

1 EMVerify Contactless

Legend:

Tamarin	Tamgram
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	executable				bank_accepts			
Mastercard_CDA_NoPIN_High	falsified 47 steps	48.2	falsified 48 steps	51.1	×	-	×	-
Mastercard_CDA_NoPIN_Low	verified 30 steps	55.5	verified 28 steps	63.8	verified 2897 steps	707.7	verified 3629 steps	932.4
Mastercard_CDA_OnlinePIN_High	verified 30 steps	55.6	verified 29 steps	69.4	verified 7145 steps	1715.6	verified 9331 steps	2396.0
Mastercard_CDA_OnlinePIN_Low	verified 30 steps	55.7	verified 28 steps	64.2	verified 2905 steps	707.2	verified 3637 steps	973.5
Mastercard_DDA_NoPIN_High	falsified 49 steps	46.8	falsified 50 steps	52.1	×	-	×	-
Mastercard_DDA_NoPIN_Low	verified 29 steps	54.1	verified 27 steps	56.2	falsified 16 steps	344.9	falsified 17 steps	603.0
Mastercard_DDA_OnlinePIN_High	verified 29 steps	54.1	verified 28 steps	58.6	verified 4865 steps	1054.8	verified 6371 steps	1468.1
Mastercard_DDA_OnlinePIN_Low	verified 29 steps	51.3	verified 27 steps	57.4	falsified 16 steps	346.5	falsified 17 steps	594.9
Mastercard_SDA_NoPIN_High	falsified 45 steps	47.4	falsified 46 steps	49.9	×	-	×	-
Mastercard_SDA_NoPIN_Low	verified 27 steps	51.1	verified 25 steps	54.3	falsified 13 steps	189.8	falsified 14 steps	52.7
Mastercard_SDA_OnlinePIN_High	verified 27 steps	51.1	verified 26 steps	58.8	verified 2315 steps	515.9	verified 3047 steps	707.9
Mastercard_SDA_OnlinePIN_Low	verified 27 steps	51.0	verified 25 steps	53.1	falsified 13 steps	192.4	falsified 14 steps	53.5
Visa_DDA_High	verified 29 steps	53.3	verified 29 steps	60.2	verified 5617 steps	933.8	verified 5657 steps	985.7
Visa_DDA_Low	verified 28 steps	54.6	verified 28 steps	59.4	falsified 17 steps	1261.0	falsified 18 steps	872.1
Visa_DDA_Low_Fix	verified 28 steps	63.3	verified 28 steps	71.1	verified 3710 steps	733.8	verified 3728 steps	779.6
Visa_EMV_High	verified 22 steps	49.0	verified 23 steps	53.1	verified 308 steps	69.3	verified 356 steps	74.8
Visa_EMV_Low	verified	49.2	verified	51.2	verified	61.9	verified	70.6

	auth_to_terminal_minimal				auth_to_terminal			
Mastercard_CDA_NoPIN_High	×	-	×	-	×	-	×	-
Mastercard_CDA_NoPIN_Low	×	TIMEOUT	×	TIMEOUT	×	TIMEOUT	×	TIMEOUT
Mastercard_CDA_OnlinePIN_High	×	TIMEOUT	×	TIMEOUT	×	TIMEOUT	×	TIMEOUT
Mastercard_CDA_OnlinePIN_Low	×	TIMEOUT	×	TIMEOUT	×	TIMEOUT	×	TIMEOUT
Mastercard_DDA_NoPIN_High	×	-	×	-	×	-	×	-
Mastercard_DDA_NoPIN_Low	×	TIMEOUT	falsified 13 steps	246.1	×	-	×	-
Mastercard_DDA_OnlinePIN_High	×	TIMEOUT	×	TIMEOUT	×	TIMEOUT	×	TIMEOUT
Mastercard_DDA_OnlinePIN_Low	×	TIMEOUT	falsified 13 steps	250.0	×	-	×	-
Mastercard_SDA_NoPIN_High	×	-	×	-	×	-	×	-
Mastercard_SDA_NoPIN_Low	×	TIMEOUT	falsified 10 steps	536.6	×	-	×	-
Mastercard_SDA_OnlinePIN_High	×	TIMEOUT	×	TIMEOUT	×	TIMEOUT	×	TIMEOUT
Mastercard_SDA_OnlinePIN_Low	×	TIMEOUT	falsified 10 steps	542.0	×	-	×	-
Visa_DDA_High	×	TIMEOUT	×	TIMEOUT	×	TIMEOUT	×	TIMEOUT
Visa_DDA_Low	×	TIMEOUT	falsified 14 steps	923.4	×	-	×	-
Visa_DDA_Low_Fix	×	TIMEOUT	×	TIMEOUT	×	TIMEOUT	×	TIMEOUT
Visa_EMV_High	falsified 11 steps	74.7	falsified 11 steps	85.2	×	-	×	-
Visa_EMV_Low	falsified 11 steps	75.7	falsified 11 steps	80.0	×	-	×	-

	auth_to_bank_minimal				auth_to_bank			
Mastercard_CDA_NoPIN_High	×	-	×	-	×	-	×	-
Mastercard_CDA_NoPIN_Low	verified 141 steps	60.9	verified 147 steps	66.9	verified 2818 steps	619.0	verified 612 steps	172.1
Mastercard_CDA_OnlinePIN_High	verified 221 steps	74.9	verified 260 steps	86.5	verified 3566 steps	820.6	verified 1086 steps	293.0
Mastercard_CDA_OnlinePIN_Low	verified 141 steps	63.6	verified 147 steps	69.6	verified 2818 steps	616.9	verified 612 steps	176.3
Mastercard_DDA_NoPIN_High	×	-	×	-	×	-	×	-
Mastercard_DDA_NoPIN_Low	verified 137 steps	59.5	verified 143 steps	68.7	verified 2912 steps	490.3	verified 666 steps	157.5
Mastercard_DDA_OnlinePIN_High	verified 203 steps	72.5	verified 242 steps	81.6	verified 3372 steps	621.6	verified 1116 steps	264.0
Mastercard_DDA_OnlinePIN_Low	verified 137 steps	61.6	verified 143 steps	65.6	verified 2912 steps	497.8	verified 666 steps	155.4
Mastercard_SDA_NoPIN_High	×	-	×	-	×	-	×	-
Mastercard_SDA_NoPIN_Low	verified 102 steps	56.2	verified 108 steps	61.7	verified 1377 steps	284.5	verified 363 steps	101.1
Mastercard_SDA_OnlinePIN_High	verified 150 steps	64.9	verified 183 steps	71.6	verified 1688 steps	355.2	verified 585 steps	150.5
Mastercard_SDA_OnlinePIN_Low	verified 102 steps	57.8	verified 108 steps	57.3	verified 1377 steps	287.8	verified 363 steps	100.2
Visa_DDA_High	verified 205 steps	70.6	verified 205 steps	74.7	verified 953 steps	168.7	verified 953 steps	182.2
Visa_DDA_Low	verified 337 steps	82.4	verified 337 steps	91.7	verified 1922 steps	309.3	verified 1922 steps	334.2
Visa_DDA_Low_Fix	verified 310 steps	96.8	verified 310 steps	99.9	verified 1382 steps	283.2	verified 1382 steps	308.8
Visa_EMV_High	falsified 11 steps	55.2	falsified 11 steps	55.1	×	-	×	-

	secrecy_MK				secrecy_privkCard			
Mastercard_CDA_NoPIN_High	verified 12 steps	44.9	verified 12 steps	50.8	verified 13 steps	44.8	verified 14 steps	47.3
Mastercard_CDA_NoPIN_Low	verified 12 steps	46.9	verified 12 steps	49.2	verified 13 steps	45.1	verified 14 steps	47.4
Mastercard_CDA_OnlinePIN_High	verified 12 steps	43.3	verified 12 steps	51.3	verified 13 steps	46.5	verified 14 steps	48.1
Mastercard_CDA_OnlinePIN_Low	verified 12 steps	44.9	verified 12 steps	51.7	verified 13 steps	46.2	verified 14 steps	49.3
Mastercard_DDA_NoPIN_High	verified 12 steps	47.7	verified 12 steps	51.3	verified 13 steps	45.5	verified 14 steps	51.8
Mastercard_DDA_NoPIN_Low	verified 12 steps	47.1	verified 12 steps	46.7	verified 13 steps	46.2	verified 14 steps	46.8
Mastercard_DDA_OnlinePIN_High	verified 12 steps	44.9	verified 12 steps	49.0	verified 13 steps	46.4	verified 14 steps	50.4
Mastercard_DDA_OnlinePIN_Low	verified 12 steps	44.4	verified 12 steps	52.1	verified 13 steps	47.3	verified 14 steps	47.1
Mastercard_SDA_NoPIN_High	verified 12 steps	47.6	verified 12 steps	50.3	×	-	×	-
Mastercard_SDA_NoPIN_Low	verified 12 steps	44.4	verified 12 steps	47.0	×	-	×	-
Mastercard_SDA_OnlinePIN_High	verified 12 steps	48.2	verified 12 steps	51.9	×	-	×	-
Mastercard_SDA_OnlinePIN_Low	verified 12 steps	48.7	verified 12 steps	48.3	×	-	×	-
Visa_DDA_High	verified 12 steps	43.8	verified 12 steps	48.3	verified 13 steps	47.5	verified 14 steps	50.1
Visa_DDA_Low	verified 12 steps	47.2	verified 12 steps	47.8	verified 13 steps	47.7	verified 14 steps	48.4
Visa_DDA_Low_Fix	verified 12 steps	55.0	verified 12 steps	58.2	verified 13 steps	59.3	verified 14 steps	60.2
Visa_EMV_High	verified 12 steps	46.4	verified 12 steps	51.9	verified 13 steps	44.1	verified 14 steps	47.1
Visa_EMV_Low	verified 12 steps	47.1	verified 12 steps	51.8	verified 13 steps	44.7	verified 14 steps	51.6

	secrecy_PIN				secrecy_PAN			
Mastercard_CDA_NoPIN_High	×	-	×	-	falsified 7 steps	43.6	falsified 7 steps	50.8
Mastercard_CDA_NoPIN_Low	×	-	×	-	falsified 7 steps	46.0	falsified 7 steps	47.9
Mastercard_CDA_OnlinePIN_High	verified 4 steps	46.9	verified 4 steps	46.8	falsified 7 steps	46.8	falsified 7 steps	50.9
Mastercard_CDA_OnlinePIN_Low	verified 4 steps	48.5	verified 4 steps	47.5	falsified 7 steps	46.4	falsified 7 steps	46.3
Mastercard_DDA_NoPIN_High	×	-	×	-	falsified 7 steps	47.3	falsified 7 steps	46.9
Mastercard_DDA_NoPIN_Low	×	-	×	-	falsified 7 steps	43.6	falsified 7 steps	47.0
Mastercard_DDA_OnlinePIN_High	verified 4 steps	47.6	verified 4 steps	46.9	falsified 7 steps	45.0	falsified 7 steps	47.3
Mastercard_DDA_OnlinePIN_Low	verified 4 steps	47.2	verified 4 steps	48.3	falsified 7 steps	44.9	falsified 7 steps	48.1
Mastercard_SDA_NoPIN_High	×	-	×	-	falsified 7 steps	45.2	falsified 7 steps	52.3
Mastercard_SDA_NoPIN_Low	×	-	×	-	falsified 7 steps	46.3	falsified 7 steps	46.8
Mastercard_SDA_OnlinePIN_High	verified 4 steps	45.7	verified 4 steps	46.1	falsified 7 steps	43.5	falsified 7 steps	50.1
Mastercard_SDA_OnlinePIN_Low	verified 4 steps	47.8	verified 4 steps	47.1	falsified 7 steps	45.2	falsified 7 steps	49.2
Visa_DDA_High	verified 4 steps	45.2	verified 4 steps	48.0	falsified 7 steps	46.0	falsified 7 steps	51.9
Visa_DDA_Low	verified 4 steps	44.4	verified 4 steps	47.0	falsified 7 steps	43.9	falsified 7 steps	51.2
Visa_DDA_Low_Fix	verified 4 steps	58.3	verified 4 steps	62.0	falsified 7 steps	57.4	falsified 7 steps	60.6
Visa_EMV_High	verified 4 steps	46.1	verified 4 steps	47.1	falsified 7 steps	44.7	falsified 7 steps	47.7
Visa_EMV_Low	verified 4 steps	46.5	verified 4 steps	47.5	falsified 7 steps	43.7	falsified 7 steps	51.1