:43N-02:76:01/02:77/02:79:01-02:97:02/02:99:01-02:99:02/02:101:01-02:121/02:123-02:140/02:142-02:243:01/02:244-02:311/02:313-02:469/02:471-02:528:01/02:529-02:569/02:571-02:590/02:591-02:02:635/02:636w/02:637-02:643N/02:645-02:673/02:674w/02:675N-02:740/02:741w/02:742-02:795Q/02:797N-02:802/02:804-02:814/02:815w/02:816-02:828/02:830:01-02:958/02:959?/02:960-02:967/02:968?/02:969-02:981/02:982?/02:983-02:1009/02:1010?/02:1011Q-02:1089, A*03:89:01, A*24:02:06/24:340, A*30:07w/30:13w/30:16w/30:22w/30:44w/30:46w, B*07:02:80w, B*35:01:60w, B*51:01:34w, B*58:01:24, 06:247w, 07:02:27w/07:577w	A2, Low A2, -, A203, A210, Null, A2/19, A24(9)	see below
					A*02:556, B*51:01:34w	-	175 bp
					A*02:50/02:556	A2, -	205 bp
					A*02:50/02:556	A2, -	225 bp
					A*02:01:01:01-02:01:07/02:01:10-02:01:11/02:01:12w/02:01:13-02:01:15/02:01:18-02:01:19/02:01:21-02:01:32/02:01:33w/02:01:34-02:01:39/02:01:41-02:01:50/02:01:53-02:01:62/02:01:64-02:01:73/02:01:75-02:01:76/02:01:78-02:01:81/02:01:83-02:01:113/02:01:115-02:01:152/02:01:154-02:03:10/02:04:01-02:05:02/02:05:04/02:05:06-02:06:06/02:06:08-02:06:11/02:06:13/02:06:15-02:06:19/02:06:21-02:07:11/02:07:13-02:07:14/02:07:16/02:07:18-02:11:01:06/02:11:03/02:11:05-02:11:08/02:11:10-02:22:01:02/02:24:01-02:35:01/02:36-02:42:01/02:43N-02:44/02:47/02:49:01-02:49:02/02:51-02:54/02:57-02:60:02/02:62-02:76:01/02:77/02:79:01-02:91/02:93:01-02:97:02/02:99:01-02:99:02/02:101:01-02:102/02:104-02:112/02:114-02:121/02:123-02:128/02:130-02:140/02:142/02:145-02:168/02:170-02:175/02:177-02:184/02:186-02:194/02:196-02:200/02:202:01-02:204/02:207-02:216/02:218-02:243:01/02:244-02:248/02:250N-02:311/02:313-02:314:02N/02:316-02:320/02:322-02:357/02:359-02:368/02:370-02:371/02:373N-02:377/02:379-02:409/02:411-02:418/02:420-02:469/02:471-02:481/02:483-02:503/02:505-02:513/02:515-02:528:01/02:529-02:543/02:545-02:569/02:572-02:590/02:591:02-02:600/02:602-02:635/02:636w/02:637-02:643N/02:645-02:673/02:674w/02:675N-02:696:02N/02:698-02:740/02:741w/02:742-02:745/02:747-02:765/02:767-02:795Q/02:797N-02:802/02:804-02:814/02:815w/02:816-02:828/02:830:01-02:872/02:874-02:880N/02:882-02:958/02:959?/02:960-02:967/02:968?/02:969-02:981/02:982?/02:983-02:1009/02:1010?/02:1011Q-02:1021/02:1023-02:1026/02:1029-02:1030/02:1032-02:1089, A*03:89:01, A*30:22w, B*07:02:80w, B*35:01:60w, B*51:01:34w, B*58:01:24, 07:02:27w/07:577w	A2, Low A2, -, A203, A210, Null, A2/19	135 bp

Position				Mix	Allele	Serology	Size
					A*02:01:01:01-02:01:07/02:01:10-02:01:11/02:01:12w/02:01:13-02:01:15/02:01:17-02:01:19/02:01:21-02:01:30/02:01:32/02:01:33w/02:01:34-02:01:39/02:01:41-02:01:66/02:01:68-02:01:81/02:01:83-02:01:121/02:01:123-02:01:126/02:01:128-02:03:10/02:04:01-02:05:04/02:05:06-02:06:06/02:06:08-02:07:05/02:07:07-02:07:11/02:07:13-02:07:23/02:09:01:01-02:11:01:06/02:11:03-02:19/02:21-02:22:02/02:24:01-02:33/02:35:02w/02:36-02:42:01/02:43N-02:49:02/02:51-02:54/02:57-02:61/02:63-02:76:01/02:77/02:79:01-02:97:02/02:99:01-02:99:02/02:101:01-02:102/02:104-02:121/02:123-02:127/02:129-02:138/02:140/02:142-02:157:02/02:159-02:168/02:170-02:194/02:196-02:207/02:210-02:243:01/02:244-02:249/02:251-02:257/02:259-02:271/02:273-02:291/02:293Q-02:311/02:313-02:316/02:318-02:350N/02:352-02:385/02:387-02:414/02:416-02:469/02:472-02:492/02:494-02:528:01/02:529-02:569/02:571-02:579/02:581Q-02:584/02:586-02:590/02:591:02-02:608N/02:610:01-02:633/02:635/02:636w/02:637-02:643N/02:645-02:662/02:664-02:673/02:674w/02:675N-02:676/02:678-02:701/02:703-02:737/02:739-02:740/02:742-02:786/02:788N-02:795Q/02:797N-02:802/02:804/02:806N-02:814/02:816-02:828/02:830:01-02:853/02:855-02:906/02:908-02:944/02:946N-02:957/02:959?/02:960-02:967/02:968?/02:969-02:981/02:982?/02:983-02:1000/02:1002-02:1009/02:1010?/02:1011Q-02:1021/02:1023-02:1027/02:1029-02:1089, A*03:89:01, A*24:02:06/24:340, A*30:07w/30:22w	A2, Low A2, -, A203, A210, Null, A2/19, A24(9)	165 bp
					A*02:01:01:01-02:01:02:02/02:01:04-02:01:07/02:01:10-02:01:11/02:01:12w/02:01:13-02:01:15/02:01:17-02:01:19/02:01:21-02:01:32/02:01:33w/02:01:34-02:01:39/02:01:41-02:01:48/02:01:50-02:01:81/02:01:83-02:01:107/02:01:109-02:01:154/02:01:156-02:03:10/02:04:01-02:05:04/02:05:06-02:05:12/02:06:01:01-02:06:01:16/02:06:03-02:06:06/02:06:08-02:07:11/02:07:13-02:10/02:12-02:22:02/02:24:01-02:34/02:36-02:42:01/02:43N-02:47/02:49:01-02:49:02/02:51-02:68/02:70-02:76:01/02:77/02:79:01-02:80/02:82N-02:86:02/02:88N-02:89:02/02:91-02:97:02/02:99:01-02:99:02/02:101:01-02:111/02:113:01N-02:115/02:117-02:121/02:123/02:125N-02:127/02:130-02:135/02:137-02:140/02:142-02:145/02:147-02:183/02:185-02:243:01/02:244-02:246/02:248-02:260/02:262-02:296:02/02:299-02:307/02:309-02:311/02:313-02:330/02:332-02:365/02:367-02:380/02:382-02:393/02:395N-02:442/02:444-02:456/02:458-02:469/02:471-02:489/02:491-02:493/02:495-02:496/02:498-02:502/02:504-02:513/02:516N-02:528:01/02:529-02:533/02:535-02:569/02:572-02:576/02:578/02:581Q-02:583/02:585-02:588/02:590/02:591:02-02:626/02:628-02:635/02:636w/02:637-02:643N/02:646-02:673/02:674w/02:675N-02:700/02:702-02:704/02:706-02:713/02:715N-02:731/02:733-02:737/02:739-02:740/02:742-02:746/02:748N/02:750/02:752-02:753/02:755-02:756/02:758-02:772/02:774-02:795Q/02:797N-02:802/02:804-02:807N/02:809-02:814/02:816-02:820/02:822-02:828/02:830:01-02:892/02:894-02:905/02:908-02:922/02:924-02:925/02:927-02:931/02:933/02:935-02:939/02:942-02:958/02:960-02:963/02:965-02:967/02:968?/02:969-02:981/02:982?/02:983-02:985/02:987-02:990/02:992-02:995/02:997Q-02:1009/02:1010?/02:1011Q-02:1030/02:1033-02:1089, A*03:89:01, A*30:13w/30:16w/30:44w/30:46w, 06:247w	A2, Low A2, -, A203, A210, Null, A2/19	190 bp
A3	A6	A9	A12	Mix 24	<b>A*43:01-43:03, A*80:01:01:01-80:01:02/80:03/80:05-80:09N</b>	A43, Null, -, A80	see below
					A*80:01:01:01-80:01:02/80:03/80:05-80:09N	A80, -, Null	170 bp
					A*43:01-43:03	A43, Null, -	445 bp

**Amplification control (internal positive control):** 90 base pairs (bp)

**w** = weak

**?** = nucleotide sequence information not available for the primer matching sequence or alleles with unknown reactivities

**Bold:** mixes which result in PCR fragments of different sizes (the specificities are first indicated all in one row, then split into several groups in the subsequent rows depending on the fragment size)

**Table 2:** Amplification patterns for all **HLA-A\*** alleles detected by the HLA-A\* CTS-PCR-SSP reagents (**Lot-No A17-2**) based on IMGT/HLA Sequence Database Release 3.51.0, January 2023

Allele	Serology	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
A*01:01:01:01:01:01:55/01:01:57-01:01:64/01:01:67-01:01:130/01:01:132-01:04:01:02N/01:06-01:12/01:14-01:33/01:35-01:37:01:02/01:39-01:50/01:52:01N-01:71/01:73-01:101/01:103-01:138/01:140:01-01:166/01:168-01:175/01:177-01:193/01:195-01:199/01:201-01:220/01:222-01:243/01:245-01:266:02/01:268-01:283/01:285N-01:379N/01:381-01:389/01:391-01:398/01:400N-01:417N/01:419-01:426, A*11:94/11:271/11:326, A*23:128, A*25:59, B*07:64, B*15:12:01-15:12:03/15:19/15:270/15:298/15:304N/15:649	A1, Null, -, B76(15)	1																								
A*01:01:56	-	1									10															
A*01:01:131/01:399	-	?																								
A*01:13/01:176/01:194	-	1			4																					
A*01:51	-	1												13												
A*01:200/01:244/01:380:01-01-01:380:01:02, A*11:17, A*36:01:01:01-36:01:02/36:03-36:13	-, A36		2																							
A*01:267	-	w																								
A*01:427, A*03:107/03:164/03:413, A*36:02	-		2		4																					

Allele	Serology	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
A*02:01:01:01-02:01:07/02:01:10-02:01:11/02:01:13-02:01:15/02:01:18-02:01:19/02:01:21-02:01:25/02:01:27-02:01:32/02:01:34-02:01:39/02:01:41-02:01:51/02:01:53-02:01:63/02:01:66-02:01:68/02:01:70-02:01:73/02:01:76-02:01:80/02:01:83-02:01:94/02:01:96-02:01:164/02:01:166-02:03:06/02:03:08-02:03:10/02:04:01-02:05:02/02:05:04/02:05:06-02:05:08/02:05:10-02:06:06/02:06:08-02:06:11/02:06:13-02:06:18/02:06:20-02:06:30/02:07:01-01:02-07:11/02:07:13-02:07:14/02:07:16-02:08:01/02:09:01:01-02:11:01:06/02:11:03-02:11:12/02:14-02:18/02:20:01-02:22:02/02:24:01/02:25-02:26/02:28-02:33/02:36/02:39-02:42:01/02:43N/02:45/02:47/02:49:02/02:51/02:53N/02:57-02:59/02:61/02:63/02:66-02:69/02:71/02:73-02:76:01/02:77/02:79:01-02:79:02/02:81-02:87/02:89:01-02:97:02/02:99:01-02:99:02/02:101:01-02:102/02:104/02:106-02:113:02N/02:115-02:116/02:118/02:120-02:121/02:123-02:128/02:130-02:134/02:136-02:140/02:143-02:151/02:153:01-02:168/02:170-02:177/02:179-02:184/02:186-02:187/02:189-02:192/02:194/02:196-02:222N/02:224-02:225N/02:227N-02:228/02:230-02:236/02:238-02:243:01/02:244-02:245/02:247-02:253/02:255-02:270/02:272-02:274/02:276-02:278/02:281-02:285/02:287/02:289:01/02:290-02:297/02:299-02:300/02:302-02:303/02:305N-02:307/02:310/02:313-02:338/02:340-02:347/02:349-02:376/02:378-02:382/02:384-02:405/02:407-02:411/02:413-02:416/02:418-02:453/02:455-02:469/02:471-02:487/02:489-02:490N/02:492-02:503/02:505-02:506N/02:508-02:509/02:511-02:526/02:528:01/02:529-02:542/02:544-02:569/02:572-02:579/02:581Q/02:583-02:590/02:591:02-02:593/02:595-02:600/02:602-02:608N/02:610:01-02:621/02:623-02:629/02:631-02:635/02:637-02:640/02:642/02:645-02:648:02/02:650-02:661/02:663-02:673/02:675N/02:677/02:679-02:680/02:684-02:710N/02:712-02:722/02:724-02:740/02:742-02:780/02:782-02:788N/02:790-02:795Q/02:797N-02:802/02:805Q-02:808/02:810-02:814/02:816-02:825/02:827Q/02:830:01-02:830:02/02:832N-02:839/02:841-02:871N/02:873-02:875/02:877-02:906/02:908-02:922/02:924-02:926/02:928-02:943/02:945N-02:947/02:949-02:958/02:960-02:967/02:969-02:981/02:983-02:984/02:986-02:991/02:993-02:1009/02:1011Q-02:1020/02:1024-02:1027/02:1031N-02:1032/02:1034-02:1045Q/02:1047-02:1049/02:1051-02:1086/02:1088-02:1089	A2, Low A2, -, A203, A210, Null			3																						23
A*02:01:09/02:05:05/02:06:07/02:07:12/02:11:02/02:76:02-02:76:03/02:243:02-02:243:03/02:528:02/02:570:01	A2, -			3																			21			
A*02:01:12/02:01:33/02:636/02:674/02:815, B*07:02:80	A2, -			3																						w

Allele	Serology	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
A*02:01:17/02:01:26/02:01:52/02:01:64/02:01:69/02:01:74/02:01:81/ 02:01:95/02:03:07/02:05:03/02:06:12/02:06:19/02:07:15/02:08:02/02:55/ 02:64:01-02:64:02/02:72/02:80/02:88N/02:105/02:114/02:117/02:119/ 02:169/02:178/02:185/02:188/02:195/02:223N/02:229/02:246/02:275/ 02:279/02:288/02:289-02/02:298/02:301N/02:304/02:339/02:348/02:377/ 02:383/02:406/02:412/02:491/02:504/02:510/02:527/02:582/02:601/ 02:622N/02:641/02:643N/02:676/02:678/02:681/02:781/02:789N/02:826Q/ 02:828/02:831N/02:872/02:876/02:923/02:944/02:985/02:1028-02:1030/ 02:1046, B*58:01:24	A2, -, Null																							23	
A*02:01:40/02:03:11/02:42:02/02:141/02:312/02:470/02:570:02/02:796N/ 02:803N, B*15:10:07	A2, -, Null			3																					
A*02:01:65/02:01:75/02:05:09/02:60:01-02:60:02/02:193/02:254/02:286/ 02:308/02:311/02:488/02:594/02:649/02:711	-			w																				23	
A*02:01:165	-			3																	20			23	
A*02:06:31	-			?					8	9	10													23	
A*02:12-02:13/02:19/02:27/02:37-02:38/02:44/02:49:01/02:54/02:142/ 02:226N/02:271/02:280/02:417/02:543/02:630/02:682-02:683/02:723/ 02:804/02:840/02:948	A2, -, Null			3											14									23	
A*02:24:02/02:507	-			3																19				23	
A*02:34-02:35:01/02:56:01/02:62/02:907	A2, -			3	w																		22	23	
A*02:35:02	A2				w																		22	w	
A*02:35:03	A2			3	w																	21	22		
A*02:46/02:70/02:1050	A2, -			3			6																	23	
A*02:48/02:129/02:571	-						6																	23	
A*02:50	A2																					21		23	
A*02:52/02:992	-								8																23
A*02:56:02/02:103	-				w																		22	23	
A*02:65/02:152	A2/19, -																			19				23	
A*02:78	A2			3																			22		

Allele	Serology	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
A*02:122/02:591:01, A*11:158, A*68:01:01:01-68:01:10/68:01:12-68:01:24/68:01:26-68:01:27/68:01:29-68:01:35/68:01:37-68:02:06/68:02:08-68:08:02/68:10-68:25/68:27:01-68:27:02/68:29-68:47/68:51-68:70/68:72-68:102/68:104:01-68:128/68:130:01/68:131-68:133/68:135-68:136/68:138-68:171:01N/68:172-68:183/68:185-68:203N/68:205N-68:217/68:219-68:229/68:231-68:233/68:235/68:237-68:248/68:250/68:252-68:257/68:259-68:261/68:263Q-68:285/68:287-68:292N/68:295-68:298, B*44:497	-, A68(28), A28, Null																					21			
A*02:135/02:309/02:454	-								8	9	10														23
A*02:237/02:580/02:809	-			3	w																				23
A*02:609	-		w	3																					23
A*02:662	-														14										23
A*02:741	-			3	w							11											22	w	
A*02:829, A*32:01:01:01-32:01:06/32:01:08-32:01:11/32:01:13-32:01:47/32:01:49-32:01:54/32:03:01:01-32:03:01:02/32:05-32:12/32:14/32:16/32:18-32:21/32:23/32:25-32:27N/32:29/32:31/32:33:01/32:33:03/32:35-32:51/32:53-32:65/32:67-32:70/32:72-32:74/32:76-32:78/32:80-32:92N/32:95-32:100/32:102-32:108/32:110-32:157/32:159-32:169/32:171-32:173	-, A32(19), Null																		18						
A*02:927	-				w																				23
A*02:959/02:968/02:982/02:1010	-			3																					?
A*02:1021/02:1023/02:1033/02:1087	-			?																					23
A*02:1022	-		2	3																					23
A*03:01:01:01-03:01:38/03:01:40-03:01:118/03:03N-03:09/03:11N-03:23:02/03:25-03:29/03:33-03:64/03:66-03:68N/03:70-03:72/03:74-03:75/03:77-03:81/03:83-03:88/03:89:02/03:91N-03:102/03:104-03:105/03:108-03:112/03:114-03:151/03:153-03:159/03:161N-03:163/03:165-03:166/03:168N-03:170/03:172-03:193/03:195-03:197:02N/03:199/03:201-03:217/03:220-03:222/03:224/03:226-03:235/03:238-03:240/03:243/03:245-03:252/03:254-03:259/03:261-03:270/03:272/03:276-03:280:02/03:283N-03:284N/03:286N-03:308/03:310-03:313/03:315-03:317/03:320-03:332/03:334N-03:342N/03:344:01-03:347/03:349-03:355/03:357N-03:372/03:374N-03:384/03:386-03:412/03:414-03:427/03:429-03:441/03:443-03:452/03:454-03:457	A3, Null, -				4																				
A*03:01:39	-				4											15						20			



Allele	Serology	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
A*03:02:01:01-03:02:06/03:31-03:32/03:65/03:69N/03:73/03:76/03:82/03:90/03:106/03:113/03:160/03:198/03:218/03:223/03:236-03:237/03:242/03:244/03:253/03:274-03:275N/03:281/03:285/03:309/03:314/03:318-03:319/03:333/03:348/03:356/03:385/03:453/03:458Q, A*11:130	A3, -, Null				4										w										
A*03:10/03:167/03:225, A*11:199:01/11:222	-				4										14										
A*03:24	A3				4									13											
A*03:30/03:273	-				4		6																		
A*03:89:01	-				4																			23	
A*03:103:01-03:103:02/03:282	-				4								12												
A*03:152	-				4		6												18						
A*03:171/03:271/03:373/03:428/03:442, A*68:71	-				4																	21			
A*03:219, A*32:04/32:52	-				4														18						
A*03:241/03:343, A*69:07	-				4																		22		
A*11:01:01:01-11:01:34/11:01:36-11:01:56/11:01:58-11:01:103/11:01:105-11:09/11:11-11:16/11:18-11:22/11:26/11:29-11:30/11:32:01-11:34/11:36-11:37/11:41-11:44/11:46-11:49/11:51-11:52Q/11:54:01-11:56/11:58-11:77/11:79-11:93/11:95-11:97/11:99N-11:110/11:113-11:115N/11:117-11:129/11:131-11:139/11:141-11:157/11:159-11:175/11:177/11:179-11:182Q/11:184-11:189/11:192-11:198/11:200-11:208:02N/11:210N/11:212-11:221/11:224-11:225/11:227-11:228/11:230-11:249/11:251N-11:257/11:259-11:268/11:270/11:272Q-11:289/11:291-11:309/11:311-11:324/11:327-11:345/11:347N-11:358/11:360-11:371/11:373-11:379/11:381-11:388N/11:390-11:391/11:393-11:395/11:398-11:431/11:433N-11:434/11:436N-11:438, A*24:89/24:290, A*68:129	A11, -, Null														14										
A*11:01:104/11:23/11:98/11:229/11:250/11:258/11:346, A*33:19	-														w										
A*11:10	A11													13	14										
A*11:27/11:38-11:39/11:209	-	1													14										
A*11:57/11:359, A*68:09/68:26/68:28/68:134/68:171:02N/68:204	-, A28, Null														14							21			
A*11:116/11:140	-												12		14										
A*11:178/11:190, A*24:02:17/24:02:49/24:02:89/24:08/24:21:01-24:21:02/24:29/24:31/24:42/24:67/24:77/24:156/24:158N/24:191/24:200/24:237/24:273/24:309-24:310:01/24:326/24:342/24:359N/24:370N/24:389N/24:489/24:506/24:562, B*51:55, B*57:129	-, A24(9), Null							7																	
A*11:199:02-11:199:03	-				w										14										
A*11:325, A*24:19/24:28/24:44/24:379/24:406/24:424	-, A9, A24(9)						6								14										

Allele	Serology	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
A*11:372, A*31:89, A*34:19, A*66:23/66:30	-												12												
A*11:389/11:392/11:396-11:397N/11:432N/11:435	-, Null														?										
A*23:01:01:01-23:01:20/23:01:22-23:02/23:04-23:08N/23:10:01-23:17:02/ 23:18-23:22/23:25-23:27/23:29-23:30/23:32-23:33/23:35-23:36/23:38N- 23:44/23:46-23:50/23:52-23:54/23:56/23:58-23:60/23:62-23:65/23:67- 23:68/23:70-23:79/23:81-23:82/23:84N-23:99/23:101-23:103N/23:106N- 23:112/23:114-23:127/23:129, A*24:315	A23(9), -, Null					5	6																		
A*23:01:21	-			3		5	6																		
A*23:03:01/23:83, A*32:170	-					5												18							
A*23:03:02:01-23:03:02:02/23:09/23:23/23:28/23:37:01-23:37:02/23:51/ 23:61/23:80/23:100, A*24:24/24:392, B*18:27	-					5																			
A*23:17:03	-					?	6																		
A*23:24/23:34/23:57/23:66/23:104, A*24:02:74/24:02:146/24:04/24:06/ 24:13:01-24:13:02/24:22/24:87/24:107/24:109/24:167/24:207:01- 24:207:02/24:227/24:285/24:289/24:299/24:339/24:355/24:373/24:381/ 24:405/24:446/24:478/24:569/24:572, A*33:21/33:53	-, A24(9), A9						6																		
A*23:31/23:45/23:55	-	1				5	6																		
A*23:105, A*24:71/24:527	-					5	6	7																	
A*24:02:01:01-24:02:05/24:02:07-24:02:16/24:02:18-24:02:48/24:02:50- 24:02:63/24:02:65/24:02:67-24:02:73/24:02:75/24:02:77-24:02:88/24:02:90- 24:02:145/24:02:147-24:03:04/24:05:01-24:05:02/24:07:01:01-24:07:04/ 24:09N-24:11N/24:14:01:01-24:14:01:04/24:17:01:01-24:17:01:02/ 24:20:01:01-24:20:02/24:23/24:25-24:27/24:30/24:32-24:40N/24:43/ 24:45N-24:50/24:52-24:64/24:66/24:68-24:70/24:72-24:76/24:78-24:86N/ 24:88/24:90:01N-24:91/24:93/24:95-24:106/24:108/24:110-24:128/24:130- 24:137/24:139-24:155N/24:157/24:159-24:166/24:168-24:187/24:189- 24:190/24:192-24:199/24:201-24:203/24:205-24:206/24:208:02:01-24:210/ 24:212/24:214-24:226:02/24:229-24:234/24:236/24:238-24:272/24:274- 24:284/24:286-24:288/24:291-24:292/24:294Q-24:298/24:300-24:308/ 24:311-24:314/24:316-24:325/24:327-24:338/24:341/24:344-24:354/24:356- 24:358/24:360-24:369/24:371-24:372/24:374-24:376/24:378Q/24:380/ 24:382-24:388N/24:390-24:391/24:393-24:404/24:407-24:414/24:416- 24:423/24:425N-24:427N/24:429N-24:445N/24:447Q-24:470/24:472- 24:477/24:479Q-24:488/24:490-24:498/24:500-24:503/24:505/24:507- 24:514N/24:516-24:521/24:523-24:526/24:528-24:550/24:552-24:555/ 24:558-24:559/24:561:01-24:561:02/24:563-24:568N/24:570-24:571/24:573- 24:589	A24(9), Low A24(9), -, A2403, A9, Null						6	7																	

Allele	Serology	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
A*24:02:06/24:340	A24(9), -						6	7																23	
A*24:02:64/24:02:66/24:343/24:415/24:428N	-, Null						w	7																	
A*24:02:76	-			3			6	7																	
A*24:15/24:41/24:51/24:92/24:235/24:499/24:504/24:551/24:557	-	1					6	7																	
A*24:18/24:204/24:213, A*31:08, A*32:79	A24(9)/A3, -						6												18						
A*24:21:03, A*32:02/32:22	-, A32(19)							7											18						
A*24:94/24:138/24:188/24:228/24:515, A*68:249	-						6														21				
A*24:208:01	-						6	7											18						
A*24:293	-						6	7														21			
A*24:310:02	-			3				7																	
A*24:377	-						6	w																	
A*24:522	-						?	7																	
A*24:556N/24:560	Null, -						6	?																	
A*25:01:01:01-25:01:01:12/25:01:03-25:01:07/25:01:10-25:01:16/25:01:18-25:01:21/25:03/25:05-25:10/25:12N-25:13/25:15-25:23/25:25-25:32/25:34-25:35/25:37-25:38/25:40-25:42N/25:45-25:58/25:60-25:64/25:66-25:74/25:76:01-25:76:02/25:78-25:80/25:83-25:84	A25(10), -, Null								8	9															
A*25:01:02, B*07:02:74	A25(10), -							w	9																
A*25:01:08/25:39	-							8	w																
A*25:02	A25(10)							8	9			12													
A*25:04/25:44	-							7	8	9															
A*25:11	-							w	9	10															
A*25:14, A*30:12:01/30:18/30:41/30:166, A*32:101Q, 04:01:49, 12:328, 15:222	-, A30(19)							8																	
A*25:24/25:33, A*26:01:02/26:01:13/26:01:63/26:110/26:227, A*66:03:01:01-66:03:01:03/66:05/66:15/66:28N/66:39N, B*18:02:02, B*38:02:04	-, A26(10), A10, Null									9															
A*25:36/25:65	-	1						8	9																
A*25:43	-												13												
A*25:75	-							w	9			12													
A*25:77	-						6	8																	
A*25:81	-										?														
A*25:82	-						6				?														

Allele	Serology	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
A*26:01:01:01-26:01:01:53/26:01:03-26:01:12/26:01:14-26:01:26/26:01:28-26:01:37/26:01:39-26:01:58/26:01:60-26:01:62/26:01:64/26:01:66-26:03:01:02/26:03:03-26:12:01:02/26:14-26:18/26:20:01-26:28/26:30/26:32/26:34-26:43:02/26:45-26:47/26:50-26:59/26:61-26:68/26:70-26:71N/26:73-26:75/26:77-26:83/26:86-26:109/26:111-26:124/26:126-26:130/26:132-26:142/26:145N-26:169/26:171-26:183/26:185-26:203/26:206:01N-26:224/26:228-26:229	A26(10), -, Null, A10									9	10														
A*26:01:27/26:84/26:184	-										10														
A*26:01:38/26:31/26:76/26:170	-									w	10														
A*26:13/26:226	-									9	10		12												
A*26:19	-										10		12												
A*26:29/26:49/26:205	A26(10), -	1								9	10														
A*26:33, A*34:06, A*66:01:01:01-66:02:01:03/66:04/66:06-66:09/66:11-66:14/66:16-66:18/66:20-66:22/66:24-66:27N/66:29/66:31-66:38/66:40/66:42-66:47	-, A66(10), Null									9			12												
A*26:48/26:69	-									9	10	11													
A*26:72	-		2								10														
A*26:143	-									w	w														
A*26:225	-									9	?														
A*29:01:01:01-29:01:06/29:01:08-29:02:35/29:02:37-29:06/29:08N-29:12/29:15-29:18/29:20-29:31/29:33-29:38/29:40-29:47/29:50/29:52-29:59/29:61-29:68/29:70-29:72/29:74-29:104/29:106-29:110/29:112N-29:158/29:160-29:163/29:165-29:172, A*32:30:02, A*74:10/74:41	A29(19), Null, -															15									
A*29:07/29:49	-				5											15									
A*29:13, A*32:30:01/32:32	-															15		18							
A*29:14	-															15		17							
A*29:19/29:39/29:159	-															15				20					
A*29:32	-												12			15									
A*29:48	-															15			19	20					
A*29:51/29:69/29:73	-															15					21				
A*29:105/29:164	-															15			19						
A*29:111	-															w									

Allele	Serology	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
A*30:01:01:01-30:01:07/30:01:09-30:02:09/30:02:11-30:04:01:03/30:04:03-30:04:04/30:06/30:08:01-30:11:02/30:14L-30:15/30:17/30:19-30:20/30:23-30:25/30:27N-30:40/30:42-30:43/30:45/30:47-30:54/30:56-30:81/30:83/30:85-30:88/30:91-30:95/30:97-30:123N/30:125-30:151/30:153-30:162/30:165/30:167-30:183/30:185/30:187-30:188/30:190-30:205	A30(19), -, Null								8								16								
A*30:01:08	-								8								w								
A*30:02:10	-								8		10														
A*30:04:02/30:90/30:96/30:124	-																16								
A*30:07/30:13/30:16/30:22/30:44/30:46	-								8								16						w		
A*30:55	-				4				8																
A*30:89/30:186	-				4				8								16								
A*30:152, A*31:01:02:01-31:01:06/31:01:08-31:01:46/31:01:48-31:06/31:09/31:11:01-31:20/31:23/31:25-31:28/31:30-31:74/31:76-31:88/31:91-31:96/31:98-31:103/31:105-31:108/31:110-31:114/31:116-31:135/31:137-31:201N/31:203/31:205-31:209/31:211-31:219	-, A31(19), Null																	17							
A*30:163	-								8					13			16								
A*30:164	-								8						14		16								
A*30:189/30:206	-								?								?								
A*31:01:47/31:202N/31:204	-, Null																	?							
A*31:07/31:10	-, A31(19)																	17	18						
A*31:24/31:97/31:136	-														w		17								
A*31:29	-					5											17								
A*31:104	-																w								
A*31:115	-												12				17								
A*32:13	-	1																	18						
A*32:15/32:93	-																	18	19						
A*32:17	-				w								12					18							
A*32:24	-		2															18							
A*32:75/32:94	-																	w							
A*32:109	-																	18				21			

Allele	Serology	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
A*33:01:01:01-33:01:04/33:01:06-33:01:18/33:03:01:01-33:03:25/33:03:28-33:03:30/33:03:32-33:03:55/33:03:57/33:03:59-33:18:01/33:20/33:22-33:29/33:31/33:33-33:34/33:36-33:37/33:39-33:48/33:50-33:52/33:54-33:58/33:60-33:65/33:67-33:80N/33:82-33:88/33:90-33:101/33:103-33:121/33:123N-33:124/33:126-33:129N/33:132-33:134/33:136-33:139/33:141-33:143N/33:145-33:149/33:151/33:153-33:157N/33:160-33:174N/33:176N/33:178-33:182/33:184-33:186/33:189/33:191-33:214/33:216-33:234, B*07:02:40, B*08:01:07, B*15:02:07, B*55:02:10	A33(19), -, A19, Null, B8																			19					
A*33:03:26/33:03:31/33:66/33:140N/33:158/33:188	-, Null																			w					
A*33:03:56/33:215	-																			?					
A*33:49/33:144	-													13						19					
A*33:59/33:102/33:150/33:177/33:190	-														w					19					
A*33:125/33:131	-												12							19					
A*33:183	-											11								19					
A*33:187	-					5														19					
A*34:01:01:01-34:01:07/34:05/34:11/34:14/34:16-34:18/34:27	A34(10), -									9		11	12												
A*34:02:01:01-34:04/34:07/34:09-34:10N/34:13/34:15/34:20-34:22/34:25-34:26N/34:29N-34:30N	A34(10), -, Null									9				13											
A*34:08	-				4					9				13											
A*34:12	-											11	12												
A*34:23	-									w		11	12												
A*34:24	-									w															
A*34:28	-									9				?											
A*43:01-43:03	A43, Null, -										10														24
A*66:10	-	1								9			12												
A*66:19	-									9			12		14										
A*66:41	-									w			12												
A*68:01:28/68:01:36/68:130:02	-															15					20	21			
A*68:103:01-68:103:02	-													13								21			
A*68:258	-																					?			
A*68:262	-												12									21			
A*68:294	-									9			12									21			
A*69:01:01:01-69:02/69:04-69:06/69:08-69:09	A69(28), -																					21	22		

Allele	Serology	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
A*69:03	-														14							21	22		
A*74:01:01:01-74:03:03/74:05-74:09/74:11-74:12N/74:14N-74:15/74:16:02-74:20/74:22-74:40/74:44	A74(19), -, Null																				20				
A*74:04/74:21/74:43	-																			19	20				
A*74:13	-				4								12								20				
A*74:42	-				?								12		15										
A*80:01:01:01-80:01:02/80:03/80:05-80:09N	A80, -, Null																								24
B*07:225/07:260	-								w																
B*35:01:60, B*51:01:34, 06:247, 07:02:27/07:577	-																							w	
B*35:08:14/35:14:03	-													w											
B*57:148	-								?																
*07:1034	-																						?		

w = weak

? = nucleotide sequence information not available for the primer matching sequence or alleles with unknown reactivities

## 14. Certificate of Analysis



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**CTS** Collaborative Transplant Study

# Certificate of Analysis

## HLA-A\* CTS-PCR-SSP Tray Kit

Product number	101
Lot number	A17-2
Number of HLA-specific primer mixes per test	24

### Mix specifications

The specificity of each primer pair has been tested against a panel of well characterized DNAs.

### Result

No false positive or false negative amplifications were obtained under our test conditions of the bulk reagents.

Date of approval	20.03.2023
Approved by	H. Tran, M.D. Quality Control, Supervisor