



EUROPEAN CENTRAL BANK
EUROSYSTEM

VERSION 2.0

PSP Participation Agreement

Appendix 2.B Functional requirements

IMPORTANT NOTICE

This is version 2.0 of the document, initially published on 14 April 2026 and republished with **editorial amendments** on 12 May 2026.

A tracked-changes version showing the amendments is published alongside this document.





1. Functional requirements overview

Appendix 2.B defines the functional and operational model of the different services in scope of the Pilot. The functional and operational model is supported by detailed End-to-End (E2E) process flows which can be found in **Appendix 2.F**. Summarised End-to-End Process Flows are included in this appendix. The process flows were designed on the basis of illustrative User Journeys, available in **Appendix 2.E – User Journeys & Minimum UX requirements**.

The functional requirements (FUR.XX) and business rules in this document detail the business logic and outline processes and tasks for Pilot PSPs to follow when interacting with End-Users and the Pilot infrastructure.

1.1 Illustrative User Journeys

User Journeys illustrate how the various functions and features of the Beta Digital Euro are utilised from an End-User perspective and provide an overview of specific user-related processes.

FUR.01 The User Journeys are illustrative of the intended outcomes and are not directly binding for Pilot PSPs.

FUR.02 Pilot PSPs may offer additional features not included in the illustrative User Journeys.

1.2 Identification of End-Users

1.2.1 Digital Euro Access Number (DEAN)

A DEAN is the unique account number assigned to an End-User's Beta Digital Euro payment account, enabling identification of both the user and their account among others, and facilitating payment transactions with Individual End-Users or Business End-Users.

FUR.03 When onboarding a new End-User, Pilot PSPs shall provide them with a Digital Euro Access Number (DEAN) requested from the Digital Euro Service Platform (DESP).

FUR.04 A DEAN is requested by a Pilot PSP from the DESP either upfront (in a bulk) or following an End-User request. The DESP generates the DEAN and then provides it to the requesting Pilot PSP. The Pilot PSP then assigns the DEAN provided by the DESP.

FUR.05 End-User that wishes to open a Beta Digital Euro payment account.



FUR.06 The DEAN is independent of the requesting Pilot PSP and does not rely on country identification.

FUR.07 DEANs are composed of 18 alphanumeric characters and respect a specific structure:

1. The first two characters are the Latin alphabetic characters 'E' and 'U'.
2. The third and fourth characters are two check digits generated using the ISO/IEC 7064, MOD 97-10 algorithm.
3. The fifth to eighteenth characters are 14 digits known as the Basic European Account Number (BEAN).

1.2.2 User Alias

The DEAN is the basic identifier for payment transactions in Beta Digital Euro, yet it can be accompanied by alternative identification means – an User Alias. The User Alias could be used in the same way as the DEAN for identifying the Individual End-User in the payment process as long as the User Alias is registered.

FUR.08 The use of an User Alias by the End-User is voluntary. If an End-User chooses to use an User Alias, he/she will have to provide one to its Pilot PSP.

FUR.09 Pilot PSPs shall support the User Alias registration.

FUR.10 Individual End-Users can use an User Alias, mapped to the corresponding DEAN, for identifying their account and using Pilot Payment Services.

FUR.11 An User Alias shall only be a phone number that is owned by and/or attributed to the Individual End-User.

FUR.12 There is only a one-to-one relationship between the User Alias (phone number) and DEAN.

FUR.13 Pilot PSPs shall perform an User Alias verification when registering User Alias (e.g. sending a one-time password to the phone number provided by the Individual End-User and the Individual End-User needs to enter it in the app or the internet banking application). Should the User Alias already be registered with the PSP for the respective user, verification is not needed.



- FUR.14** In case an Individual End-User's mobile number changes, then the Individual End-User should be able within the set of access management features offered by his/her Pilot PSP to request the change of User Alias. His/her Pilot PSP should then take the request further to the DESP component – following the User Alias verification as outlined above. Pilot PSPs may put in place a periodic reconfirmation requirement to ensure that their customers' User Alias is still up to date.
- FUR.15** Business End-Users are not able to use an User Alias as an identification method.

1.3 Authentication of Individual End-Users

1.3.1 Individual End-Users onboarded on the Eurosystem-provided app

- FUR.16** Pilot PSPs shall implement and make available seamless authentication for m-commerce payment transactions. Seamless authentication relies on public key cryptography and the use of biometrics (or alternatively a PIN depending on End-User's preferences) and aims at allowing consumers to stay in the merchant app environment to authenticate, consent and initiate a payment transaction without any visible redirection to another authentication app.
- FUR.17** Pilot PSPs shall offer Individual End-Users the possibility to enroll into the seamless authentication solution when the Individual End-User onboarded on its mobile device. Redirection will be the default authentication in the digital euro app, while seamless authentication will be offered for Prioritised Use Cases.
- FUR.18** For e-commerce payment transactions, decoupled authentication using biometrics or a PIN via a notification in the Individual End-User's Eurosystem-provided app is the authentication method.

1.3.2 Individual End-Users relying on Pilot PSPs' digital instruments

- FUR.19** Pilot PSPs are free to implement their preferred strong customer authentication method when Individual End-Users rely on their digital instruments, including the support of European Digital Identity Wallet (for online payment transactions only). The authentication method shall comply with all applicable regulatory frameworks and associated security requirements.
- FUR.20** Pilot PSPs shall abide by the minimum User Experience (UX) requirements as set in **Appendix 2.E – User Journeys & Minimum UX Requirements**.



1.3.3 Authentication for offline payment transactions

FUR.21 Authentication for offline payment transactions (P2P) relies on the device's local authentication mechanisms for both the Eurosystem-provided app and proprietary Pilot PSP app. For offline operations that require internet connectivity, such as (de)funding or offline device deactivation, the same authentication approach used for online payment transactions is applied (refer to **sections 1.4.4**).

1.4 Pilot Payment Services - steps and requirements

This section provide a high-level description of the Pilot Payment Services (for a detailed list, refer to **Appendix 1 – Pilot Payment Services**).

- **Access management – registration and management of End-Users:** describes the processes for onboarding, offboarding, and lifecycle management for End-Users (see **section 1.4.2**).
- **Liquidity management – issuance and redemption of a Beta Digital Euro:** describes manual funding/defunding of the account linked to the End-User’s DEAN from and to a commercial bank money account, to be available 24 hours a day during all calendar days of the year. It also describes the steps to enforce the End-User’s holding limit (see **section 1.4.3**).
- **Payment transaction management – processing of payment transactions:** describes the services that enable End-Users to make payment transactions in Beta Digital Euro (through a one-off service). It comprises activities including authentication, payment transaction initiation and payment confirmation/rejection (see **section 1.4.4**).

Access management	Liquidity management	Transaction management
Onboarding of End-Users	Funding	Person-to-Person payment
End user lifecycle management	Defunding	E-/m-commerce payment
Offboarding of End-Users	Reverse waterfall	Point-of-sale payment
	Waterfall	Refund
	Holding limit	

Figure 1-1 High-level overview of Pilot Payment Services

1.4.1 Functional requirements specific naming conventions

This section describes the naming conventions used. The descriptions are based on the concepts of process and process-step:



- A **process** refers to an End-to-End completion of the major business functions/a major business function carried out by [one of] the different parties involved.
- A **process-step** is defined as the realisation of each step of one process executed by the parties involved in that step.

1.4.2 Access management

1.4.2.1 Onboarding of End-Users

FUR.22 Pilot PSPs are responsible for the onboarding of End-Users.

FUR.23 Pilot PSPs shall comply with the applicable business rules and End-to-End Process Flows for the onboarding of an End-User as defined in this subsection.

Onboarding can take place online within a Pilot PSP's proprietary app integrating the Pilot Payment Services, or through the Eurosystem-provided app.

Onboarding consists of activities that provide an End-User access and ability to use the Beta Digital Euro in online and offline modes, including the allocation of DEAN(s) and the issuance of payment instruments.

Individual End-Users may ask for a registration of a User Alias to receive online payments, in addition to being addressable via a DEAN.



Figure 1-2 High level flow for the onboarding of an End-User

Description of steps

1. The End-User requests its Pilot PSP to provide access to Pilot Payment Services.
2. The Pilot PSP onboards (only if unknown) and/or authenticates the End-User according to its processes and applicable regulations.
3. The Pilot PSP requests the DESP to generate a DEAN mapped to the Pilot PSP.
4. The DESP generates a DEAN and maps it to the Pilot PSP.
5. The DESP returns the generated DEAN and confirms to the Pilot PSP the updated mapping.



6. The Pilot PSP receives and links the DEAN to the End-User, activates the End-User's payment instruments and sets up liquidity management and notification preferences (if requested by the End-User).
7. The Pilot PSP informs the End-User about successful onboarding and shares the DEAN associated with the End-User.

Business rules	
Individual End-User business rules	
AM-011-001	An Individual End-User can have only one DEAN.
AM-011-002	An Individual End-User can have only one offline device.
AM-011-003	Upon receipt of an onboarding request from an Individual End-User, the Pilot PSP shall check whether the Individual End-User already holds a DEAN.
AM-011-005	When opening a new DEAN upon the Individual End-User 's onboarding request, the Pilot PSP shall request a DEAN and registration of the Individual End-User in the DESP, including the mapping to itself as the corresponding Pilot PSP and including a potential User Alias.
End-to-End Process Flows	
AM-1.1	Onboarding of an Individual End-User (online and offline).
AM-1.2	Onboarding of a Business End-User (online).
AM-1.3	Eurosystem-provided app configuration and onboarding of an Individual End-User.

1.4.2.2 Lifecycle management

- FUR.24** Pilot PSPs are responsible for the lifecycle management of End-Users and for enabling an End-User to interact with the Pilot Payment Services.
- FUR.25** Pilot PSPs shall comply with the business rules and End-to-End Process Flows for the lifecycle management of an End-User as defined in this subsection.

The Pilot Payment Services on Individual End-User lifecycle includes the following features:

- manage DEAN(s) (including DEAN blocking and unblocking);
- view, register or edit profile settings such as User Alias(-es);
- enable/disable different types of notifications;
- checking digital euro balance and payment transaction history;
- block and unblock payment instruments.

**Business rules - Managing DEAN(s)****Individual End-User business rules**

AM-021-001 The Pilot PSP shall give Individual End-Users the possibility to block and unblock their DEAN. Individual End-Users can only unblock their DEAN if they have blocked it themselves (i.e. if it was not blocked by the Pilot PSP for e.g. compliance or fraud reasons).

Business rules - Viewing, registering or editing profile settings such as User Alias(-es)**Individual End-User business rules**

AM-021-002 The Pilot PSP is only allowed to register User Aliases for Individual End-Users to which it provides Pilot Payment Services.

AM-021-003 The Pilot PSP is only allowed to register User Aliases for Individual End-Users.

AM-021-004 The Pilot PSP shall give Individual End-Users the possibility to register, change or disable an User Alias. Individual End-Users can choose not to register an User Alias.

AM-021-005 Registration of an User Alias, changes to an User Alias registration and disablement of an User Alias are executed at the request of the Individual End-User.

AM-021-006 Only one User Alias can be registered per DEAN.

AM-021-007 The Pilot PSP shall verify that the User Alias provided is available to the Individual End-User.

AM-021-008 The Pilot PSP shall manage its Individual End-User's User Aliases by promptly updating, amending and deactivating them as soon as a change is required by the Individual End-User.

AM-021-009 The Pilot PSP shall ensure the correctness of the association between the User Alias and the Individual End-User's DEAN.

AM-021-010 The Pilot PSP is not permitted to use the registered User Alias(es) received as part of a payment instruction/request for any other purpose than the initiation of a payment transactions.

Business rules - Enabling/disabling different types of notifications**Individual End-User business rules**

AM-021-011 The Pilot PSP shall allow Individual End-Users to specify for which events they wish to receive at least the following notifications:

- a credit to the account linked to their DEAN
- a debit to the account linked to their DEAN
- execution of a waterfall payment transaction
- execution of a reverse waterfall payment transaction

AM-021-012 The Pilot PSP shall allow Individual End-Users to select the means of notification.

AM-021-013 The Pilot PSP shall allow Individual End-Users to modify their notification settings at any point in time.

**Business rules - Viewing and adding/removing linked commercial bank money account(s)****General business rules**

AM-020-001 The commercial bank money account to be linked to a DEAN can be any payment account held by the End-User at the same Pilot PSP which services that End-User's DEAN.

Individual End-User business rules

AM-021-014 The Pilot PSP shall allow Individual End-Users to link a commercial bank money account to their DEAN for funding and defunding purposes including waterfall and reverse waterfall (see **section 1.4.3**), either during onboarding or at any later point in time.

AM-021-015 The Pilot PSP shall allow Individual End-Users to change or remove the link to a commercial bank money account at any point in time. If the Individual End-User chooses to remove the linked payment account, all liquidity management options, including waterfall and reverse waterfall, shall be disabled as well.

Business End-User business rules

AM-022-004 The Pilot PSP shall ensure that a Business End-User links a commercial bank money account(s) to their Beta Digital Euro payment account(s) and shall allow to change the link to a payment account(s), while ensuring that a Business End-User's DEAN has a commercial bank money account linked to it at all times.

Business rules - Checking balance and payment transaction history**General business rules**

AM-020-002 For online holdings, the Pilot PSP shall inform the End-User about the current online balance and payment transaction history at the End-User's request.

Business rules - Blocking and unblocking payment instruments**Individual End-User business rules**

AM-021-017 The Pilot PSP shall give Individual End-Users the ability to block, unblock, add, or remove their payment instrument(s) (e.g., app, offline device).

AM-021-018 The Pilot PSP shall verify that the End-User reporting a stolen or lost payment instrument is indeed the authorised individual End-User of the payment instrument.

AM-021-019 The Pilot PSP shall ensure that a disabled payment instrument is not allowed to initiate or receive payment transactions, to fund or defund or to query payment transactions.

AM-021-020 The Pilot PSP shall change the status of the payment instrument from disabled to enabled when it is reported found or recovered by the authorised Individual End-User.

AM-021-021 When an offline device connects online, the Pilot PSP shall check whether the offline device has been reported lost or stolen and if so the status of the offline device shall be set as disabled.

Business End-User business rules



AM-022-005 The Pilot PSP shall give Business End-Users the possibility to block, unblock, add or remove their acceptance instrument(s) (e.g. SoftPOS terminal, payment gateway). Business End-Users can only unblock their acceptance instrument(s) if blocked on their behalf (i.e. if not blocked by the Pilot PSP for e.g. compliance or fraud reasons).

End-to-End flows

- AM-4.1.1** Individual End-User amendments (account linkage)
- AM-4.1.2** Individual End-User amendments (liquidity management settings)
- AM-4.1.3** Individual End-User amendments (online notification preferences)
- AM-4.1.4** Individual End-User amendments (offline notification preferences)
- AM-4.1.5** Individual End-User amendments (un-blocking payment instrument(s))
- AM-4.1.6** Individual End-User amendments (un-blocking DEAN)
- AM-4.1.7** Individual End-User amendments (de-activate form factors)
- AM-4.1.8** Individual End-User amendments (user data)
- AM-4.1.9** Individual End-User amendments (User Alias registration)

1.4.2.3 Offboarding of End-Users

FUR.26 Pilot PSPs are responsible for the offboarding of End-Users.

FUR.27 Pilot PSPs shall comply with the business rules and End-to-End Process Flows for the offboarding of an End-User as defined in this subsection.

The offboarding is a procedure initiated to close the End-Users' DEAN. The Pilot PSP shall be able to return the funds associated with a DEAN or an offline device to the offboarding End-User (online and offline defunding) and disable access to payment or acceptance instruments.



Figure 1-3 - High level flow for the offboarding of an End-User

Description of steps:

1. The End-User requests the Pilot PSP to be offboarded from Pilot Payment Services.



2. The Pilot PSP authenticates the End-User, locks the Beta Digital Euro payment account and payment instrument(s).
3. If the End-User's account linked to their DEAN has a positive balance (online and/or offline), the Pilot PSP sends a defunding instruction to DESP to defund the holdings (for online the defunding is triggered by the Pilot PSP, while for offline defunding is triggered by the End-User).
4. The DESP validates and defunds the End-User's holdings linked to their DEAN.
5. The DESP confirms the defunding to the Pilot PSP.
6. The Pilot PSP credits the commercial bank money account.
7. The Pilot PSP requests the DESP to close the End-User's DEAN and deactivate End-User registration.
8. The DESP deactivates the End-User registration and closes the End-User's DEAN.
9. The DESP confirms the deactivation of End-User registration and closing of the End-User's DEAN to the Pilot PSP.
10. The Pilot PSP disables Pilot Payment Services and payment instrument(s) for the offboarded End-User.
11. The Pilot PSP informs the End-User about successful offboarding.

Business rules

General business rules

- AM-040-001** End-Users can request their Pilot PSPs to be offboarded at any point in time. A Pilot PSP can only reject such a request for any of the following reason:
- the End-User's DEAN(s) is (are) blocked by the Pilot PSP for e.g. compliance or fraud reasons.

Individual End-User business rules

- AM-041-001** The Pilot PSP accepting the offboarding of an Individual End-User shall ensure that the End-User can neither receive nor send any further payment transactions and that the Individual End-User's online and/or offline holdings are defunded and offline device deactivated prior to the completion of the offboarding.

Business End-User business rules

- AM-042-001** The Pilot PSP accepting the offboarding of a Business End-User shall ensure that the Business End-User can neither receive nor send any further payment transactions and
- AM-042-002** The Pilot PSP accepting the offboarding of a Business End-User shall ensure that a DEAN for that Business End-User is maintained after closure for the purpose of processing refunds, until the formal conclusion of the pilot.



End-to-End Process Flows

AM-3.1	Offboarding of an Individual End-User (online and offline)
AM-3.2	Offboarding of a Business End-User (online)

1.4.3 Liquidity management

Pilot PSPs shall support liquidity management of End-Users within the holding limit (see **section 1.4.3.5**), supporting the full range of methods for End-Users to fund (see **section 1.4.3.1**) and defund (see **section 1.4.3.2**) their holdings.

To maximise payment convenience, an Individual End-User may choose to link the online account to a commercial bank money account to pay with Beta Digital Euro even though available holdings do not suffice (see **section 1.4.3.3**) or receive a payment transaction that would exceed the holding limit and defund the amount in excess (see **section 1.4.3.4**). In these cases, the Individual End-User has the option to set up reverse waterfall and waterfall functionalities, which requires linking an existing commercial bank money account with the online account.

Neither a commercial bank money account nor a link between such an account and the DEAN are prerequisites for Individual End-Users to receive access to Pilot Payment Services. A Business End-User shall always link the DEAN(s) to a commercial bank money account enabling (at least) the waterfall function necessary to enforce the Business End-User’s holding limit.



Figure 1-4 High level flow for a manual (de)funding operation

Description of steps:

1. The End-User initiates (de)funding of the holdings linked to their DEAN.
2. The Pilot PSP assures the End-User is authenticated and that sufficient funds are available for (de)funding.
3. The Pilot PSP sends the (de)funding instruction to the DESP.
4. The DESP validates and executes the (de)funding operation.
5. The DESP confirms completion of the (de)funding operation to the Pilot PSP.



6. The Pilot PSP confirms the (de)funding of the holdings linked to the DEAN to the End-User.

1.4.3.1 Funding

FUR.28 Pilot PSPs shall support the full range of funding functionalities for End-Users to fund their holdings.

FUR.29 Pilot PSPs shall comply with the applicable business rules and End-to-End Process Flows for funding as defined in this subsection.

The funding functionalities allow End-Users to manually fund their holdings online and offline. Funding can only be done from a commercial bank money account held at the same Pilot PSP that services the End-User’s DEAN. Manual funding from commercial bank money account shall be available 24 hours a day and on all calendar days of the year.

Offline funding

- Offline manual funding from a commercial bank money account;
- Offline manual funding from online holdings.

Manual funding from a commercial bank money account may be triggered by the End-User from any payment account held by the End-User at the same Pilot PSP that services the End-User’s DEAN.

Business rules	
General business rules	
LM-020-001	The Pilot PSP shall ensure that the manual funding functionalities from a commercial bank money account are available to End-Users on 24 hours a day and on all calendar days of the year. The linked commercial bank money account shall be held at the same Pilot PSP as the Beta Digital Euro payment account.
Individual End-User business rules	
LM-021-001	The Pilot PSP shall offer Individual End-Users the possibility to fund its offline device from online holdings. This requires the Pilot PSP to request defunding first (see section 0), followed by a funding request (see section 0).
LM-021-006	If the Individual End-User has linked a commercial bank money account to the DEAN, this linked payment account should be presented by the Pilot PSP as the default source account for manual funding.

**End-to-End flows****Online End-to-End Process Flows**

LM-1.1 Online manual funding from commercial bank money account– same Pilot PSP.

Offline End-to-End Process Flows

LM-1.8 Offline manual funding from commercial bank money account via app.

LM-1.9 Offline manual funding from online holdings via app.

1.4.3.2 Defunding

FUR.30 Pilot PSPs shall support manual defunding functionalities for End-Users to defund their holdings.

FUR.31 Pilot PSPs shall comply with the applicable business rules and End-to-End Process Flows for defunding as defined in this subsection.

Defunding functionalities allow End-Users to manually defund their holdings online and offline. Defunding can only be done to a commercial bank money account held at the same Pilot PSP that services the End-User's DEAN. Defunding functionalities to a commercial bank money account shall be available 24 hours a day and on all calendar days of the year.

Online defunding

- Online manual defunding to a commercial bank money account;

Offline defunding

- Offline manual defunding to a commercial bank money account;
- Offline manual defunding to online holdings.

Manual defunding to a commercial bank money account can be triggered by the End-User from any payment account held by the End-User at the same Pilot PSP that services the End-User's DEAN.

Business rules**General business rules**

LM-040-001 The Pilot PSP shall ensure that manual defunding functionalities to a commercial bank money account are available to End-Users 24 hours a day and on all calendar days of the year.



	The linked commercial bank money account shall be held at the same Pilot PSP as the Beta Digital Euro payment account.
LM-040-003	The Pilot PSP shall credit the End-User's commercial bank money account immediately after receiving the confirmation from DESP that the defunding instruction has been settled.
Individual End-User business rules	
LM-041-001	The Pilot PSP shall offer Individual End-Users the possibility to defund its offline holdings held in the offline device to online holdings. This requires the Pilot PSP to request defunding first (see section 0), followed by a funding request (see section 0).
LM-041-002	The Pilot PSP shall support manual defunding functionalities for Individual End-Users. Defunding shall be initiated by the End-User and processed manually, allowing the End-User to transfer Beta Digital Euro to a commercial bank money account held at the same Pilot PSP.
LM-041-004	If the Individual End-User initiates manual defunding and the defunding amount is not available on the account linked to the DEAN, the defunding process shall be aborted, and the Pilot PSP shall inform the Individual End-User.
LM-041-005	If the Individual End-User initiates manual defunding after processing an incoming payment transaction to the account linked to their DEAN, the Pilot PSP shall ensure the defunding process is completed manually, subject to the available balance on the account linked to the DEAN.
End-to-End flows	
Online End-to-End Process Flows	
LM-2.1	Online manual defunding to commercial bank money account same Pilot PSP.
Offline End-to-End Process Flows	
LM-2.10	Offline manual defunding to commercial bank money account via app.
LM-2.11	Offline manual defunding to online holdings via app.

1.4.3.3 Reverse waterfall

The reverse waterfall functionality allows an Individual End-User to automatically transfer money from the linked commercial bank money account, if holdings are not sufficient to complete a payment transaction. The activation of the reverse waterfall is mandatory for Business End-Users to enforce Business End-User's online holding limit while ensuring an adequate user experience when paying a Business End-User in Beta Digital Euro (see **section 0**).

The reverse waterfall is solely available for online payment transactions.



In case the Individual End-User does not have sufficient holdings, the reverse waterfall (if activated by the Individual End-User) will be triggered to cover for the insufficient holdings to perform the outgoing payment transactions. The check whether reverse waterfall is required is integrated into the pre-settlement validation of an online payment transactions (so called 'balance pre-check', executed by the Payer's Pilot PSP). Likewise, the settlement of reverse waterfall is fully integrated into the settlement of an online payment transactions.

If the reverse waterfall is not activated, or if it fails due to, e.g., insufficient funds on the linked commercial bank money account (within the financial agreement specified between the Individual End-User and the Pilot PSP providing the commercial bank money account), both the payment transaction and the reverse waterfall will be rejected.

Further details on the management of payment transactions can be found under **section 0**.

Business rules	
General business rules	
LM-030-001	The Pilot PSP shall ensure that the reverse waterfall functionality is available to End-Users on 24 hours a day and on all calendar days of the year.
LM-030-002	If reverse waterfall is required, the Pilot PSP shall instruct the funding of the payment transaction amount deducted from the End-User's balance.
LM-030-003	If a payment transaction including reverse waterfall fails, the Pilot PSP shall immediately reverse the debit made on the End-User's commercial bank money account.
Individual End-User business rules	
LM-031-001	The Pilot PSP shall allow Individual End-Users to activate or deactivate the reverse waterfall option.
LM-031-002	The Pilot PSP shall allow Individual End-Users to specify that the reverse waterfall can only be applied if the linked commercial bank money account holds sufficient balance, within the financial agreement specified between the Individual End-User and the Pilot PSP providing the commercial bank money account.
Business End-User business rules	
LM-032-001	The Pilot PSP shall ensure that a Business End-User has activated the reverse waterfall option at all times.
End-to-End flows	
The reverse waterfall is directly integrated into the following End-to-End flows that are part of the pre-payment transaction processing	
sTM-31	Balance pre-check Payer sub-flow.



1.4.3.4 Waterfall

FUR.32 An Individual End-User may allow automatic transfers of money to the linked commercial bank money account via a waterfall functionality if the online holding limit is reached.

FUR.33 Pilot PSPs shall comply with the applicable business rules and End-to-End Process Flows for the waterfall functionality as defined in this subsection.

The waterfall functionality allows an Individual End-User to automatically transfer money to the linked commercial bank money account, if the online holding limit is reached. The activation of the waterfall is mandatory for Business End-Users to enforce Business End-Users online holding limit when accepting payment transactions.

The waterfall functionality is solely available for online payment transactions.

In case an incoming payment transaction would exceed the End-User's holding limit, the waterfall (if activated by the End-User) will be triggered for the excess amount above the holding limit (current balance plus payment transaction amount minus holding limit). The check whether waterfall is required is integrated into the pre-settlement validation of an online payment transactions (so called 'balance pre-check' executed by Payee's Pilot PSP). Likewise, the settlement of waterfall is integrated into the settlement of an online payment transactions.

If the waterfall is not activated, or if it fails, with an incoming payment transaction exceeding the holding limit, both the payment transactions and the waterfall will not be processed.

Further details on the management of payment transactions can be found under **section 0**.

In exceptional circumstances an additional waterfall may be necessary after settlement confirmation to handle the following scenario (so-called post-settlement holding limit check):

- Incoming payment transactions 1 is received. The check is performed to verify if it would result in a breach of the holding limit. This is not the case. Waterfall is not triggered.
- Incoming payment transactions 2 is received while payment transaction 1 has not yet been settled. The check is performed to verify if it would result in a breach of the holding limit. This is not the case at this point in time. However, after settlement of incoming payment transaction 1, payment transaction 2 would breach the holding limit. Waterfall is not triggered by the standard validation. To ensure the holding limit, the additional waterfall step is performed after settlement. Further details can be found in the relevant End-to-End flows.



Business rules	
General business rules	
LM-050-001	The Pilot PSP shall ensure that the waterfall functionality is available to End- Users on 24 hours a day and on all calendar days of the year.
LM-050-002	If waterfall is required, the Pilot PSP shall instruct the defunding of the excess amount above the holding limit (current balance plus payment transactions amount minus holding limit).
LM-050-003	The Pilot PSP shall credit the End-User's commercial bank money account immediately after receiving the confirmation from DESP that the waterfall instruction has been settled.
Individual End-User business rules	
LM-051-001	The Pilot PSP shall allow Individual End-Users to activate or deactivate the waterfall option.
Business End-User business rules	
LM-052-001	The Pilot PSP shall ensure that a Business End-User has the waterfall activated at all times.
End-to-End Process Flows	
The waterfall is integrated into the (post-) payment transaction processing and is represented by the following End-to-End Process Flows:	
sTM-33	Balance pre-check Payee sub-flow
sTM-32	Post-settlement holding limit check (waterfall) sub-flow

1.4.3.5 Holding limit

FUR.34 Pilot PSPs shall comply with the business rules applicable to enforcing End-Users' holding limits as defined in this subsection.

Business rules	
General business rules	
LM-010-001	The Pilot PSP shall enforce the End-User's online holding limit.
Individual End-User business rules	
LM-011-001	At no point in time shall the total sum of Beta Digital Euro held by an Individual End-User exceed the Individual End-User's holding limit.
LM-011-002	A Beta Digital Euro Payment account linked to a DEAN owned by an Individual End-User has a holding limit assigned to it. This holding limit can never be exceeded.
LM-011-003	An offline device owned by an Individual End-User has a holding limit assigned to it. This holding limit can never be exceeded.
Business End-User business rules	



LM-012-001	A Beta Digital Euro Payment Account linked to a DEAN owned by a Business End-User has a holding limit of zero. Any online Beta Digital Euro received by a Business End-User shall be defunded via the waterfall functionality (see section 0).
LM-012-002	An offline device owned by a Business End-User has a holding limit assigned to it. Offline digital euro holdings received by a business user shall be defunded as soon as technically possible, down to the defined threshold. The Business End-User's offline device shall initiate a defunding operation towards the linked commercial bank money account as soon as a network connection is available.

1.4.4 Payment transaction management

FUR.35 Pilot PSPs shall be responsible for the payment transaction management outlining the ways of End-User's paying and receiving payments at any time (24 hours a day and on all calendar days of the year) and everywhere.

FUR.36 Pilot PSPs shall comply with the business rules applicable to the general management and processing of payment transactions as defined in this subsection.

Pilot PSPs are responsible for the payment transaction management outlining the ways of End-Users paying and receiving payments at any time (24 hours a day and on all calendar days of the year) and everywhere. This involves providing a variety of payment and acceptance instruments, such as mobile apps for Individual End-Users, and physical or virtual points of interaction for Business End-Users, like SoftPOS or e/m-commerce systems. These instruments are supported by different communication technologies (e.g. NFC, and possibly an User Alias). The Beta Digital Euro can be used in various payment transactions:

- (online and offline) P2P payment transactions (see [section 1.4.4.1](#)),
- (online) e-commerce and m-commerce payment transactions (see [section 1.4.4.2](#)), and
- (online) SoftPOS payment transactions (see [section 1.4.4.3](#) Point-of-sale payment).

Offline payment transactions occur directly between Payer and Payee devices, enforcing any relevant rules locally on the device. Since Pilot PSPs are not involved in these payment transactions, details about offline payment transactions will not be further covered in this section, except for references to the offline End-to-End Process Flows.

Online payment transactions processing depends on the payment acceptance instruments used and can fall into two categories with regard to the required interactions between the involved parties (Payer, Payee, Payer's Pilot PSP, Payee's Pilot PSP and DESP). The payment process begins when the first



request, containing payment information (and settlement details, if initiated by the Payer's Pilot PSP), reaches the DESP:

- If the initial request with payment information is sent by the Payee's Pilot PSP, it is considered a Payee-initiated payment.
- If the initial request comes from the Payer's Pilot PSP, it is a Payer-initiated payment and also includes settlement details.

A high level flow of a Payer-initiated online payment transactions using the example of a simplified P2P payment is shown in **Figure 1-5**.

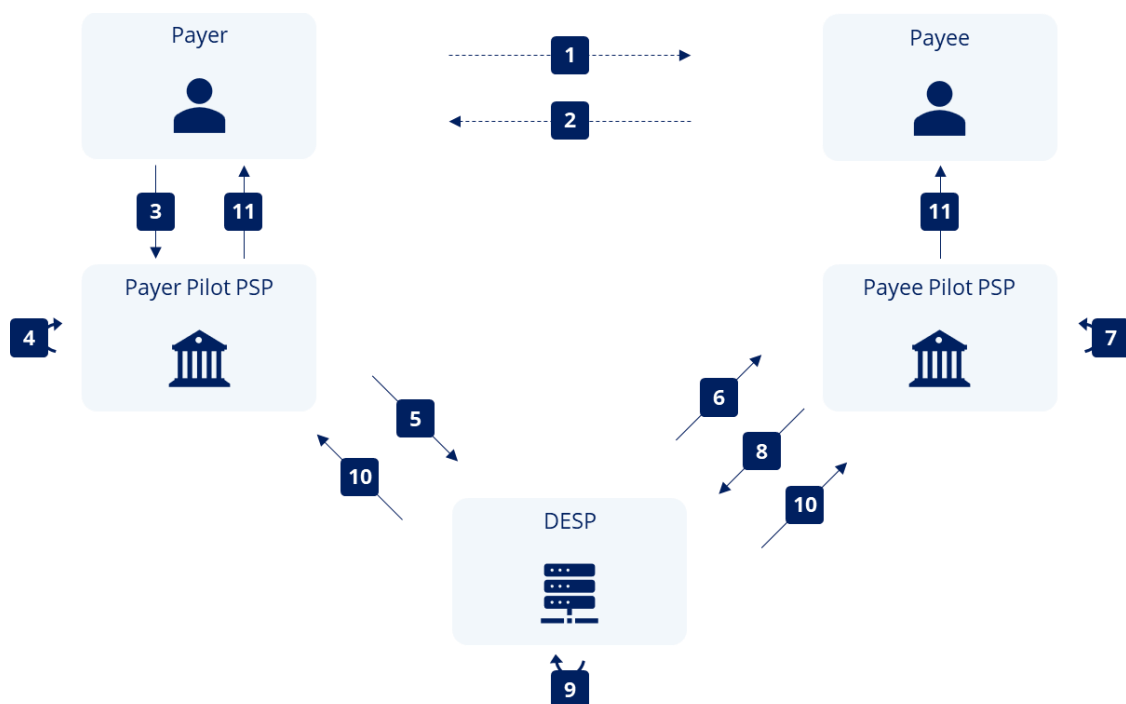


Figure 1-5 High level flow of a Payer-initiated online payment transaction - P2P payment¹

Description of steps:

1. and 2. The Payer and Payee agree on the payment details and amount (*optional depending on the payment method used*).
3. The Payer initiates the payment transactions with its Pilot PSP.
4. The Payer's Pilot PSP validates the payment transactions.
5. The Payer's Pilot PSP submits the payment transactions to the DESP.

¹ A payment transaction might involve the initiation of both reverse waterfall on payer's side and waterfall on payee's side as well as different Pilot PSP(s) in case the Pilot PSP(s) providing the DEAN(s) and the Pilot PSP(s) providing the commercial bank money account(s) are not the same.



6. The DESP forwards the payment transactions to the Payee's Pilot PSP for validation.
7. The Payee's Pilot PSP validates the payment transactions.
8. The Payee's Pilot PSP sends the validation response to the DESP.
9. The DESP initiates the settlement instruction, after the involved Pilot PSPs have confirmed and provided the settlement information, and settles the payment transaction.
10. The DESP confirms the settlement to the involved Pilot PSPs.
11. The involved Pilot PSPs confirm the settlement to the Payer and the Payee respectively.

A high level flow of a Payee-initiated online payment transactions using the example of a simplified SoftPOS payment is shown in **Figure 1-6**.

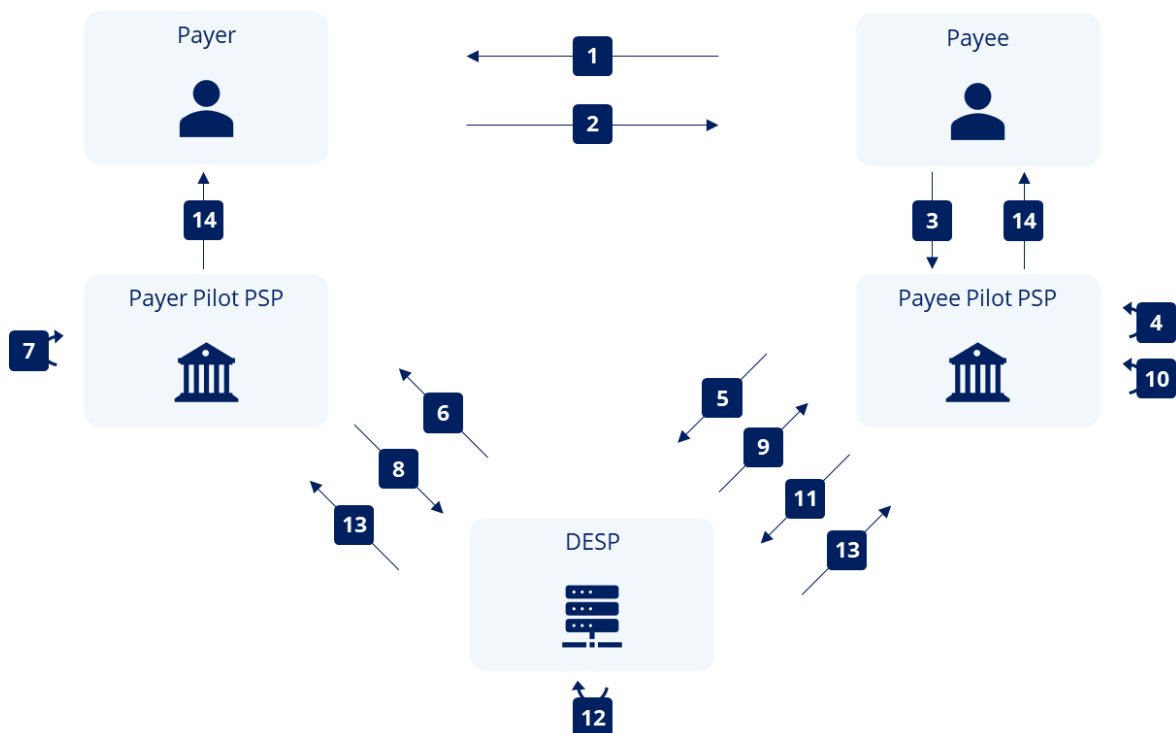


Figure 1-6 High level flow of a Payee-initiated online payment transaction – SoftPOS payment²

Description of steps:

1. The Payee presents the amount payable to the Payer at the SoftPOS.
2. The Payer verifies the payment by authenticating and presenting the payment instrument.

² A payment transaction might involve the initiation of both reverse waterfall on payer's side and waterfall on payee's side (compulsory for Business End-Users) as well as different Pilot PSP(s) in case the Pilot PSP(s) providing the DEAN(s) and the Pilot PSP(s) providing the commercial bank money account(s) are not the same.



3. The Payee initiates the payment authorisation request, including consent details with its Pilot PSP.
4. The Payee's Pilot PSP validates the payment authorisation request.
5. The Payee's Pilot PSP submits the payment authorisation validation request to the DESP.
6. The DESP forwards the payment authorisation validation request to the Payer's Pilot PSP for validation.
7. The Payer's Pilot PSP validates payment authorisation validation request.
8. The Payer's PSP submits the payment transaction to the DESP.
9. The DESP forwards the payment transaction to the Payee's PSP for validation.
10. The Payee's PSP validates the payment transaction.
11. The Payee's PSP sends the validation response to the DESP.
12. The DESP initiates the settlement instruction, after the involved PSPs have confirmed and provided the settlement information, and settles the payment transaction.
13. The DESP confirms the settlement to the involved PSPs.
14. The involved PSPs confirm the settlement to the Payer and the Payee respectively.

The business rules applicable to the general management and processing of payment transactions are included in the box below.

Business rules	
General business rules	
TM-000-001	The Pilot PSP shall ensure that paying and receiving payments in Beta Digital Euro is possible for End-Users on 24 hours a day and on all calendar days of the year.
TM-000-002	The Pilot PSP shall perform validations of payment transactions (including funding/defunding).
TM-000-003	If the Pilot PSP rejects a payment transactions from its End-User or receives a rejection notification from DESP, the Pilot PSP shall ensure that reason for the reject is communicated in a clear and easy to understand manner to the End-User.
TM-000-004	Upon receipt of the settlement confirmation from the DESP, the Pilot PSP immediately updates the End-User balance and notifies the End-User in accordance with the End-User's notification preferences (see section 0).
TM-000-005	The Payer Pilot PSP shall verify that the Payer either <ul style="list-style-type: none">• holds sufficient Beta Digital Euro to complete the payment transactions, or



	<ul style="list-style-type: none"> has a linked commercial bank money account which holds sufficient balance to compensate for the insufficient holdings, within the agreement specified between the End-User and the Pilot PSP providing the commercial bank money account, and has activated the reverse waterfall option (see section 0).
TM-000-006	The Pilot PSP submitting a payment transactions to the DESP shall ensure that at least one party that is to be debited (Payer) or credited (Payee) in the payment transaction is an Individual End-User.
TM-000-007	The Payer's Pilot PSP shall accept all payment transactions received from either DESP or the Payer that for processing, unless the identified Payer account is closed, invalid or being monitored for suspected fraudulent or other illegal activity.
TM-000-008	The Payee's Pilot PSP shall accept all payment transactions received from either DESP or the Payee for processing, unless the identified Payee account is closed, invalid or being monitored for suspected fraudulent or other illegal activity.
TM-000-009	The Pilot PSP shall make the status/result of a payment transactions known to its End-User immediately.
TM-000-010	Payment transactions cannot be cancelled once sent to the DESP.
Individual End-User business rules	
TM-001-001	<p>If the Payee is an Individual End-User, the Payee's Pilot PSP shall verify that the payment transactions either;</p> <ul style="list-style-type: none"> would not result in the Payee's balance exceeding the holding limit, or would result in the triggering of the waterfall mechanism, if activated (see section 0).
TM-001-002	If the Payee is an Individual End-User and the Payee does not have a linked commercial bank money account with an activated waterfall option, the Payee's Pilot PSP shall reject any further incoming payment transactions while an incoming payment transaction is still being processed.
Business End-User business rules	
TM-002-001	If the Payee is a Business End-User, the Payee's Pilot PSP shall trigger the waterfall mechanism upon receipt of each incoming payment transactions (see section 0).

1.4.4.1 Person-to-Person payment

FUR.37 Individual End-Users may use the Beta Digital Euro for initiating one-off P2P payment transactions.



FUR.38 Pilot PSPs shall comply with the End-to-End Process Flows for P2P payment transactions as stated in this subsection.

End-to-End Process Flows	
Online End-to-End Process Flows (Payer-initiated)	
TM-3.5	P2P payment with User Alias (Payer-initiated).
TM-3.10	P2P Account to account payment with DEAN (Payer-initiated) – same PSP.
Offline End-to-End Process Flows	
TM-3.4	Offline contactless P2P payment.

1.4.4.2 E-commerce or m-commerce payment

FUR.39 Individual End-Users and Business End-Users may use the Beta Digital Euro for initiating one-off e-commerce and m-commerce payment transactions.

FUR.40 Pilot PSPs shall comply with the End-to-End Process Flows for e-commerce/m-commerce payment transactions as stated in this subsection.

End-to-End Process Flows	
Online End-to-End Process Flows (Payer-initiated)	
TM-2.4	M-Commerce payment (in-app).
Online End-to-End flows (Payee-initiated)	
TM-2.2	E-commerce payment with User Alias or DEAN.

1.4.4.3 Point-of-sale payment

FUR.41 Individual End-Users and Business End-Users may use the Beta Digital Euro for initiating one-off SoftPOS payment transactions.

FUR.42 Pilot PSPs shall comply with the End-to-End Process Flows for SoftPOS payment transactions as stated in this subsection.

End-to-End Process Flows	
Online End-to-End Process Flows (Payee-initiated)	
TM-1.6	Online contactless SoftPOS payment.



1.4.4.4 Refund

FUR.43 Business End-Users may use the Beta Digital Euro for initiating refunds.

FUR.44 Pilot PSPs shall comply with the business rules and End-to-End Process Flows for a refund as stated in this subsection.

Business End-Users may use the Beta Digital Euro for initiating refunds. Refunds might be initiated online via the e-commerce website or the m-commerce app.

Business rules	
General business rules	
TM-060-001	The Payee's Pilot PSP is not allowed to request decoding of the Payer's details received as part of a refund.
Individual End-User business rules	
	When the Payer's Pilot PSP receives a refund, it shall verify that the refund either
TM-061-001	<ul style="list-style-type: none">would not result in the Individual End-User's balance exceedance of the holding limit, orwould result in the triggering of the waterfall mechanism (see section 0).
Business End-User business rules	
TM-062-001	When initiating a refund, the Payee's Pilot PSP shall ensure that the refund relates to an original payment transaction that has already been settled.
End-to-End flows	
Online End-to-End Process Flows (Payee-initiated)	
TM-7.2	Refund (e-commerce)