BS EN 50523-1:2009

BSI British Standards

Household appliances interworking —

Part 1: Functional specification

National foreword

This British Standard is the UK implementation of EN 50523-1:2009.

The UK participation in its preparation was entrusted to Technical Committee CPL/59, Performance of household electrical appliances.

A list of organizations represented on this committee can be obtained on request to its secretary.

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Interfonctionnement des appareils électrodomestiques - Partie 1: Spécifications fonctionnelles

Geräte für den Hausgebrauch - Interworking - Teil 1: Funktionsspezifikation

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CENELEC

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Foreword

This European Standard was prepared by the WG 7 of Technical Committee CENELEC TC 59X, Consumer information related to household electrical appliances.

The text of the draft was submitted to the formal vote and was approved by CENELEC as EN 50523-1 on 2009-06-01.

The following dates were fixed:

– latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2010-06-01
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The Working Group CLC/TC 59X/WG 7, Smart house, was initiated by CECED and installed by the decision of the CLC/TC 59 meeting on 2004-09-14/15.

This European Standard has been based on documents developed and provided by the CECED Convergence Working Group.

This Part 1 of EN 50523 defines the interoperability requirements for installation, control and monitoring of household appliances.

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Introduction

The objective of this European Standard is to specify how sets of products from multiple manufacturers are able to interoperate and be installed with or without the use of a special tool, in the most automatic manner. By meeting this standard, future household appliances will be able to enjoy a significantly larger market.

Figure 1 shows what it takes to obtain interworking between household appliances:

- the Household Appliances Interworking standard. It is highly independent of the underlying protocol;
- a protocol for communication between devices in the home;
- a mapping scheme from the Household Appliances Interworking standard to each selected protocol.

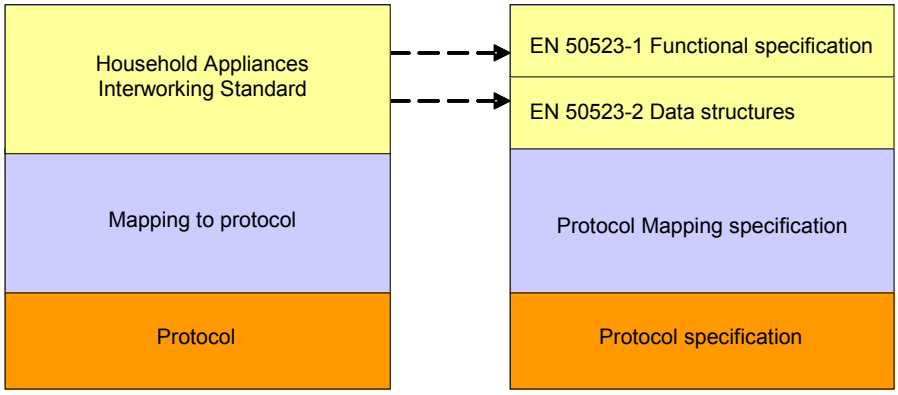

Figure 1 – Dependencies of interworking

EN 50523-1 defines the functionality required for appliances to ensure interoperability.

EN 50523-2 defines the data structures used to implement the interoperable functionality.

The Protocol Mapping specification is a document that describes the mapping of the defined interoperable functionality in terms of a selected protocol that satisfies the requirements of EN 50523-1.

The Protocol specification defines a communication protocol suitable for communication between devices in the home.

1 Scope

This European Standard focuses on interworking of household appliances and describes the necessary control and monitoring. It defines a set of functions of household and similar electrical appliances which are connected together and to other devices by a network in the home.

This European Standard does not deal with safety requirements.

2 Terms, definitions and abbreviations

2.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1.1
domain address
identification of a logical network on an open network such as power-line. Domain addresses are used in a frame to insulate it from neighbouring networks

2.1.2
house address
see definition 2.1.1 for domain address

2.1.3
network address
identification of a device in a network

2.1.4
fixed addressing scheme
fixed addressing schemes are used when the network address is a unique identification assigned through an agreement between manufacturers so that no two communicating devices have the same identification, hence the same address

2.1.5
communication link
logical application link between two devices exchanging messages

2.1.6
installation
installation of all networked devices within a given home unit

2.1.7
configuration data
set of data including network protocol data (domain address and network address) and communication link data

2.1.8
message
application message

2.1.9
local control
direct control of a device through its panel

2.1.10
remote control
control of device through a network

2.1.11
indoor remote control
control of device from a device connected to the home network

2.1.12
outdoor remote control
control of device from a device connected to a residential gateway itself connected to the home network

2.1.13
enable / disable remote control
authorisation to control a device through a network

2.1.14
Functional Block
logical grouping of device functions. Consists of one or more functions that belong together and that cannot be separated across two devices. A Functional Block has a well-defined black-box behaviour

2.1.15
wet white goods
washing machine, dish washer, tumble dryer

2.1.16
hot white goods
oven, hobs, hood

2.1.17
cold white goods
refrigerator, freezer, refrigerator-freezer, winecabinet

2.1.18
air conditioner
this document refers to HVAC mobile devices which can be directly installed by the consumer

2.1.19
water heater
storage water heater (boiler) or instantaneous water heater

2.1.20
short time
term used to identify short-length time period in messaging and installation procedures. Equal to 5 s

2.1.21
medium time
term used to identify medium-length time period in messaging and installation procedures. Equal to 30 s

2.1.22
long time
term used to identify long-length time period in messaging and installation procedures. More than 30 s

2.1.23
home controller
home controller is a controller providing the capability for remote control on the household appliances

2.1.24
residential gateway
residential gateway is a home controller providing also internet access. It usually provides also the capability for remote control on the household appliances from networks outside the home. Also referred as gateway in this document

2.2 Abbreviations

For the purposes of this document, the abbreviations included in Table 1 apply.

Table 1 – Abbreviations

AC	HVAC mobile device Air Conditioner
DW	Dishwasher
FB	Functional Block
FR	Refrigerator-Freezer
FZ	Freezer
CB	Combi
GO	Gas Oven
GT	Gas Cooktop
HB	Hobs
HBES	Home and Building Electronic Systems
HD	Hood
HVAC	Heating, Ventilation, Air Conditioning
IH	Induction Hobs
MID	Message Interaction Descriptor
MW	Microwave Oven
OID	[Communication] Object Identifier
OV	Electric Oven
RE	Refrigerator
RG	Range Cooker
ST	Steam Oven
TD	Tumble Dryer
WC	Winecabinet
WD	Washer Dryer
WG	White Good, appliance, white good appliance, household appliance
WHI	Instantaneous Water Heater
WHS	Storage Water Heater
WM	Washing Machine

3 Installation of a system

3.1 Definitions

3.1.1 Phases of Installation

Installation of WG appliances with home networking capability consists of two main phases:

- initialising specific network protocol data:
  - **house address** or **domain address**. This value is used on open media (e.g. power-line or RF) to recognise network messages within the same home unit. It is necessary to make sure appliances do not receive messages coming from different homes;
  - **network address** of the appliance being installed. A network address serves as a "unique" identifier for an appliance on a network. Appliances can determine the addresses of other appliances on the network and use these addresses to send messages to each other;
- initialising **communication links data**, basically consisting of the network address of remote devices.

3.1.2 Plug & Play Installation

An installation which is fully automatic, i.e. which does not require user intervention is said to **Plug & Play**.

3.1.3 Plug, Touch & Play Installation

An installation, which is based on a limited sequence of simple user actions (i.e. **Plug, Touch & Play**).

3.2 Rationale for Installation in WG Appliances

3.2.1 Installation Approach for Household Appliances

In general, it is expected that WG appliances installation will be simple, protected and secure. The installation procedures should be such that the user without the intervention of a specialised installer can perform it. In particular, it could be either fully automatic (i.e. Plug & Play), or explicitly started and handled in a simple way by the user, for example using a combination of buttons to start the procedure and relying on some LED feedback (i.e. Plug, Touch & Play).

The limited sequence of user actions will typically be used for two purposes:

- getting the domain address. To this end, a touch sequence or another interaction will be typically available to the user. The objective of the touch sequence is to direct another appliance to provide the domain address information. In principle any already installed appliance can provide this information. In practice, a dedicated appliance such as a gateway will be used for this purpose;
- handling the case of more than one WG appliance of the same type in the same home (e.g. two washing machines). When such a case happens, there is a need to distinguish the appliances from a networking point of view, in order to allow a home controller to access individually. This function is called "Instance Identification". To this end, a touch sequence will be typically available to the user or another mechanism in order to indicate it.

The figure below shows the interactions which are expected during installation. To achieve installation, the appliance is interacting with another cooperating device. It will be involved in four phases, shown in rectangles:

1) getting the domain address;
2) automatic installation phase;
3) optional instance identification;
4) providing installation feedback.

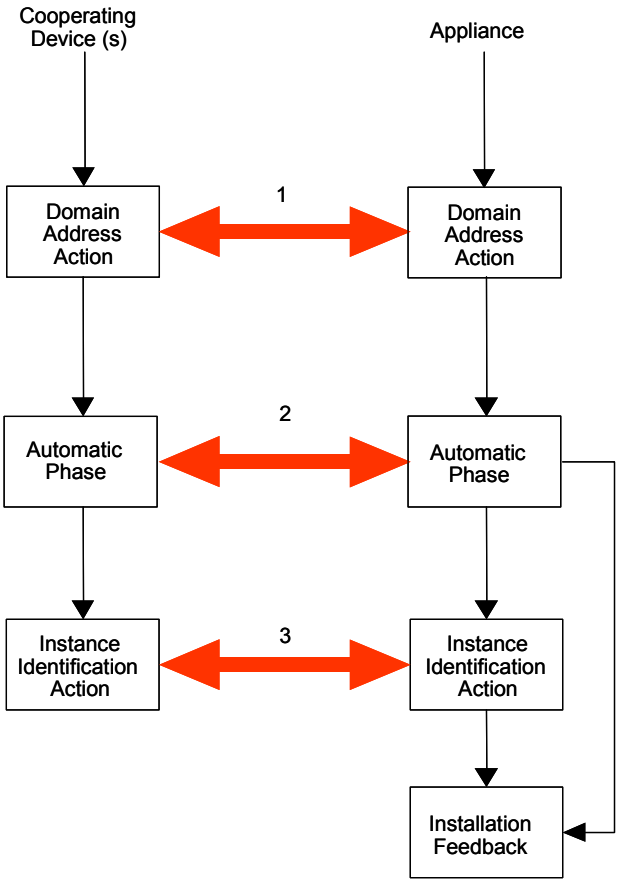

Figure 2 – Expected Interactions during Installation

The implementation of these four phases is completely open to the manufacturer. It is recommended that

- the sequence of actions to get the domain address should conform to the related protocol (interaction 1 in Figure 2),
- the automatic part should conform to the related protocol (interaction 2 in Figure 2). Note that the figure was simplified as the automatic procedure could also take place before and after the sequence of actions,
- the section of actions to implement instance identification should conform to the related protocol (interaction 3 in Figure 2),
- the semantics of the feedback display should conform to the semantics of the installation protocol.

Therefore, it is expected that in practice there will still be many different approaches used for installation:

- the way to accomplish the installation actions at the level of the appliance could change from one appliance to another, as long as the objective of such actions and the related protocol are the same (e.g. a different combination of touch buttons is used);
- the actions to take at the level of other devices could be very different. They could involve different devices from one installation to another (e.g. a specific controlling device with a user interface, a gateway with specific installation buttons, a specific temporary tool), as long as the achieved objective and the involved protocol are the same. For instance, it is possible that within the home system an Installer device can be used to supervise installation and operations of other appliances. This specific device could then be responsible for domain address provision, for the handling of multiple appliances of the same kind (for example two washing machines on the same system). It could further support some routine to verify that a new appliance is not installed on different or wrong environments (for example an appliance being installed on the neighbour system).

Consequently, even though user intervention could be different for each manufacturer, it should use the same network management protocol. This will ensure that interoperability can be insured.

3.2.2 Constraints

It is expected that a number of constraints related to installation procedures will be typically met in order to put Household Appliances with networking capability on the market.

- Appliances with networking capability should also work even when they are used as autonomous system without communication during their lifetime. The transition from and to autonomous modes must be transparent to the user and should not require user interventions.

- Installation procedures
  - should not depend on specific communication technology aspects,
  - should be clearly presented (for instance in the case of combination of buttons),
  - should allow the manufacturer to be free in the choice in their implementation,
  - should support domain address acquisition. Without this capability, a filter separating communication would be needed in each home [1)],
  - should give a chance to every appliance to be linked,
  - should have a duration that is minimised,
  - should take into account appliances that may be switched off (such as washing machines).

- User interfaces for installation procedures
  - should be easily accessible,
  - should have minimised costs. As an example, a solution based on one push button and one LED seems to be correct from the point of view of the price.

- Regular checking of communication links integrity is expected in order to maintain consistent configuration data upon events such as appliance removal, switch on or communication failure (note that it is not obvious to distinguish such events). This point is particularly difficult because it is application related and therefore seems to be difficult to standardise.

3.3 Key Installation Events and related User Functions

Household Appliance installation procedures shall follow a common scenario and common rules. More precisely, the procedures shall be described through the same list of key events concerning the whole installation. Each key event shall be associated with user functions.

The following table defines the key events concerning the whole installation.

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1) Even then, cross talking could happen.

Table 2 – Key Installation Events

Key event	Description
First installation	First time communicating appliances are installed in a home. For instance, a gateway and a washing machine are installed.
Power Up	Powering up one or several appliances (e.g. powering up the whole installation after power failure).
Appliance is added	A new appliance is added to the home installation. In some cases the appliance could have been used in an autonomous mode (i.e. without networking capability) for some time.
Appliance is removed	An existing appliance is removed from the home installation (this could be because the appliance is physically removed or because the appliance gets back in an autonomous mode without networking capability).
Appliance Re-installation	Part of the installation is re-installed.
Re-installation	The whole home installation is re-installed.
De-installation	The home installation is de-installed. This could take place when persons are moving out from their home.
Monitoring of Communication Links	A verification of the communication links is performed.

The following user functions in Table 3 are associated with each key event. In the following configuration, data refer to network protocol data and configuration links data.

Table 3 – User Functions associated with Key Installation Events

Key event	User function
First installation	**Installation creation** The overall installation is created and personalised (i.e. a domain address is assigned). An installation feedback is provided to the user.
	Communication function is enabled with optional feedback to the user.
Power Up	**Automatic power up verification** After power up of one or several appliances, a short automatic start-up phase takes place, involving the verification of its configuration.
Appliance is added	**Adding an appliance** The installation configuration is updated with a new communicating appliance (i.e. configuration data of appliances are updated).
Appliance is removed	**Removing an appliance** The installation configuration is updated to take into account removal (i.e. configuration data of appliances are updated).
Re-installation	**Re-installation** Network configuration data is changed in all the appliances or in a subset (i.e. get domain address and dependent data).
De-installation	**De-installation** Network configuration data are removed from all appliances in the installation (i.e. remove domain address and dependent data).
Monitoring of the Communication links	**Verification of configuration data** Configuration data are verified.
	Removing a specific communication link In some cases, communication links might be considered as frozen once they are set (this would be the case of an appliance that is usually switched off). It is therefore necessary to specifically indicate when an actual removal has taken place (e.g. with an appliance that is switched off).

3.4 Guidelines on Installation Procedures

3.4.1 Requirements

The following requirements are defined concerning installation procedures.

- Requirements on user functions. The following user functions shall be supported:
  - installation creation;
  - communication function enabling;
  - automatic power up verification;
  - adding an appliance;
  - removing an appliance;
  - re-installation;
  - de-installation;
  - verification of configuration data;
  - removing a communication link.

- Requirements on installation actions. While each manufacturer will have the choice of their implementations, such actions shall use as many existing elements of appliances as possible (e.g. button, LED), except if the desired element does not exist. The minimum shall be the following: one Boolean actuator such as a button (to perform the actions) and one Boolean display LED (to visualise the status). Note that using a combination of buttons is considered reasonable.

- Requirements on feedback. The display of the status of each WG appliance in terms of installation shall be mandatory. Each manufacturer will have the choice of its implementation.

- Requirements at the interworking level. WG appliances shall interwork at the installation level.

- Requirements at the installation level. Installers will have the choice of the installation scheme in terms of involved devices, installation action and user interface. The minimum shall be an installation without any tool.

3.4.2 Installation Functions

Installation functions are the procedures required to carry out user functions. Two types of such procedures are defined:

- automatic: These procedures shall be supported by the network management part of the underlying protocol as shown in Figure 2. As a result, this document only provides a functional description of these procedures, while the protocol part is being described in specification documents related to the selected underlying protocol.

- user: These procedures involve user action and a protocol part. Similarly to automatic procedures, the automatic part of the user procedures shall be supported by the network management part of the underlying protocol. The user action part shall be supported by the WG appliances through an appropriate interface.

Installation functions are defined in the table below.

Table 4 – Installation Functions

Installation Function	Profile	Description
Domain Address Acquisition	Required in an open medium	The objective of the Domain Address Acquisition is to obtain the domain address value. This function requires a server device to provide the domain address value. It is not foreseen that WG appliances have this capability. It shall be assumed that gateway devices or home controller devices will have this capability. It is possible to have more than one domain address server in the network. This situation occurs when, for example, both gateway and home controller are present as two separate devices. Only one of them shall enter into domain address server mode. This function may involve the following user action: • action on the WG appliance to get into the domain address acquisition phase.
Registration	Required except if a fixed addressing scheme is used	The objective of this function is to assign automatically a network address to the WG appliance when it is installed for the first time. This function is invoked once the domain address requirement has been completed. This function is not necessary in fixed addressing schemes where the network address is a unique identification assigned through an agreement between manufacturers so that no two communicating devices have the same identification, hence the same address.
Registration verification	Required except if a fixed addressing scheme is used	This function is used when an appliance has already been installed and is switched on. The objective of this function is to verify that the appliance network address is still valid. In case it has been reused by another appliance, the registration function is executed again. This function is not necessary in fixed addressing schemes, as in the case of the Registration function above.
Enrolment	Required	The objective of this function is to automatically create the communication links of the WG appliance. This function takes place when the involved appliances, already registered are available.
Enrolment verification	Required	The objective of this function is to automatically verify that a communication link is valid. Because some appliances can be switched off for a long time, it shall also be possible that the application part of the appliance specify to the network management part that a link does not need to be verified.
Instance Identification	Application requirement	The objective of this function is to distinguish and/or locate two appliances of the same type. This function could involve a user action: • identification action on the WG appliance upon request by a controller. Examples are: - the user is asked to switch on one appliance at a time; - the user is asked to switch off a particular appliance.
Appliance de-installation	Application requirement	The objective of this function is to remove all configuration data (domain address, network address and communication links) from the appliance. This function could involve user actions: • action on the WG appliance to remove all configuration data. In such case, the electronic of the WG appliance must be powered on. For instance, a button could be pressed with a needle. Note that the domain address acquisition and appliance de-installation user action could be the same
Communication link removal	Optional	The objective of this function is to remove a specific configuration link to an appliance. This function could involve a user action.

NOTE 1 Communication link removal is likely to be more important at the level of home controllers rather than at the level of appliances, as in general most WG appliances will be linked to always on devices.

NOTE 2 Communication link removal is a very specific system procedure, which can be useful at the controlling device level (for instance a gateway with human interface capability). This is the reason, why this procedure is optional. Further the appliance removal user procedure can be used.

3.4.3 Installation Functions Involved in User Functions

Table 5 shows the list of Installation Functions which are associated with each User Function.

Table 5 – Installation functions involved in User Functions

User Function	Installation Functions
Installation creation The overall installation is created and personalised (i.e. a domain address is assigned).	For each new appliance: • **Domain Address Acquisition** • **Registration** • **Enrolment** • **Instance Identification** (optional)
Communication function is enabled with optional feedback to the user.	For each new appliance: • **Application specific procedure**
Automatic power up verification After power up of an appliance, a short automatic start-up phase takes place involving the verification of its configuration.	For powered up appliance: • **Registration Verification** • **Enrolment Verification**
Adding an appliance The installation configuration is updated with a new communicating appliance (i.e. configuration data of appliances are updated).	For new appliance N: • **Domain Address Acquisition** • **Registration** • **Enrolment** • **Instance Identification** (optional) For appliances interacting with N: • **Enrolment** • **Instance Identification** (optional)
Removing an appliance The installation configuration is updated to take into account removal (i.e. configuration data of appliances are updated).	For Appliance N that is removed: • **Appliance de-installation** For appliances interacting with N: • **Enrolment verification** • **Configuration removal** (optional)
Re-installation Network configuration data are changed in all the appliances or in a subset.	For all appliances: • **Appliance de-installation** (optional) • **Domain Address Acquisition** • **Registration** • **Enrolment** • **Instance Identification** (optional)
De-installation Network configuration data are removed from all appliances in the installation.	For all appliances: • **Appliance de-installation**
Verification of configuration data Configuration data are verified.	For appliances performing configuration verification: • **Enrolment verification**
Removing a communication link Configuration data may be frozen.	For appliances participating in the communication link: • **Communication link removal**

Figure 3 shows the interactions which take place with the Appliance during installation.

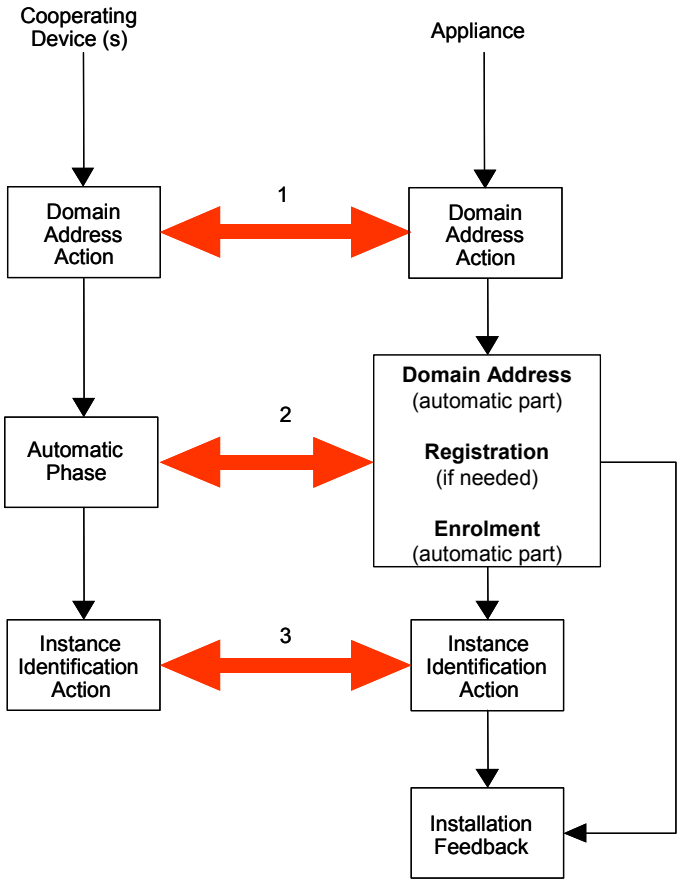


Figure 3 – Interactions during Installation

Figure 4 shows the interactions which take place with the appliance upon switching it on after installation.

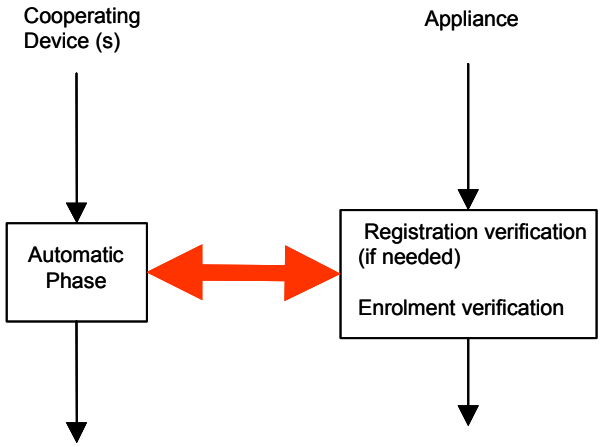


Figure 4 – Interactions upon Switch On

4 Household Appliances Application Domain

4.1 Application Scenario

The following figure depicts a typical network configuration in the home.

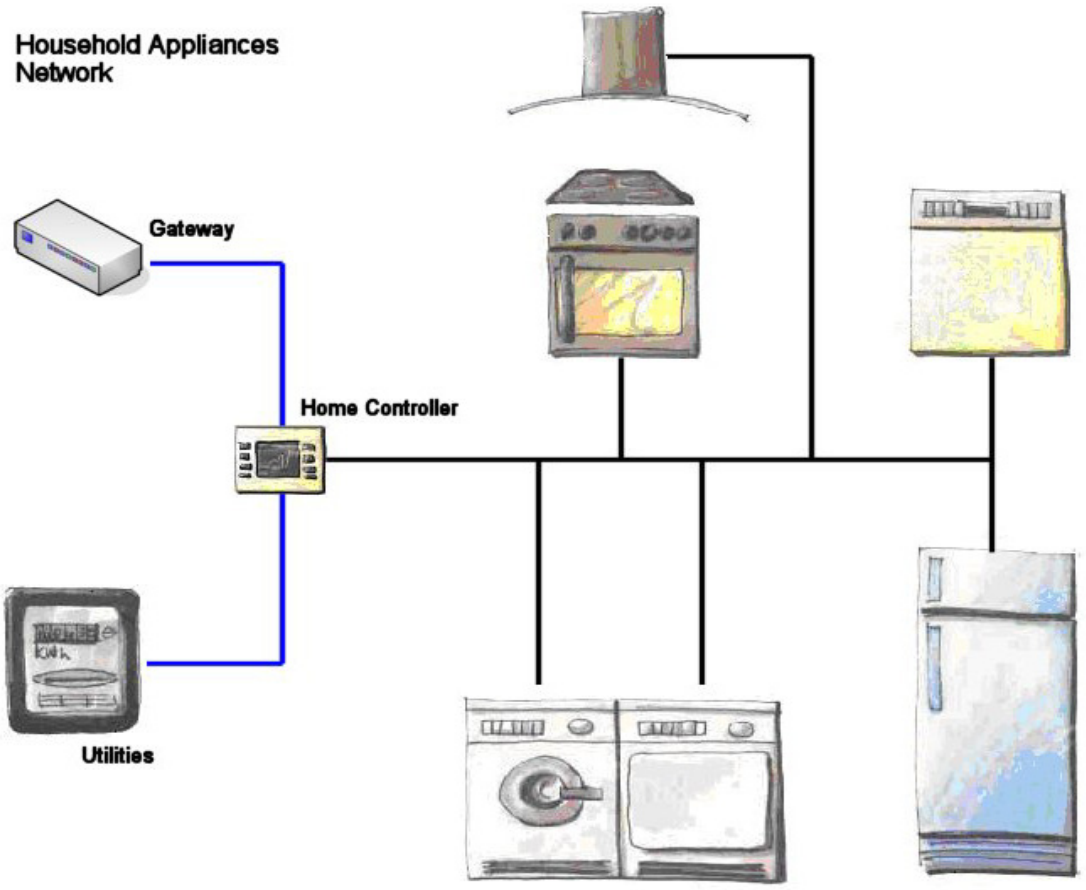


Figure 5 – Example of Household Appliances Installation System

The following devices are involved:

- household appliances: hob, gas cooktop, electric oven, refrigerator-freezer, dishwasher, washing machine and tumble dryer;
- other devices: a home controller with a display, an electricity meter and a residential gateway.

With this configuration, the following functions could be provided:

- the controller with a display is used to control the Household Appliances devices. It is also used to provide time and date value;
- alert events (e.g. refrigerator door open) are sent to the controller;
- the electricity meter provides tariff information to the Household Appliances devices;
- the residential gateway can be used to remotely access the system.

4.2 Access Rights for Control Modes

All appliances shall have an **Enable Remote Control** and **Disable Remote Control** capability. When the remote control capability is disabled, then the set of basic messages to control remotely Household Appliances are not authorised. When the remote control capability is enabled, then they are authorised, except when there are safety reasons.

The implementation of the enabling and disabling capability depends on manufacturer decisions. It could be a switch, or it could be a selection operation.

This standard allows for concurrent access to a Household Appliances device (i.e. two remote devices send the same command to the household appliance). It is up to the appliance to decide on the policy to apply. To help the development of indoor and outdoor controllers, referring to the problems that could arise in the concurrent access of an appliance, the appliance can inform the remote device also about a temporary unavailability of the remote control.

Additional level of access rights can be defined in the future, depending in particular on safety and privacy issues:

- different rights could be associated with indoor remote control and outdoor remote control. Remote outdoor devices will have to use a non-dependable external communication link in terms of access security. Note that remote outdoor control has an impact on gateways, which are assumed to take into account proper access verification mechanisms;

- different rights could also be defined depending on whether the controlling device is visible or audible.

It is possible that a remotely initiated action can be completed locally and vice versa if the enable condition is set. As a general rule, local action has priority to remote action.

When a remote user is operating an appliance simultaneously with a local user, consistency problems might arise. To avoid (or simplify) this situation, it is recommended to lock the operation for other users while one user is operating.

EXAMPLE Example of simultaneous use by remote and local user.

- When the remote user is interacting with the appliance, temporarily lock the local user panel for (default value) 0,5 s.

- When the local user is interacting with the appliance, temporarily lock the remote UI for (default value) 30 s.

Please note the substantial difference in the proposed values. This is to prioritise the local user, and to let a local user finish a typical user interaction possibly consisting of several interactions (e.g. pushing three buttons). The values of the locking time are strictly up to the different appliances or manufacturers, and the values mentioned above are just illustrative.

It is assumed that conflicts created by having multiple remote users competing for the control of household appliances are handled outside the household appliance level (e.g. it could be the responsibility of a residential gateway).

4.3 Types of Appliances

Household appliances can be categorised as follows.

- **Basic appliances:** Such appliances have distinctive, unique characteristic elements which identify them completely. Basic appliances are Washing Machines, Tumble Dryers, Dishwashers, Microwave Ovens, Electric Ovens, Gas Cooktop, Gas Oven, Refrigerators, Freezers, Winecabinets, Hobs, Induction Hobs, Instantaneous Water Heaters and Storage Water Heaters. At the network level, a basic appliance has a single network address.

- **Complex Appliances:** Such appliances consist of the integration of functional elements available in Basic Appliances in such a way that it is not possible to identify the separate Basic Appliances. Examples of complex appliances are Refrigerator-Freezers, Washer-Dryers, Microwave/Electric Ovens. At the network level, a complex appliance has a single network address.

- **Combis:** Such appliances result from the combination of Basic appliances and/or Complex Appliances which are each individually controlled and monitored, and the addition of further common functions such as a user interface, common commands (e.g. START or STOP for the entire Combi), common load management, common time management, common identification. Examples of Combis are Washing centres, Cooking centres, Cooling devices with independent cavities. At the network level, a Combi has several addresses, one per individual element, as well as one to address the common part.

- **Unions:** Such appliances are the union of Basic appliances and/or Complex Appliances which are each individually controlled and monitored with no addition of common functions. Examples of such appliances are multiple functional gateways, multiple hobs. At the network level, a union has several addresses, one per individual element.

5 Household Appliances Interworking

5.1 Concepts and Rules for Interworking

5.1.1 Interworking Concepts

5.1.1.1 Concepts

The following table describes the concepts used by this standard to achieve household appliances interworking.

Table 6 – Application Interworking Concepts

Concepts	Description
Household appliances interact through **messages.**	The purpose of this document is to define the content, format and semantics of these messages. For instance a controller will be able to interact with a washing machine to start it.
Each message corresponds to an **operation** applied to a **communication object,** possibly with some **data**.	For instance the "individual send" operation applied to the "temperature" communication object would allow an appliance to transmit its temperature to another device.
A communication object is also called **Object Id** (**OID**).	The term object is meant to be consistent with the object concept used in programming languages: one of the interacting devices has to support/implement an object. (e.g. temperature object) through a number of methods (called here operations).
An OID is either managed by a household appliance or by the device which interacts with the household appliance.	For instance a Temperature OID could be managed by the Electric Oven, and read by a controller device. Or a Time OID could be managed by a clock device, and read by household appliances
An OID is associated with **OID Data** which have specific data structure.	
The structure of OID Data is composed of data **Fields**.	For instance Temperature OID data contain only one Field, which is the temperature value. Basic Id OID contains four data Fields. Extended Id OID contains eleven data Fields.
An OID may provide access to • the full Data, or • a data Field (in this case a **Field Id** is used for the identification of each Field). **OIDs will provide access only to the full OID Data structure, unless otherwise specified in the specification of the OID.**	Basic ID OID data Fields may not be accessed separately. Extended ID OID data Fields may be accessed only separately. Each Field of the Extended ID OID is identified by a Field id and accessed separately. At this version only the Extended ID OID supports separate access to data Fields.

Table 6 – Application Interworking Concepts *(continued)*

Concepts	Description
Operations consist of • one **primitive** (change value, send value, get value, return value), • an **addressing** scheme (individual, group, broadcast), • **Quality of Service attributes.**	The different types of addressing and primitives are further explained below in a specific section. High-level types of addressing and primitives have been chosen in order to meet the application needs. They turn out to be very simple and they will facilitate the mapping of the specification on a given home network protocol. This document does not specify Quality of Service attributes. It is assumed for the time being that selected home networks will provide the right level of QoS.
Operations on OIDs use data. The data used in an operation depend on the OID data and the operation primitive. There are four cases for the data used in an operation. • **No data.** No data are used. • **Data.** The full data value of the OID. • **Field Id.** The identification of a Field. • **Field Id** followed by **Field data.**	A message related to requesting the full data value of the Temperature OID will contain No data. A message related to receiving the value of the Temperature OID will contain Application Data (OID data). A message related to requesting the value of a data Field of the Extended Id OID will contain a data Field Id (e.g. Field Id of “Brand Id”). A message related to receiving the value of the above requested data Field “Brand Id” will contain the requested data Field Id (Brand Id Field Id) followed by Application Data – OID Field data (Brand Id Field value)
A message interaction is defined by a **Message Interaction Descriptor** (**MID**) which consists of one OID and a set of possible operations with data.	An MID is the basic communication capability. An MID can include up to 12 potentially different operations (combination of three addressing types and four primitives). It is possible that two different MIDs have the same OID as long as they have different operations. These MIDs are just meant to describe different capabilities. For instance a state management function would necessitate a temperature MID with the get value and return value operation, while an event management function would necessitate a temperature MID with the send value.
MIDs are functionally grouped into **Functional Blocks**.	Functional Blocks describe interworking capability at a higher functional level. Their purpose is mainly for profile description and structuring. In particular, the notion of Functional Block is not visible in a message (i.e. a message does not contain explicit Functional Block information). Also note the following : - an OID may be shared by several Functional Blocks; - on the other hand an MID belongs to one single Functional Block. Functional Blocks are further explained below in a specific section.
A message interaction may fail due to either **Application or Network Errors**.	Application Errors occur due to the implementation of the interworking rules of this standard on the interworking devices. For instance a Get operation on an object that does not exist in a specific appliance should generate an Application Error. Network Errors occur due to Network Management reasons.

More extensive descriptions for the basic interworking concepts listed above may be found in the next subclauses.

5.1.1.2 Functional Blocks

A household appliance is structured into components called Functional Blocks. Each Functional Block is responsible for the handling of specific MIDs.

Figure 6 shows the 6 Functional Blocks which are managed by a household appliance in this standard: EXECUTE COMMAND, SIGNAL STATE, SIGNAL EVENT, IDENTIFY PRODUCT, COLLECT DIAGNOSIS DATA and MANAGE TIME. Further Functional Blocks may be defined in the future.

Each Functional Block is associated with one or several MIDs shown in the figure through stylised arrows. The arrow direction shows the main functional data flow. For instance the EXECUTE COMMAND Functional Block has two MIDs: one related to the Command OID and one related to the Programme OID.

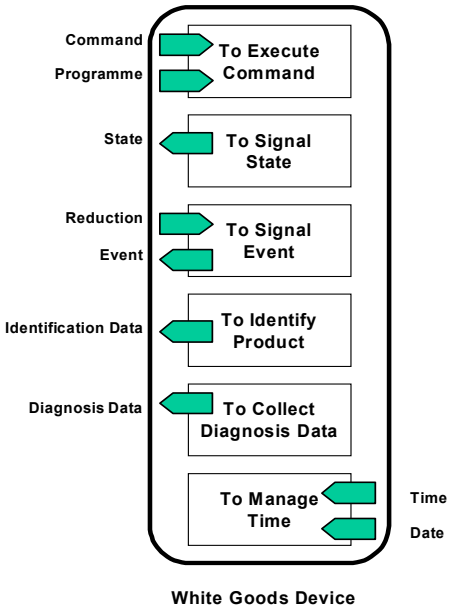
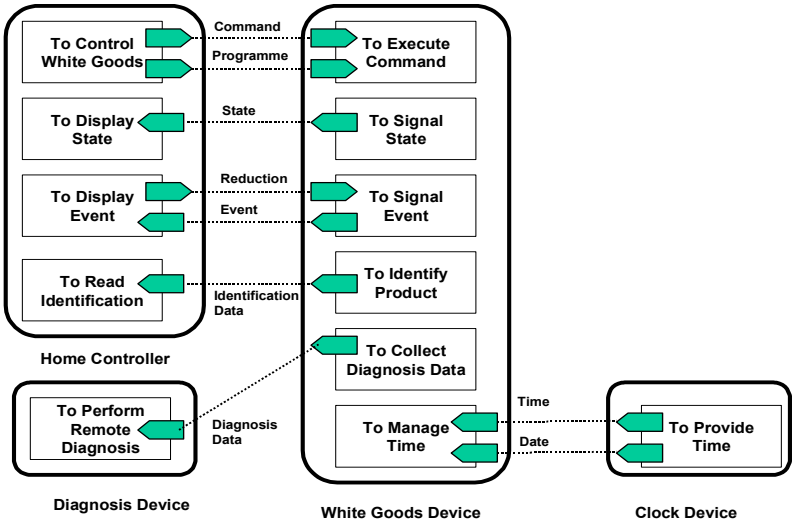


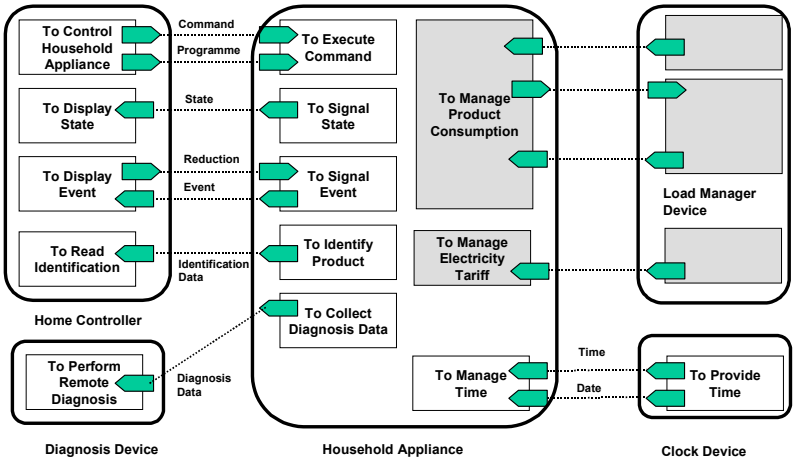
Figure 6 – Functional Block Structure of Household Appliance

EXAMPLE 1 The following figure shows an example of a configuration where three devices interact with the Household Appliances device: a clock device, a home controller device, and a diagnosis device. Note that many other configurations are possible.



NOTE The graphic notation provides a visual reminder of the main data flow direction, not about the communication direction. For instance messages can be sent by the accessing device to request the State, the Identification Data, the Time, the Date and Diagnosis Data.

EXAMPLE 2 Example of Interworking involving Tariff and Load Management. The following figure shows an example of a Household Appliance which includes tariff and load management functions (not defined in this standard).



5.1.1.3 Primitives

Primitives refer to the action applied to the OID and identify the reason for the specific communication. They are defined in the following table.

Table 7 – Primitives

Primitive	Description
Change	Request to change the OID value is made (equivalent to Set). For instance this primitive can be used by a home controller to send a control command to a household appliance.
Send	Provide the value of an OID or OID Field without any prior request for it. For instance this primitive can be used by a household appliance to signal an event.
Get	Request to get the value of an OID or the value of an OID Field. For instance this primitive can be used by a home controller to request identification data concerning a household appliance.
Return	Return the value of an OID or the value of an OID Field upon request (i.e. response to Get). For instance, a household appliance can return identification device to a home controller which made the request.
Term **any**, when used in the context of Primitive**,** is used to indicate any of the 4 primitives.	

5.1.1.4 Addressing

Addressing refers to the list of intended recipients for the OID and identifies the devices involved in the specific communication. Addressing types are defined in the following table.

Table 8 – Addressing

Addressing	Description
Individual	The message is intended for the interworking layer of a given node
Group	The message is intended for the interworking layer of a specific group of nodes
All nodes/Broadcast	The message is intended for interworking layer of all nodes
Term **any,** when placed in an addressing context, is used to indicate any of the 3 addressing types.	

5.1.1.5 Quality of Service Attributes

This document does not specify Quality of Service attributes. It is assumed for the time being that selected home networks will provide the right level of QoS.

5.1.1.6 Possible Combinations of Primitives and Addressing

The following combinations have been identified as needed.

Table 9 – Possible Combinations of Primitives and Addressing

Primitive	Individual	Group	All/Broadcast
Change	Yes	Yes	Yes
Send	Yes	Yes	Yes
Get	Yes	Yes	Yes
Return	Yes	No	No

5.1.1.7 Data

The allowed types of data used in an operation depend on the operation primitive and the OID.

The possible cases of data used in an operation are

- no data,
- OID Data,
- Field Id,
- Field Id followed by Field data.

If the operation on the OID does not use individual access to data Fields then the types of data that shall be used per operation are listed in Table 10.

Table 10 – Allowed data in case of no use of OID Fields

Primitive	Data
Change	OID data
Send	OID data
Get	No data
Return	OID data

The data of Change, Send and Return operations should always use the same data structures for the same OID.

If the operation on the OID uses individual access to data Fields then the data types that shall be used per operation are listed in Table 11.

Table 11 – Allowed data in case of use of OID Fields

Primitive	Data
Change	Field Id + Field data
Send	Field Id + Field data
Get	Field Id
Return	Field Id + Field data

The data of Change, Send and Return operations should always use the same data structures for the same OID Data Field.

5.1.1.8 Application Errors

An interaction between appliances using operations on communication objects may fail at any time due to application functionality errors. The following Application Errors are defined:

Table 12 – Application errors

Application Error	Description
Command Refused	The device is not able to execute the command due to application reasons e.g. the device has temporarily disabled remote operations due to manual operation
Unknown OID	The requested object is unknown to this device, either because the object is not defined or because it is not implemented in this device.
Unimplemented Operation	The requested operation is not implemented for this object.
Unknown Field	The OID Field used for the operation is unknown to this device, either because the field is not defined or because it is not implemented in this device.
Invalid Data	The data used for the operation are invalid e.g. out of range
Invalid Transition	This request is not permitted by the state machine of the device.

The reaction of a device when it is informed about the failure of an interaction is not strongly defined. It is up to the controlling application to implement any reaction it fits its purpose. Nevertheless a number of standard reactions are described here as strongly recommended in order to offer safe standard reactions for all application errors.

Table 13 – Reaction on Application errors

Application Error	Cause of failure	
Command Refused	Device is functional but not available at this time.	Device A may retry after a specified period of time
Unknown OID	Device has not implemented optional OID	Do not contact this device again
Unimplemented Operation	Device has not implemented optional operation for an OID	Do not contact this device again
Unknown Field	Device has not implemented optional Field for an OID	Do not contact device again
Invalid Data	Device does not implement standard application data.	Do not contact device again
Invalid Transition	Device's state machine does not permit this operation.	Do not retry to perform the operation.

5.1.2 Rules

Interworking must take into account two types of variations, **Profile** variations and **Version** variations.

5.1.2.1 Profile

For each type of appliance there will be a Profile, which consists of a predetermined subset of the functionality described in this document. The subset corresponds to a selection of **standardised**, **non-standardised** and **proprietary** items. The selection depends on whether these items are **mandatory** or **optional** and whether they are **interoperable** or **non-interoperable**.

a) Standardised, non-standardised and proprietary items:

- **standardised** items are items commonly agreed by all manufacturers and described in a clear and complete way in this specification. They may be implemented only in the common and agreed way described in this specification;

- **non-standardised** items are items commonly agreed by all manufacturers, not described in a complete way in this specification, providing the possibility for different manufacturer implementations. They must be defined in a complete way by each appliance manufacturer and their complete description must be included in publicly available documents provided directly by the appliance manufacturer. These manufacturer definitions must comply with any commonly agreed characteristics described in the specification;

- **proprietary** items are items not commonly agreed by all manufacturers, and not described in this specification.
  They provide the possibility for implementing proprietary manufacturer functionality, thus it is not mandatory for each manufacturer to include their complete description in any publicly available document.

  NOTE 1 Proprietary items allow manufacturers to implement proprietary interworking functionality or to add specific implementation features that they wish to protect.

  NOTE 2 Non-standardised items allow manufacturers to use different implementations for commonly agreed needs or to add specific features in an appliance before the item can be standardised, meeting this way time-to-market constraints.

b) Mandatory and optional items:

- **mandatory** items are the standardised and non-standardised items included in this specification which must be implemented for all appliances of a specific appliance type;

- **optional** items are the standardised and non-standardised items included in this specification which may be implemented by all appliances of a specific appliance type.

c) Interoperable and non-interoperable items:

- **interoperable** items are all standardised and non-standardised items included in this specification. They may be used in an interoperable way by all appliances;

- **non-interoperable** items are proprietary items. They may not be used in an interoperable way by all appliances.

Table 14 – Profile Items

STANDARDISED	**NON-STANDARDISED**	**STANDARDISED**	**NON-STANDARDISED**	**PROPRIETARY**
MANDATORY		**OPTIONAL**		**-**
INTEROPERABLE				**NON-INTEROPERABLE**

5.1.2.2 Version

Versions correspond to future evolutions of this standard. This document covers version 1 of this standard. Subsequent versions of this standard may be available in the future. They will contain new mandatory, optional, standardised and non-standardised items.

However, interworking can only be ensured when the allowed variations are defined in a "compatible" manner. This means that a number of rules must be provided. The purpose of this subclause is to provide those rules.

Table 15 – Application interworking rules

Rules	Details
For each type of household appliance, a profile must be defined. This profile consists of a subset of interoperable items, either mandatory or optional. Items consisting a profile are: • Functional Blocks • MIDs (OIDs + Operations) • Data • Fields • Fields data	It is expected that appliances can freely implement optional items (Functional Blocks, MIDs, Data, Fields, Fields data) as long as they follow the rules. It is assumed that a device interacting with a household appliance implementing mandatory and optional items knows the list of such items because it can identify precisely the appliance through the basic identification request OID [a]. Non-standardised items allow manufacturers to develop ahead of competition specific behaviour, which they intend to standardise. Proprietary items allow manufacturer to develop specific behaviour that they wish to keep proprietary.
The structuring of a profile using these items: • a profile consists of a number of mandatory and optional Functional Blocks. • a Functional Block consists of a number of mandatory and optional MIDs. • a MID consists of one OID and a number of Operations with Data. • data consist of either a set of mandatory and optional data values or mandatory and optional data Fields. • a Field consists of a Field Id and a set of mandatory and optional Field data values.	An appliance that implements a MID must implement all MID operations.
A household appliance implementing the profile an appliance type must implement the mandatory subset of the appliance type profile, which consists of: • all mandatory Functional Blocks • all mandatory MIDs (OIDs + Operations) of these Functional Blocks • all mandatory Data of these MIDs • all mandatory Fields for each of these MIDs • all mandatory Field data for each of these MID Fields	
A household appliance may additionally implement any subset of the optional profile subset of the appliance, which consists of: • all optional Functional Blocks • all optional MIDs of the implemented mandatory and optional Functional Blocks • all optional Data of the implemented mandatory and optional MIDs • all optional Fields for each of the implemented mandatory and optional MIDs • all optional Field data for each of the implemented mandatory and optional Fields	
A household appliance that implements a Functional Block must implement all mandatory MIDs of this Functional Block.	

Table 15 – Application interworking rules *(continued)*

Rules	Details
A household appliance that implements a MID must implement the OID and all operations of the MID.	For instance, an appliance must implement both the Get value and Return value primitives for the Device status MID of the SIGNAL STATE FB. It cannot implement only the Return value primitive. This rule applies also all MIDs. Once they are implemented, all the determined list of transmission types and primitives must be implemented.
A household appliance that implements a MID must implement all mandatory Data of the MID.	
A household appliance that implements a MID must implement all mandatory Fields of the MID.	
A household appliance that implements a Field of a MID must implement all mandatory Field data values.	
A household appliance may implement non-interoperable items: • proprietary Functional Blocks • proprietary MIDs of all implemented Functional Blocks • proprietary MID data of all implemented MIDs • proprietary Fields of all implemented MIDs • proprietary Field data of all implemented Fields	
Versions of this standard must have increasing values from V1, V2 … VN. Version number is information that can be obtained through the basic identification MID or the extended identification MID.	It is not expected that many versions will be issued. For instance, there could be just three versions in a time span of 15 years.
The mandatory profile subset of VN must be a superset of the mandatory profile subset of VN-1. This superset is obtained by: • adding new mandatory items • transforming optional items into mandatory items	This rule does not apply to optional or non-standardised and proprietary items.
A device implementing VN must be able to restrict its behaviour to the mandatory subset profile of VN-1, of VN-2, etc.	This means that a controller A supporting V1 can control an appliance B supporting V4 as B can restrict its behaviour to V1. This rule allows interworking between devices implementing different versions. Note that while this rule does not apply to optional or non-standardised and proprietary items, it may be to the benefit of a manufacturer to apply this rule to them. See comments on next rule.
The transformation of a non-standardised item into a standardised (optional or mandatory) item is obtained by creating a new item.	For instance: manufacturer A implements in V1 a non-standardised MID M1. M1 gets standardised into a mandatory MID M2 in V2. M2 is implemented by all manufacturers of V2 appliances. M1 is no longer used, except maybe by manufacturer A implementing a V2 appliance. A can decide to support both M1 and M2 in order to interact with former V1 devices using M1.

[a] It is possible that future versions of the specification include a dynamic discovery capability of optional features.

Figure 7 shows the different graphic shapes associated with the items involved in the definition of a profile: Functional Blocks, MIDs, OIDs, operations, fields and application data.

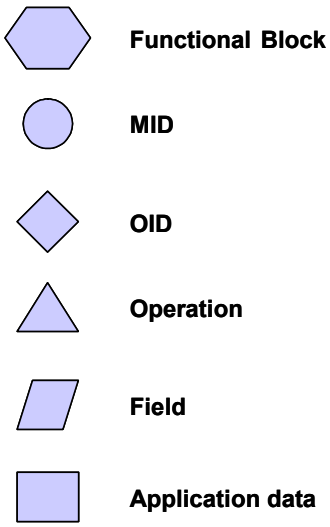


Figure 7 – Graphic Shapes for Profile Items

Figure 8 shows the relations between the items involved in a profile definition:

- a Functional Block is composed of MIDs;
- a MID consists of one OID, a number of operations and either application data, or a number of fields;
- a field consists of a field Id and possibly application data.

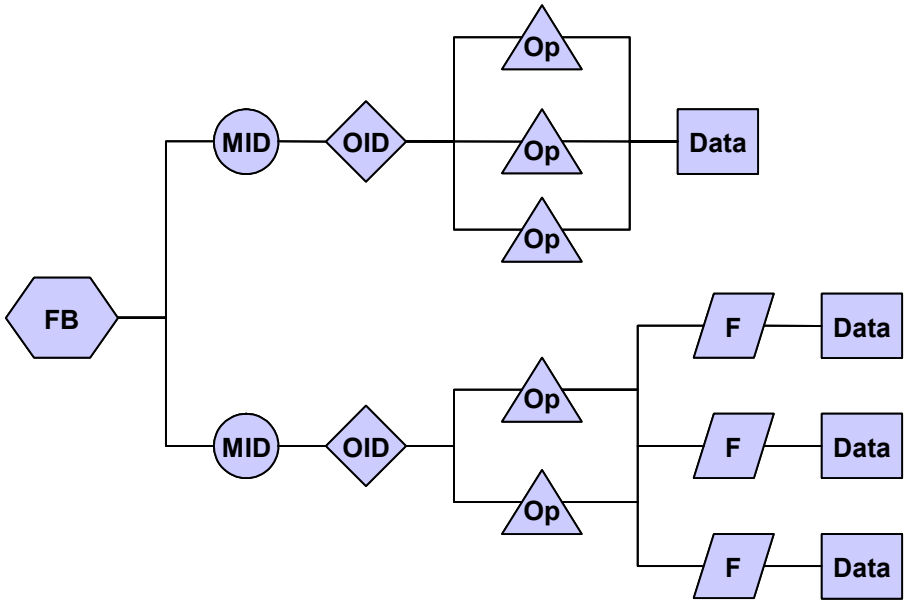


Figure 8 – Elements involved in a profile

Figure 9 shows the shading conventions used to distinguish mandatory, optional, proprietary items, as well as the letter convention to distinguish standardised, non-standardised and proprietary items.

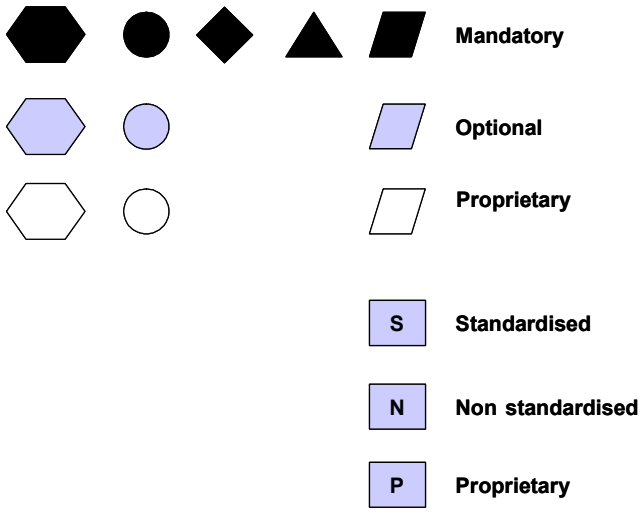


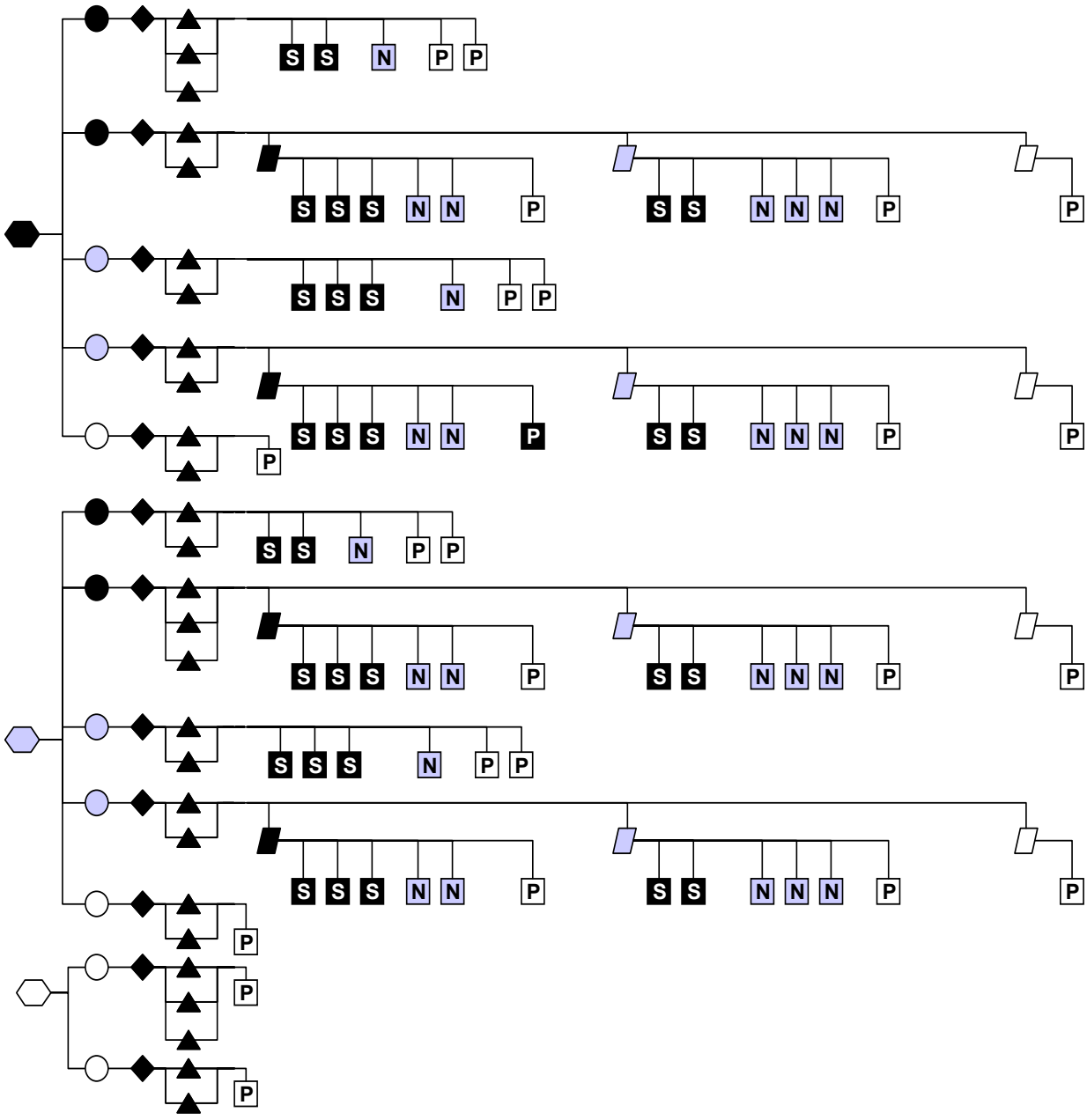
Figure 9 – Graphic Shade / Letter Notation

The examples below present a typical household appliance profile and how the mandatory profile subset is expanded with optional Functional Blocks, optional MIDs and optional Fields.

EXAMPLE 1 A typical household appliance profile consists of

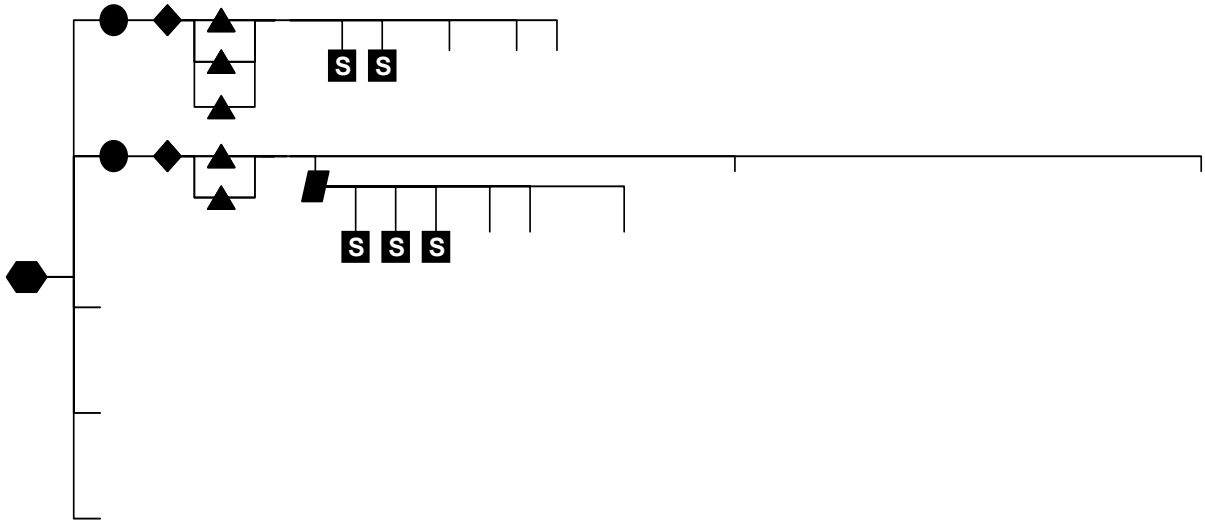
- a list of mandatory, optional and proprietary Functional Blocks,
- for each Functional Block, a list of mandatory, optional and proprietary MIDs (note that a proprietary Functional Block only contains proprietary MIDs),
- for each MID, one OID and a number of mandatory operations,
- for each MID a list of standardised, non-standardised and proprietary data values,
- for each MID with Fields, a list of standardised, non-standardised and proprietary Fields,
- for each Field, a Field Id and a list of standardised, non-standardised and proprietary data values.

Note that OIDs and operations are always in black.



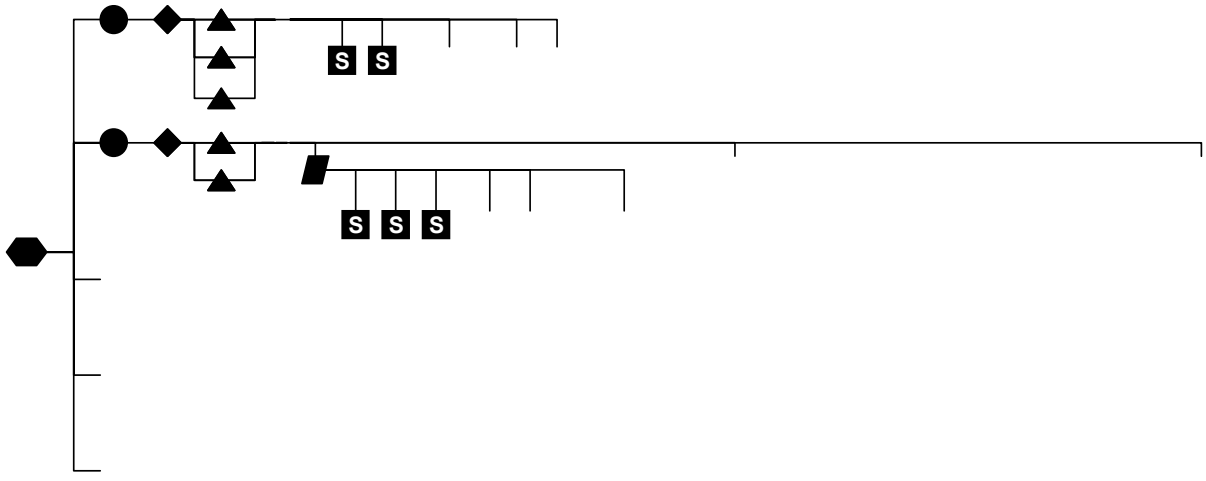
EXAMPLE 2 Profile implementation with only the mandatory profile subset.

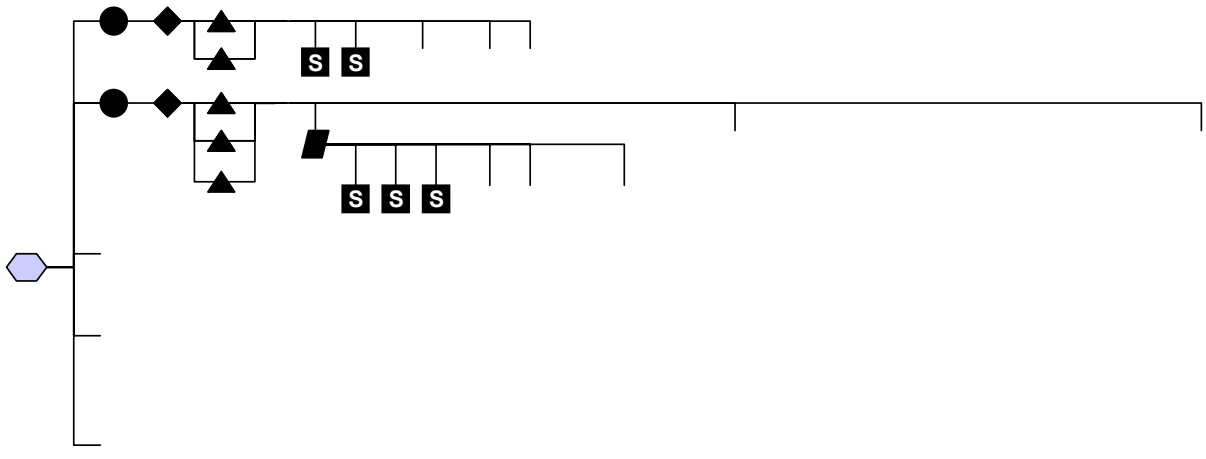
Only mandatory Functional Blocks, mandatory MIDs of such Functional Blocks, mandatory fields of such MIDs, mandatory application data values of such MIDs are supported.



EXAMPLE 3 Profile implementation with the mandatory profile subset and also one optional Functional Block.

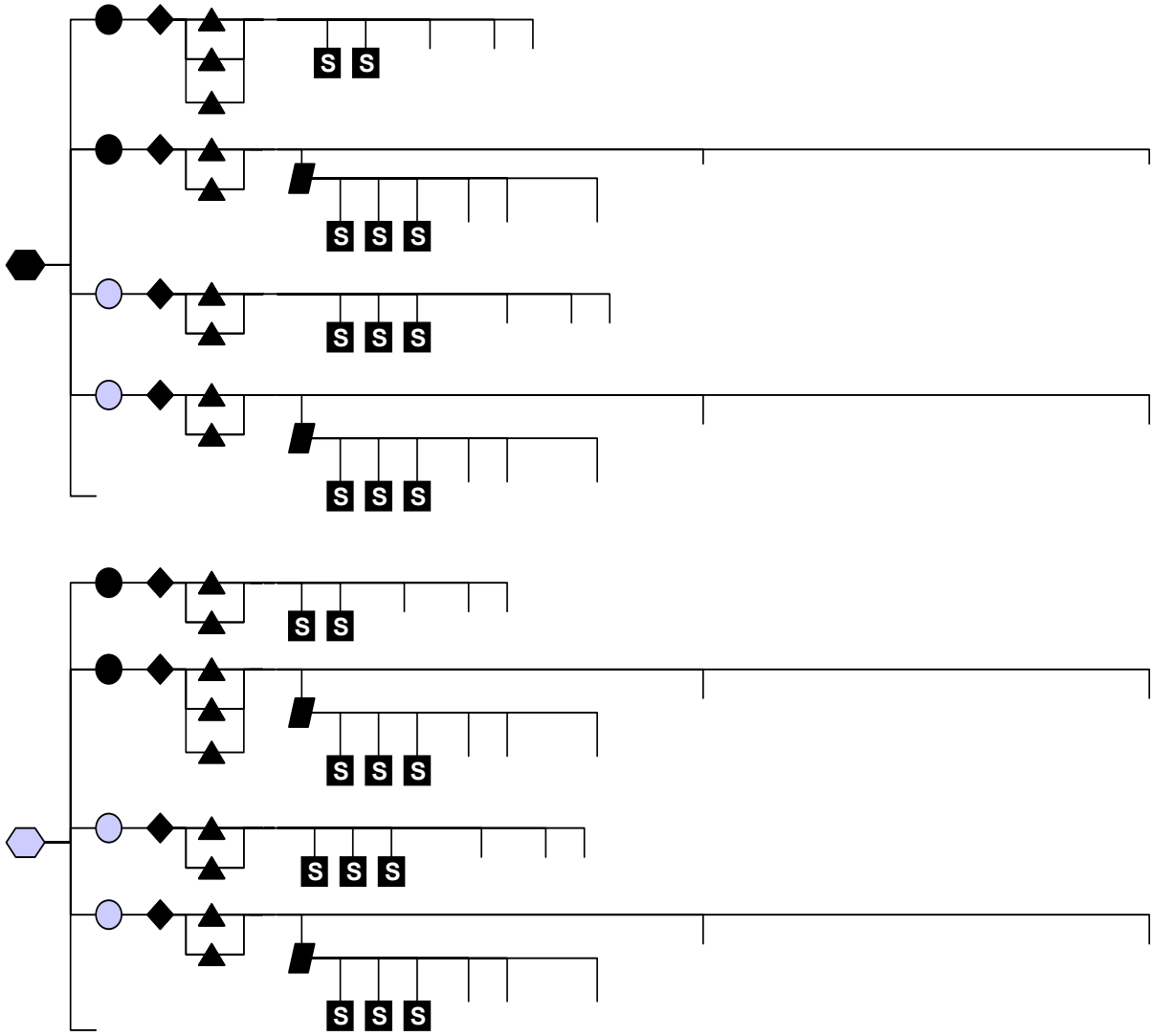
The minimum implementation of the optional Functional Block is to support all mandatory MIDs, all mandatory fields of such MIDs, and all mandatory application data values of such MIDs.





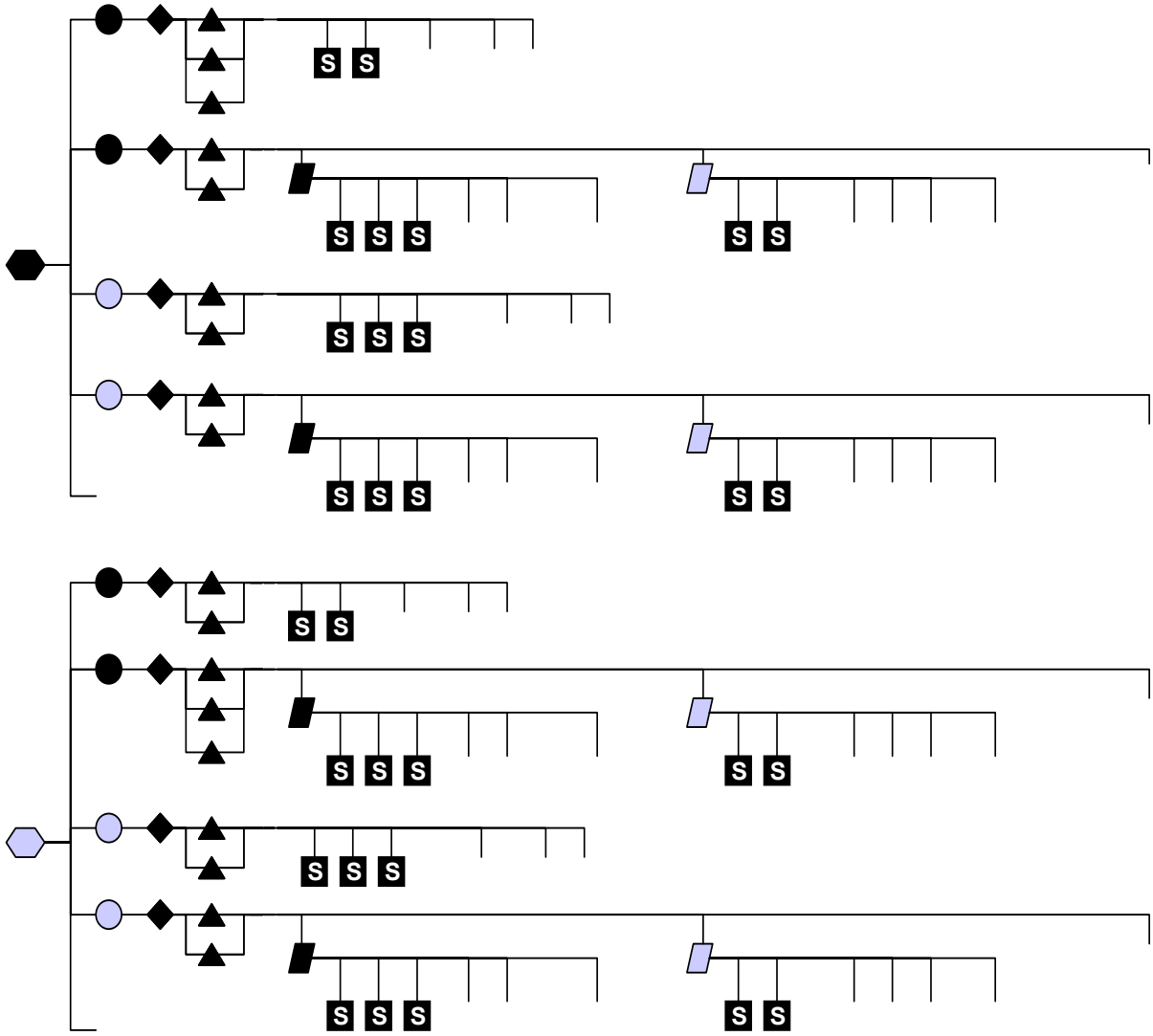
EXAMPLE 4 Profile implementation with optional MIDs.

All mandatory fields of such MIDs, and all mandatory application data values of such MIDs must be supported.



EXAMPLE 5 Profile implementation with optional MID Fields.

All mandatory application data values of such fields must be supported.



5.2 Functional Blocks Specification

5.2.1 Introduction

The objective of the Functional Blocks Specification is to specify the functionality implemented and provided by an appliance through all standardised Functional Block implementations. Additionally to specify the behaviour in case of not implemented/supported Functional Block components. Therefore, there is one section per standardised Functional Block plus one section for not supported functionality.

Each section specifying a Functional Block is organised in the following four subclauses:

1) Aims and objectives

This subclause is used for a generic description of the functionality offered by the corresponding Functional Block.

2) Functional Specification

This subclause is used to

- list the MIDs of the Functional Block;
- describe the functionality offered by each MID.

3) Specification of the Use of the Functional Block

This subclause is used to describe the way the MIDs may be used and the behaviour of appliances upon their use. This is done mainly in terms of **MID flows**.

A **MID flow** is a table describing the behaviour of an appliance during control and monitoring actions belonging to the specific Functional Block. Each row contains an action either by the accessing device or by the household appliance. An action is either a message transmitted or another device action. The messages transmitted shall not necessarily belong to the respective Functional Block, but shall be referred if they are caused by the Functional Block message or action.

Table columns “Flow”, “Primitive” and “Addressing” present the flow, primitive, addressing of a message – if the row refers to a message transmission – otherwise they are empty.

Accessing Device column refers to the device that accesses the household appliance. Household Appliance column refers to the actual appliance that is accessed. Both columns contain additional information on the action performed: OID used, data used, timing and other action conditions.

An example of such an MID flow table is the following.

EXAMPLE MID flow:

Accessing device	Flow	Primitive	Addressing	Household Appliance
Transmission of EXECUTE COMMAND MID “Execution of a Command”. This operation is in conformance with the white good device current state. The OID data used are valid for the appliance.	⇒	Change	Individual	
	⇐	Send	Group	The device shall transmit a SIGNAL EVENT MID “Device Status” with the new appliance state, result of the execution of the command.

In many cases, the MID flow tables of a Functional Block use flows defined in other Functional Blocks. This is permitted in order to have a clear description of the behaviour of the appliance.

4) Mandatory and Optional Profiles

This subclause is used in order to define

- which MIDs and possibly MID fields and data are mandatory or optional,
- which MIDs and possibly MID fields and data may be used depending on the status of Remote Control availability.

5.2.2 EXECUTE COMMAND

5.2.2.1 Aims and objectives

This Functional Block is mandatory.

A set of basic messages is used to control remotely Household Appliances and to programme appliances. Examples of control are START, STOP and PAUSE. An example of programming is Programme Data.

5.2.2.2 Functional Specification

The following table provides a description of all the MIDs used by the Functional Block EXECUTE COMMAND.

Table 16 – EXECUTE COMMAND MIDs

MID			Description	
OID	**Operation**			
	Primitive	**Addressing**		
Execution of a Command	Change	Individual	This MID allows execution of commands on a household appliance. Standardised command available are described in Table 17 – Execution of a Command MID Commands.	
			A range of values is further reserved for non-standardised and proprietary commands.	
Washing Parameters Non-standardised	Change	Individual	Also called: Programme Data for WET Non-standardised message describing information regarding the execution of a washing cycle. Condition parameters such as start time or finish time information could be provided through this MID.	
Cooking Parameters Non-standardised	Change	Individual	Also called: Programme Data for HOT Non-standardised message describing information regarding the execution of a cooking cycle. Condition parameters such as start time or finish time information could be provided through this MID.	
Refrigeration Parameters Non-standardised	Change	Individual	Also called: Programme Data for COLD Non-standardised message describing information regarding the execution of a refrigeration cycle.	
Air Conditioning Parameters Non-standardised	Change	Individual	Also called: Programme Data for AC Non-standardised message describing information regarding the execution of air conditioning. Condition parameters such as "Ventilation Only", heating, start time or finish time information could be provided through this MID.	
Water Heating Parameters Non-standardised	Change	Individual	Also called: Programme Data for HEAT Non-standardised message describing information regarding the execution of a heating cycle.	
Start Time	Change	Individual	The time (either relative or absolute) of the start of the machine activity. Default format for Oven, Microwave Oven and Storage Water Heater is absolute time. The default format for other appliances is relative time.	
Finish Time	Change	Individual	The time (either relative or absolute) of the expected end of the machine activity. Default format for Electric Oven, Microwave Oven and Storage Water Heater is absolute time. The default format for other appliances is relative time.	
Set Temperature	Change	Individual	The desired temperature in the process managed by the device.	
Reduction	Change	Individual	This MID allows a remote device (e.g. a user interface) to set the level of event information coming from a WG using Normal Event and Alert Event MIDs of SIGNAL EVENT Functional Block. The reduction value shall be kept by the WG after power off and identifies which events are allowed. The following values are standardised:	
			NORMAL	All Alert Events MIDs and Normal Event MIDs
			ALL	All Alert Event MIDs: category FAILURE, DANGER, WARNING
			FAILURE & DANGER	Alert Event MIDs of category FAILURE, DANGER
			FAILURE	Alert Event MIDs of category FAILURE
			A range of values is further reserved for non-standardised and proprietary reduction levels. WARNING: The level of information set affects all remote devices that receive events from the appliance. If one remote device sets the Reduction value of an appliance to a specific level, then any other remote devices receiving events from the same appliance will start receiving only the events of that level.	

Table 17 – Execution of a Command MID Commands

Command Message	Description
START	Start immediately or continue the execution of the programme
STOP	Stop immediately the execution of the programme. It is up to the appliance to decide whether information setting (programme data + delay + …) is cleared.
PAUSE	Pause immediately to allow for future continuation
START SUPERFREEZING	Start the superfreezing function of the Freezer
STOP SUPERFREEZING	Stop the superfreezing function of the Freezer
START SUPERCOOLING	Start the supercooling function of the Refrigerator
STOP SUPERCOOLING	Stop the supercooling function of the Refrigerator
START SUPERHEATING	Start heating up to defined maximum temperature of the Storage Water Heater
STOP SUPERHEATING	Stop heating up to defined maximum temperature of the Storage Water Heater
ENABLE GAS	Enable the operation of gas appliances
DISABLE GAS	Disable the operation of gas appliances

The DISABLE GAS and ENABLE GAS are only for gas appliances. The START SUPERCOOLING/FREEZING and STOP SUPERCOOLING/FREEZING are only for Refrigerators or Freezers.

Condition parameters concerning the appliance programmes are provided through the Programme Data for WET, HOT, COLD, AC and HEAT MIDs respectively. The reason for having five programme data messages is to differentiate between the different WG areas (WET, HOT, COLD, AC, HEAT). It is assumed that such MIDs have non-standardised content. It is also assumed that non-standardised parameter settings can involve other MIDs (Start Time, Finish Time, Power Available and Tariff MIDs).

5.2.2.3 Specification of the Use of EXECUTE COMMAND MID

Table 18 – MID Flow for MID "Execution of a Command"

Accessing device	Flow	Primitive	Addressing	Household Appliance
Transmission of EXECUTE COMMAND MID "Execution of a Command". This operation is in conformance with the white good device current state and remote status. The OID data used are valid for the appliance.	⇒	Change	Individual	
	⇐	Send	Group	The device shall transmit a SIGNAL EVENT MID "Device Status" with the new appliance state, result of the execution of the command.

Table 19 – MID Flow for other EXECUTE COMMAND MID

Accessing device	Flow	Primitive	Addressing	Household Appliance
Transmission of any EXECUTE COMMAND MID (except from “Execution of a Command”). This operation is in conformance with the white good device current state. The application data used are valid for the appliance.	⇒	Change	Individual	
	⇐	Send	Group	The device shall transmit the corresponding SIGNAL EVENT MID (the SIGNAL EVENT MID of the same OID as the OID used in the above Change operation). The SIGNAL EVENT MID will contain with the new OID value of the appliance.

Table 20 – MID Flow upon operation not in conformance with appliance remote control status

Accessing device	Flow	Primitive	Addressing	Household Appliance
Transmission of EXECUTE COMMAND MID “Execution of a Command”. This operation is in conformance with the white good device current state but not with remote control status of the appliance.	⇒	Change	Individual	
	⇐	Send	Individual	The device shall transmit a SIGNAL EVENT MID “Application Error” with error code “Command Refused”. This shall be sent within a short time.

Table 21 – MID Flow upon operation not in conformance with appliance state machine

Accessing device	Flow	Primitive	Addressing	Household Appliance
Transmission of EXECUTE COMMAND MID not in conformance with the household appliance current state.	⇒	Change	Individual	
	⇐	Send	Individual	The device shall transmit a SIGNAL EVENT MID “Application Error” with error code “Invalid Transition”. This shall be sent within a short time.

Table 22 – MID Flow upon use of invalid Application Data

Accessing device	Flow	Primitive	Addressing	Household Appliance
Transmission of EXECUTE COMMAND MID with application data invalid for the appliance.	⇒	Change	Individual	
	⇐	Send	Individual	The device shall transmit a SIGNAL EVENT MID “Application Error” with error code “Invalid Data”. This shall be sent within a short time.

Table 23 – MID Flow upon no response received from the appliance for MID “Execution of a Command”

Accessing device	Flow	Primitive	Addressing	Household Appliance
Transmission of EXECUTE COMMAND MID “Execution of a Command”.	⇒	Change	Individual	
				The device does not transmit any SIGNAL EVENT MID “Device Status” or SIGNAL EVENT MID “Application Error” within a short time.
No action is specified. The appliance may be OFF or there may be communication problems.				

Table 24 – MID Flow upon no response from the appliance for other EXECUTE COMMAND MIDs

Accessing device	Flow	Primitive	Addressing	Household Appliance
Transmission of any EXECUTE COMMAND MID (except from “Execution of a Command”).	⇒	Change	Individual	
				The device does not transmit the corresponding SIGNAL EVENT MID or SIGNAL EVENT MID “Application Error” within a short time.
No action is specified. The appliance may be OFF or there may be communication problems.				

5.2.2.4 Mandatory and Optional Profiles

The following table shows the MIDs available for each appliance, and if they are mandatory or optional.

Table 25 – EXECUTE COMMAND MIDs Profile

MID	WM	TD	DW	MW	OV	GT	GO	RE	FZ	WC	FR	HB/IH	HD	AC	WHI	WHS
Execution of a Command	M	M	M	M	M	M	M	O	O	O	O	M	M	M	O	M
Washing Parameters	O	O	O	-	-	-	-	-	-	-	-	-	-	-	-	-
Cooking Parameters	-	-	-	O	O	-	-	-	-	-	-	O	O	-	-	-
Refrigeration Parameters	-	-	-	-	-	-	-	O	O	O	O	-	-	-	-	-
Air Conditioning Parameters	-	-	-	-	-	-	-	-	-	-	-	-	-	O	-	-
Water Heating Parameters	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	O
Start Time	O	O	O	O	O	-	O	-	-	-	-	-	O	O	-	O
Finish Time	O	O	O	O	O	-	O	-	-	-	-	-	O	O	-	O
Set Temperature	O	O	O	O	O	O	O	O	O	O	-	O	-	O	O	O
Reduction	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O

The following symbols are used in this table:
- = MID not available for the appliance
O = MID is Optional
M = MID is Mandatory

The following table shows the commands available for each appliance, as included in the MID Execution of a Command, and whether they are mandatory or optional.

Table 26 – Execution of a Command MID Profile

MID with Data		WM	TD	DW	MW	OV	GT	GO	RE	FZ	WC	FR	HB/IH	HD	AC	WHI	WHS
Execution of a Command	**START**	O	O	O	O	O	-	-	O	O	O	O	O	O	O	O	O
	STOP	M	M	M	M	M	M	M	-	-	-	-	M	M	M	O	M
	PAUSE	O	O	O	O	O	-	O	-	-	-	-	O	-	O	-	-
	START SUPER-COOLING	-	-	-	-	-	-	-	O	-	-	O	-	-	-	-	-
	START SUPER-FREEZING	-	-	-	-	-	-	-	-	O	-	O	-	-	-	-	-
	STOP SUPER-COOLING	-	-	-	-	-	-	-	O	-	-	O	-	-	-	-	-
	STOP SUPER-FREEZING	-	-	-	-	-	-	-	-	O	-	O	-	-	-	-	-
	START SUPER-HEATING	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O
	STOP SUPER-HEATING	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O
	DISABLE GAS	-	-	-	-	-	M	M	-	-	-	-	-	-	-	-	-
	ENABLE GAS	-	-	-	-	-	O	O	-	-	-	-	-	-	-	-	-

The following symbols are used in this table:
- = MID not available for the appliance
O = MID is Optional
M = MID is Mandatory

The following two tables show whether MIDs and commands need the Enable Remote Control to be executed.

Especially regarding MID Execution of a Command, the need to Enable Remote Control depends on the command executed. This information is described as extended profiling information in Table 27, which shows which commands need the Enable Remote Control to be executed.

Table 27 – Execution of a Command MID Enabling Profile

MID with Data		WM	TD	DW	MW	OV	GT	GO	RE	FZ	WC	FR	HB/IH	HD	AC	WHI	WHS
Execution of a Command	START	E	E	E	E	E	-	-	E	E	E	E	E	Y	E	E	E
	STOP	Y	Y	Y	Y	Y	Y	Y	-	-	-	-	Y	Y	Y	E	E
	PAUSE	E	E	E	E	E	-	E	-	-	-	-	E	-	E	-	-
	START SUPER-COOLING	-	-	-	-	-	-	-	E	-	-	E	-	-	-	-	-
	START SUPER-FREEZING	-	-	-	-	-	-	-	-	E	-	E	-	-	-	-	-
	STOP SUPER-COOLING	-	-	-	-	-	-	-	E	-	-	E	-	-	-	-	-
	STOP SUPER-FREEZING	-	-	-	-	-	-	-	-	E	-	E	-	-	-	-	-
	START SUPER-HEATING	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	E
	STOP SUPER-HEATING	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	E
	DISABLE GAS	-	-	-	-	-	Y	Y	-	-	-	-	-	-	-	-	-
	ENABLE GAS	-	-	-	-	-	E	E	-	-	-	-	-	-	-	-	-

The following symbols are used in this table:
Y = MID is always available for use
E = MID is available for use only if an Enable Remote Control is executed in the appliance
- = MID is not available for use

The following table shows whether commands need the Enable Remote Control to be executed.

Table 28 – EXECUTE COMMAND MIDs Enabling Profile

MID	WM	TD	DW	MW	OV	GT	GO	RE	FZ	WC	FR	HB/IH	HD	AC	WHI	WHS
Washing Parameters	E	E	E	-	-	-	-	-	-	-	-	-	-	-	-	-
Cooking Parameters	-	-	-	E	E	-	-	-	-	-	-	E	E	-	-	-
Refrigeration Parameters	-	-	-	-	-	-	-	E	E	E	E	-	-	-	-	-
Air Conditioning Parameters	-	-	-	-	-	-	-	-	-	-	-	-	-	E	-	-
Water Heating Parameters	-	-	-	-	-	-	-	-	-	-	-	-	-	-	E	E
Start Time	E	E	E	E	E	-	E	-	-	-	-	-	E	E	-	E
Finish Time	E	E	E	E	E	-	E	-	-	-	-	-	E	E	-	E
Set Temperature	E	E	E	E	E	E	E	E	E	E	-	E	-	E	-	-
Reduction	E	E	E	E	E	E	E	E	E	E	E	E	E	E	-	-

The following symbols are used in this table:
Y = MID is always available for use
E = MID is available for use only if an Enable Remote Control is executed in the appliance
- = MID is not available for use

The following recommendations apply on these profiles:

- it is recommended that the WM, TD, DW, OV, MW, GO, and HB/IH appliances **Disable Remote Control** at the end of the execution of the programme. The actual decision is based on manufacturer policy;
- it is also recommended that the FR and HD appliances **Enable Remote Control** at the end of the execution of the programme. The actual decision is based on manufacturer policy;
- the STOP command should always be available to perform remote shut down of the house or for safety functions (example: turn off the Electric Oven);

- the START command is available for hood for safety reasons. For instance, the hood could be started when gas leakage is detected;
- it is expected that appropriate safety conditions are met to START a Hob.

5.2.3 SIGNAL STATE

5.2.3.1 Aims and objectives

This Functional Block is mandatory.

A set of basic states is used to monitor the state of the Household Appliances by remote means (central controller, telephone gateway, etc). The basic states are static states of the product.

Basic states are used to monitor the product functionality of the Household Appliances. Examples are: STAND BY, RUNNING and END PROGRAMME.

Not all states are mandatory. A subset of the described items can be selected if a simpler state diagram is preferred, as shown in the following figure.

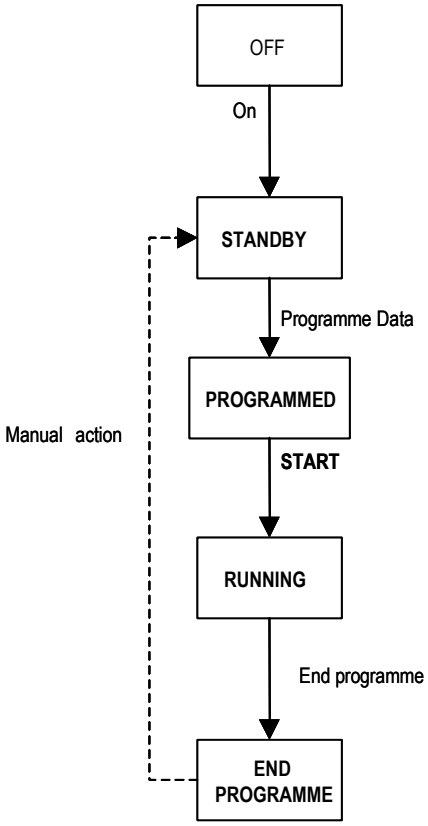


Figure 10 – Generic State Diagram

5.2.3.2 Functional Specification

The following table shows the MIDs that are used by the Functional Block SIGNAL STATE.

Table 29 – SIGNAL STATE MIDs

MID / OID	Operation		Description
	Primitive	Addressing	
Device Status	Get Return	Individual	Provides the status of the device. There are three fields: • An internal machine state (Stand by, Running, etc.). Standardised states are defined in Table 30 – Device Status MID States. • The remote control enabling status of the machine. This field is used to inform about the Remote Control enabling status of the machine. Three values are possible (other values are reserved): - Disabled: Remote Control is disabled - Enabled: Remote Control is enabled - Temporarily Locked: Remote Control is enabled in general but temporarily locked because of conflict of access. It is used in particular situations when remote users and local users compete for access. • Additional field used to contain more general information, and related to the machine internal status. It may also contain IRIS code (see [1]). The use of IRIS code is optional. Non-standardised and proprietary values are possible.
Alert Events Non-standardised	Get Return	Individual	A list of events can be transmitted to notify the occurrence of an alert event such as alarm, fault or warning. Non-standardised and proprietary values are poss ble. Each event is described through three fields: • An event identification value. A range of values is reserved for standard events, and a range of values is reserved for non-standardised and proprietary events. No standardised events have been defined until now, so this MID is non-standardised. • A category: either WARNING, or DANGER, or FAILURE. • A presence/recovery flag. Either the event has been detected, or the alert has been recovered.
Remaining Time	Get Return	Individual	Remaining time in hours and minutes before the end of the activity.
Washing Parameters Non-standardised	Get Return	Individual	See definition in Table 16 – EXECUTE COMMAND MIDs
Cooking Parameters Non-standardised	Get Return	Individual	See definition in Table 16 – EXECUTE COMMAND MIDs
Refrigeration Parameters Non-standardised	Get Return	Individual	See definition in Table 16 – EXECUTE COMMAND MIDs
Air conditioning Parameters Non-standardised	Get Return	Individual	See definition in Table 16 – EXECUTE COMMAND MIDs
Water Heating Parameters Non-standardised	Get Return	Individual	See definition in Table 16 – EXECUTE COMMAND MIDs
Current Phase Non-standardised	Get Return	Individual	The current phase the machine is performing. Non-standardised and proprietary values are possible. No standardised values have been defined until now, so this MID is non-standardised.
Start Time	Get Return	Individual	See definition in Table 16 – EXECUTE COMMAND MIDs
Finish Time	Get Return	Individual	See definition in Table 16 – EXECUTE COMMAND MIDs
Set Temperature	Get Return	Individual	See definition in Table 16 – EXECUTE COMMAND MIDs
Displayed Temperature	Get Return	Individual	A filtered value of the current temperature of the process managed by the device (for the OV it would be the temperature of the cavity, for the AC it is the room temperature).
Current Temperature	Get Return	Individual	The current temperature of the process managed by the device.
Reduction	Get Return	Individual	See definition in Table 16 – EXECUTE COMMAND MIDs

Table 30 – Device Status MID States

State	Description
OFF	Product is switched off.
STAND BY	Product waiting for complete programming data setting, and no programme is processing.
PROGRAMMED	Complete set of programming data sent to the machine, product ready to receive a message to start. Will accept two commands: START or conditional start.
PROGRAMMED WAITING TO START	Product is programmed and a conditional start has been received, but it is waiting for the conditions to be reached (delay, power, tariff, ...) to effectively start.
PAUSE	Product is temporarily paused. PAUSE message has been received. After receiving a START message the product will continue its programme from the point were it was paused.
RUNNING	The appliance is executing a specific programme. This happens when product receives START or conditions to start are verified. For example, in the case of WM, it is executing the washing process. In the case of WHS the water is heating up. In the case of WHI the water flows and the heating is active.
END PROGRAMME	Normal completion of the programme execution. It is used in washing and cooking appliances that require some kind of user action after the end of programme execution. For example, remove clothes from WM, dishes from DW, food from OV.
FAILURE	Failure detected, cycle is stopped. Failure can be in some cases recoverable (e.g. by the user) or unrecoverable.
PROGRAMME INTERRUPTED	The programme execution has been interrupted. This happens when product receives a STOP message. It will never be able to continue from the point of the programme where it has been stopped. In the case of a WM, water could be there and has then to be removed. Clothes are there and not completely washed.
IDLE	Product is functioning normally but without executing any programme. Only for FR, RE, FZ, WC, WHS and WHI. For FR, RE, FZ, WC a local stop has been made. For WHS temperature has been reached, nothing to do. For WHI there is no water flow, nothing to do.
RINSE HOLD	Only for WM. Cleaning is finished, rinse hold function has been selected. WM is waiting for the user input (START).
PROPRIETARY	Product is in a manufacturer specific state. No further information available in a generic way (hence a proprietary state of one producer can be completely different from another). There could be several proprietary states.
SERVICE	Product is in a manufacturer dependent servicing mode. In this state, the user cannot use appliance.
SUPERCOOLING	Product is in supercooling mode.
SUPERFREEZING	Product is in superfreezing mode.
SUPERHEATING	Product is in superheating mode.

5.2.3.3 Specification of the Use of MID

All the MIDs shall support the following flows.

Table 31 – MID Flow for SIGNAL STATUS MIDs without data Fields

Accessing device	Flow	Primitive	Addressing	Household Appliance
Transmission of SIGNAL STATUS MID with GET operation. The OID of this operation does not use Data Fields, so no data are used in this operation.	⇒	Get	Individual	
	⇐	Return	Individual	The device shall transmit the corresponding SIGNAL STATUS MID with RETURN operation. The MID data returned will be the current OID data. This shall be sent within a short time.

Table 32 – MID Flow for SIGNAL STATUS MIDs with data Fields

Accessing device	Flow	Primitive	Addressing	Household Appliance
Transmission of SIGNAL STATUS MID with GET operation. The OID used of this operation uses Data Fields. Data contain the Field Id of the Field requested. The Field Id is valid for the appliance.	⇒	Get	Individual	
	⇐	Return	Individual	The device shall transmit the corresponding SIGNAL STATUS MID with RETURN operation. The MID data returned will be the current data of the requested OID Field. This shall be sent within a short time.

Table 33 – MID Flow for SIGNAL STATUS MIDs upon use of invalid data Fields

Accessing device	Flow	Primitive	Addressing	Household Appliance
Transmission of SIGNAL STATUS MID with GET operation. Data contain the Field Id of the Field requested. The Field Id is invalid for the appliance.	⇒	Get	Individual	
	⇐	Return	Individual	The device shall transmit a SIGNAL EVENT MID “Application Error” with value “Invalid Field”. This shall be sent within a short time.

Table 34 – MID Flow upon no message received from the appliance

Accessing device	Flow	Primitive	Addressing	Household Appliance
Transmission of SIGNAL STATUS MID with GET operation.	⇒	Change	Individual	
				The device does not transmit the corresponding SIGNAL STATE MID with RETURN operation or a SIGNAL EVENT MID "Application Error" within a short time.
No action is specified. The appliance may be OFF or there may be communication problems.				

5.2.3.4 Mandatory and Optional Profiles

Table 35 – SIGNAL STATE MID Profiles

MID	WM	TD	DW	MW	OV	GT	GO	RE	FZ	WC	FR	HB/IH	HD	AC	WHI	WHS
Device Status	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M
Alert events	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Remaining Time	O	O	O	O	O	O	O	-	-	-	-	O	O	O	-	O
Washing Parameters	O	O	O	-	-	-	-	-	-	-	-	-	-	-	-	-
Cooking Parameters	-	-	-	O	O	O	O	-	-	-	-	O	O	-	-	-
Refrigeration Parameters	-	-	-	-	-	-	-	O	O	O	O	-	-	-	-	-
Air Conditioning Parameters	-	-	-	-	-	-	-	-	-	-	-	-	-	O	-	-
Water Heating Parameters	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	O
Start Time	O	O	O	O	O	-	O	-	-	-	-	-	O	O	-	O
Finish Time	O	O	O	O	O	-	O	-	-	-	-	-	O	O	-	O
Current Phase	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Set Temperature	O	O	O	O	O	O	O	O	O	O	-	O	O	O	O	O
Displayed Temperature	O	O	O	O	O	O	O	O	O	O	-	O	O	O	O	O
Current Temperature	O	O	O	O	O	O	O	O	O	O	-	O	O	O	O	O
Reduction	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
The following symbols are used in this table: - = MID is not available for the appliance O = MID is Optional M = MID is Mandatory																

Washing Parameters, Cooking Parameters, Refrigeration Parameters, Air Conditioning Parameters, Water Heating Parameters are part of both the EXECUTE COMMAND and SIGNAL STATE Functional Blocks. When these optional MIDs are implemented for the EXECUTE COMMAND Functional Block, then they must be implemented also in the SIGNAL STATE Functional Block.

Likewise, Alert Events is part of both the SIGNAL STATE and the SIGNAL EVENT Functional Blocks. When these optional MIDs are supported by an appliance, they shall be supported in both Functional Blocks.

The following table shows which states are available for each type of appliance and the states, which are either optional or mandatory. Except for the RUNNING state, all other states are either optional or are not used. Optional states are defined as following. When appliance provides a function, which uses the state, then the function must be interoperable.

Table 36 – SIGNAL STATE State Profiles

State	WM	TD	DW	MW	OV	GT	GO	RE	FZ	WC	FR	HB/IH	HD	AC	WHI	WHS
OFF	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
PAUSE	O	O	O	O	O	-	O	-	-	-	-	-	O	O	-	-
RUNNING	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M
STAND BY	O	O	O	O	O	O	O	-	-	-	-	O	O	O	-	-
PROGRAMMED	O	O	O	O	O	O	O	-	-	-	-	-	-	-	-	-
PROGRAMMED WAITING TO START	O	O	O	O	O	-	O	-	-	-	-	-	-	O	-	-
END PROGRAMME	O	O	O	O	O	O	O	-	-	-	-	-	-	-	-	-
FAILURE	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
PROGRAMME INTERRUPTED	O	O	O	O	O	O	O	-	-	-	-	O	O	O	O	O
IDLE	-	-	-	-	-	-	-	O	O	O	O	-	-	-	O	O
RINSE HOLD	O	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SERVICE	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
SUPERFREEZING	-	-	-	-	-	-	-	-	O	O	-	-	-	-	-	-
SUPERCOOLING	-	-	-	-	-	-	-	O	-	-	-	-	-	-	-	-
SUPERHEATING	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O

The following symbols are used in this table:
- = state is not available for the appliance
O = state is Optional
M = state is Mandatory

5.2.4 SIGNAL EVENT

5.2.4.1 Aims and objectives

This Functional Block is mandatory

The objective of the SIGNAL EVENT Functional Block is to provide appliance event information on the bus.

5.2.4.2 Functional Specification

When the value of an OID has changed, the corresponding information of the OID value shall be sent on the bus.

The remote device could be a controller with a display, or a telephone gateway.

Devices interested in receiving event information can specify whether to receive all the information or only part of it, using a specific Reduction MID.

Table 37 – SIGNAL EVENT MIDs

MID / OID	Operation: Primitive	Operation: Addressing	Description
Application Error	Send	Individual	Error caused by an operation. This MID is used to notify the occurrence of an error caused by an operation. Each error is described through three fields: • Error code. This descr bes the actual error that has occurred. A range of values is reserved for standard application errors. These are defined in Table 12 – Application errors. A range of values is further reserved for non-standardised and proprietary errors. • OID used in the failed operation. e.g. failure to change value in an unimplemented OID should set here the ID of this OID. • Operation that caused the failure. e.g. failure to change value in an unimplemented OID should set here the ID of the CHANGE operation.
Normal Event	Send	Group except for Wrong data (Individual)	Normal event values. This MID is used to notify the occurrence of simple advice information. A range of values is reserved for standardised events. The following events are defined: END OF CYCLE: End of cycle. TEMPERATURE REACHED: Temperature is reached. END OF COOKING: End of cooking. SWITCHING OFF: This device is switching off. This event is transmitted only from devices which have the possibility to send a message upon being switched off. A range of values is further reserved for non-standardised and proprietary events. WRONG DATA: This is used to indicate a failure of an operation on the appliance. Additional non-standardised or proprietary data may be included. NOTE The use of this item to indicate an application error is deprecated and will not be used in next versions. It is poss ble that future versions of this specification will be based on event values which are structured differently. To this end, a specific field is reserved.
Alert Event Non-standardised	Send	Group	See definition in Table 29 – SIGNAL STATE MIDs
Reduction	Send	Group	See definition in Table 16 – EXECUTE COMMAND MIDs
Device Status	Send	Group	See definition in Table 29 – SIGNAL STATE MIDs
Remaining Time	Send	Group	See definition in Table 29 – SIGNAL STATE MIDs
Washing Parameters Non-standardised	Send	Group	See definition in Table 16 – EXECUTE COMMAND MIDs
Cooking Parameters Non-standardised	Send	Group	See definition in Table 16 – EXECUTE COMMAND MIDs
Refrigeration Parameters Non-standardised	Send	Group	See definition in Table 16 – EXECUTE COMMAND MIDs
Air Conditioning Parameters Non-standardised	Send	Group	See definition in Table 16 – EXECUTE COMMAND MIDs
Water Heating Parameters Non-standardised	Send	Group	See definition in Table 16 – EXECUTE COMMAND MIDs
Current Phase Non-standardised	Send	Group	See definition in Table 29 – SIGNAL STATE MIDs
Start Time	Send	Group	See definition in Table 29 – SIGNAL STATE MIDs
Finish Time	Send	Group	See definition in Table 29 – SIGNAL STATE MIDs
Set Temperature	Send	Group	See definition in Table 29 – SIGNAL STATE MIDs
Displayed Temperature	Send	Group	See definition in Table 29 – SIGNAL STATE MIDs
Current Temperature	Send	Group	See definition in Table 29 – SIGNAL STATE MIDs

To notify regarding application errors, an appliance should use the SIGNAL EVENT MID “Application Error” with data value depending on the error occurred. However since it has been common practice in the past to use “Normal Event” MID with value “WRONG DATA”, this practice is still supported for backward compatibility. So in order to notify for an error, an application may alternatively use “Normal Event” with value “WRONG DATA”. An appliance may not use the two MIDs to notify for the same application error case.

5.2.4.3 Specification of the Use of MID

Table 38 – MID Flow for SIGNAL EVENT MID

Accessing device	Flow	Primitive	Addressing	Household Appliance
	⇐	Send	Group	Transmission of any SIGNAL EVENT MID except from Normal Event and Application Error. It shall be performed anytime the value of the corresponding OID is changed.

Table 39 – MID Flow for SIGNAL EVENT MID “Normal Event”

Accessing device	Flow	Primitive	Addressing	Household Appliance
	⇐	Send	Group	Transmission of Normal Event MID with any value except from “Wrong data”. It shall be performed anytime the appliance has generated one of the described events in Normal Event description.

Table 40 – MID Flow for SIGNAL EVENT MID “Normal Event” with value “Wrong data”

Accessing device	Flow	Primitive	Addressing	Household Appliance
Transmission of valid or invalid message.	⇒	Any	Any	The operation fails due to an application error.
	⇐	Send	Individual	Transmission of Normal Event MID with value “Wrong data”. It shall be performed within a short time.

Table 41 – MID Flow for SIGNAL EVENT MID “Application Error”

Accessing device	Flow	Primitive	Addressing	Household Appliance
Transmission of valid or invalid message.	⇒	Any	Any	The operation fails due to an application error.
	⇐	Send	Individual	Transmission of Application Error MID with data including: • Error Code as specified in Table 12 • OID used in the message that caused the application failure. • Operation used during the application failure. It shall be performed within a short time.
More detailed description of generic application error cases may be found in 5.1.1.8, Application Errors.				

5.2.4.4 Mandatory and Optional Profiles

Table 42 – SIGNAL EVENT MID Profiles

MID	WM	TD	DW	MW	OV	GT	GO	RE	FZ	WC	FR	HB/IH	HD	AC	WHI	WHS
Device Status	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M
Application Error	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M
Normal events	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M
Alert events	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Reduction	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Remaining Time	O	O	O	O	O	O	O	-	-	-	-	O	O	O	-	O
Washing Parameters	O	O	O	-	-	-	-	-	-	-	-	-	-	-	-	-
Cooking Parameters	-	-	-	O	O	O	O	-	-	-	-	O	O	-	-	-
Refrigeration Parameters	-	-	-	-	-	-	-	O	O	O	O	-	-	-	-	-
Air Conditioning Parameters	-	-	-	-	-	-	-	-	-	-	-	-	-	O	-	-
Water Heating Parameters	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	O
Start Time	O	O	O	O	O	-	O	-	-	-	-	-	O	O	-	O
Finish Time	O	O	O	O	O	-	O	-	-	-	-	-	O	O	-	O
Current Phase	O	O	O	O	O	O	O	O	O	O	O	O	O	O	-	-
Set Temperature	O	O	O	O	O	O	O	O	O	O	-	O	O	O	O	O
Displayed Temperature	O	O	O	O	O	O	O	O	O	O	-	O	O	O	O	O
Current Temperature	O	O	O	O	O	O	O	O	O	O	-	O	O	O	O	O

The following symbols are used in this table:
- = MID is not available for the appliance
O = MID is Optional
M = MID is Mandatory

Table 43 – Normal Event MID Events Profile

MID with Data		WM	TD	DW	MW	OV	GT	GO	RE	FZ	WC	FR	HB/IH	HD	AC	WHI	WHS
Normal Event	END OF CYCLE	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
	TEMPERATURE REACHED	O	O	O	O	O	O	O	O	O	O	-	O	O	O	O	O
	END OF COOKING	-	-	-	O	O	O	O	-	-	-	-	O	O	-	-	-
	SWITCHING OFF	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
	WRONG DATA	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M

The following symbols are used in this table:
- = MID is not available for the appliance
O = MID is Optional
M = MID is Mandatory

All OIDs that have been implemented in the SIGNAL STATE Functional Block and their values may change during the normal operation of an appliance must also be implemented in the SIGNAL EVENT Functional Block.

5.2.5 IDENTIFY PRODUCT

5.2.5.1 Aims and objectives

This Functional Block is mandatory.

The objective of this Functional Block is to provide product information.

5.2.5.2 Functional Specification

It is possible to ask the appliance information about its identification. Identification data are persistent data, i.e. they are kept even when the WG is switched off. The following table shows the possible identification request MIDs.

Table 44 – IDENTIFY PRODUCT MIDs

<table>
<tr><th colspan="3">MID</th><th rowspan="3" colspan="3">Description</th></tr>
<tr><th>OID</th><th colspan="2">Operation</th></tr>
<tr><th></th><th>Primitive</th><th>Addressing</th></tr>
<tr><td>Extended Identification Request</td><td>Get
Return</td><td>Individual</td><td colspan="3">The Extended Identification Request OID is used to access various Fields providing information on the identification of a WG device. Each such OID Field is designated by an OID Field Id. The following table shows the identified OID Field Id, and further specifies whether it is mandatory/optional and whether the field is available to the final user.</td></tr>
<tr><td rowspan="14"></td><td rowspan="14"></td><td rowspan="14"></td><td>Field Id</td><td>Mandatory/ Optional</td><td>Availability to Final User</td></tr>
<tr><td>Company name</td><td>O</td><td>No</td></tr>
<tr><td>Company id</td><td>O</td><td>No</td></tr>
<tr><td>Brand name</td><td>O</td><td>Yes</td></tr>
<tr><td>Brand id</td><td>O</td><td>Yes</td></tr>
<tr><td>Model</td><td>O</td><td>Yes</td></tr>
<tr><td>Part number</td><td>O</td><td>Optional</td></tr>
<tr><td>Product revision</td><td>O</td><td>No</td></tr>
<tr><td>Software revision</td><td>O</td><td>No</td></tr>
<tr><td>Product type name</td><td>O</td><td>Yes</td></tr>
<tr><td>Product type id</td><td>O</td><td>Yes</td></tr>
<tr><td>Standard version</td><td>O</td><td>No</td></tr>
<tr><td colspan="3">Further values of Field Id are reserved for future standardised values.
Further values of Field Id are reserved for non-standardised and proprietary values.</td></tr>
<tr><td>Basic Identification Request</td><td>Get
Return</td><td>Individual</td><td colspan="3">Provides the following information:
• Company id
• Brand id
• Product Type id
• Standard version</td></tr>
<tr><td colspan="6">The following symbols are used in this table:
O = Field is Optional</td></tr>
</table>

5.2.5.3 Specification of Use of MID

Table 45 – MID Flow for Basic Identification MID

Accessing device	Flow	Primitive	Addressing	Household Appliance
Transmission of Basic Identification MID with GET operation. No data may be used.	⇒	Get	Individual	
	⇐	Return	Individual	The device shall transmit the Basic Identification MID with RETURN operation. This shall be sent within a short time.

Table 46 – MID Flow for Extended Identification MID

Accessing device	Flow	Primitive	Addressing	Household Appliance
Transmission of Extended Identification MID with GET operation. This OID uses Data Fields, so application data shall contain the value of the requested Field Id. The requested Field Id is valid.	⇒	Get	Individual	
	⇐	Return	Individual	The device shall transmit the Extended Identification MID with RETURN operation. The MID data returned will be the data of the requested OID Field. This shall be sent within a short time.

Table 47 – MID Flow for IDENTIFY PRODUCT MIDs upon use of invalid data

Accessing device	Flow	Primitive	Addressing	Household Appliance
Transmission of IDENTIFY PRODUCT MID with GET operation. The application data used are invalid.	⇒	Get	Individual	
	⇐	Send	Individual	The device shall transmit a SIGNAL EVENT MID “Application Error” with error code “Invalid data”. This shall be sent within a short time.

Table 48 – MID Flow upon no message received from the appliance

Accessing device	Flow	Primitive	Addressing	Household Appliance
Transmission of IDENTIFY PRODUCT MID with GET operation.	⇒	Get	Individual	
				The device does not transmit the corresponding IDENTIFY PRODUCT MID with RETURN operation nor a SIGNAL EVENT MID “Application Error” within a short time.
No action is specified. The appliance may be OFF or there may be communication problems.				

5.2.5.4 Mandatory and Optional Profiles

Table 49 – IDENTIFY PRODUCT MID Profiles

MID	WM	TD	DW	MW	OV	GT	GO	RE	FZ	WC	FR	HB/IH	HD	AC	WHI	WHS
Basic Id Request	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M	M
Extended Id Request	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
The following symbols are used in this table: O = MID is Optional M = MID is Mandatory																

5.2.6 COLLECT DIAGNOSIS DATA

5.2.6.1 Aims and objectives

This Functional Block is optional.

The objective of this Functional Block is to provide diagnosis data.

5.2.6.2 Functional Specification

It is possible to obtain appliance information diagnosis data through non-standardised messages using common MIDs.

Table 50 – COLLECT DIAGNOSIS DATA MIDs

MID			Description
OID	Operation		
	Primitive	Addressing	
Diagnosis Data Non-standardised	Get Return	Individual	Diagnosis data. No standardised values have been defined, so only non-standardised and proprietary values are possible.
	Send		
Diagnosis Operation Non-standardised	Change	Individual	Diagnosis operation. No standardised values have been defined, so only non-standardised and proprietary values are possible.

This Functional Block is defined to support simple diagnosis applications in a non-standardised or proprietary way. Some possible approaches are the following:

- diagnosis data consists of an array A of several bytes. Diagnosis Data Get MID is just requesting to return content of A. Diagnosis Data Return MID returns the value of A;
- diagnosis data consists of a buffer B of several hundred bytes. Diagnosis Data Get MID requests a specific segment of B. Diagnosis Data Return MID returns the value of the specific segment;
- diagnosis data is a structure with several fields. Diagnosis Data Get MID is used to request the value of a field. Diagnosis Data Return MID returns the value of the field;
- diagnosis session is supported. The Diagnosis Operation Change MID is used for session specific directives (e.g. request to open, close a session, executing a diagnosis command, etc.). The Diagnosis Data Send MID provides session specific feedback (e.g. session open, diagnosis command executed, etc.).

Not all diagnosis functions are possible. For instance diagnosis applications could involve event notification needs (e.g. upon certain alert events, trigger some diagnosis capability).

5.2.6.3 Specification of the Use of MID

Table 51 – MID Flow for Diagnosis Data MID

Accessing device	Flow	Primitive	Addressing	Household Appliance
Transmission of MID “Diagnosis Data” with GET operation. Non-standardised or proprietary data supported by the appliance are used.	⇒	Get	Individual	
	⇐	Return	Individual	The device shall transmit the Diagnosis Data MID with Return operation. Data used are non-standardised or proprietary. This shall be sent within a short time.

Table 52 – MID Flow for Diagnosis Data MID

Accessing device	Flow	Primitive	Addressing	Household Appliance
Transmission of MID “Diagnosis Data” with GET operation. Data not supported by the appliance are used.	⇒	Get	Individual	
	⇐	Send	Individual	The device shall transmit a SIGNAL EVENT MID “Application Error” with error code “Invalid data”. This shall be sent within a short time.

Table 53 – MID Flow for Diagnosis Data MID

Accessing device	Flow	Primitive	Addressing	Household Appliance
	⇐	Send	Individual	The device transmits a Diagnosis Data MID. Data used are non-standardised or proprietary. This may be sent at any time depending on the non-standardised application.

Table 54 – MID Flow for Diagnosis Operation MID

Accessing device	Flow	Primitive	Addressing	Household Appliance
Transmission of Diagnosis Operation MID with CHANGE operation. Non-standardised or proprietary data supported by the appliance are used.	⇒	Change	Individual	
	⇐	Send	Individual	The device shall at least transmit a Diagnosis Data MID with Send operation to acknowledge the successful completion of the CHANGE operation. Data used are non-standardised or proprietary. This shall be sent within a short time.
				Any other operations of the appliance are part of the proprietary diagnosis mechanism of each appliance and are not described here.

Table 55 – MID Flow for Diagnosis Operation MID

Accessing device	Flow	Primitive	Addressing	Household Appliance
Transmission of Diagnosis Operation MID with CHANGE operation. Non-standardised or proprietary data not supported by the appliance are used.	⇒	Change	Individual	
	⇐	Send	Individual	The device shall transmit a SIGNAL EVENT MID “Application Error” with error code “Invalid data”. This shall be sent within a short time.

5.2.6.4 Mandatory and Optional Profiles

Table 56 – COLLECT DIAGNOSIS DATA MID Profiles

MID	WM	TD	DW	MW	OV	GT	GO	RE	FZ	WC	FR	HB/IH	HD	AC	WHI	WHS
Diagnosis Data	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Diagnosis Operation	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
The following symbols are used in this table: O = MID is Optional																

5.2.7 MANAGE TIME

5.2.7.1 Aims and objectives

This Functional Block is optional.

The objective of this Functional Block is to provide a time reference and possibly to update the time reference through a trusted clock.

5.2.7.2 Functional Specification

The MANAGE TIME FB shall be supported by appliances which have a clock display. This FB can be in two modes:

- the master clock capability, when the appliance can provide a time reference;
- the slave clock capability, when the appliance uses the time reference.

Only one master clock may be present at any time. This shall be ensured by a proprietary mechanism that enforces the presence of only one master clock.

This could be the appliance, on which the user sets the time and date.

When appliances are first switched on, they shall have slave clock capability, unless (1) they have external synchronisation capability, or (2) the user has set the date on an appliance that is able to keep this information when it is off.

Appliances, with a hardwired master clock could be synchronised with the European clock, or through an external Internet connection.

The user shall have the possibility to disable the automatic external synchronisation.

The Master clock shall send the following periodic messages.

Table 57 – MANAGE TIME MIDS

MID			Description
OID	Operation		
	Primitive	Addressing	
Time	Get	Group Individual	Hourly update of time. It includes hour, minute and second information. It optionally includes week of the day. It is expected that latency will not exceed a few seconds.
	Return	Individual	
	Send	Any	
Date	Get	Group Individual	Date value. It includes year, month and day information.
	Return	Individual	
	Send	Any	

Date request is a message that is sent when an appliance is switched on and has not yet received the date value.

Periodic broadcast delivery (every hour or more frequently) of the current time is useful to resolve the synchronisation problem among several displays (e.g. two identical Electric Ovens, with the same time at the beginning, would display different time values after few hours of running). The delivery of the time value with the indicated time period does not generate important traffic.

A device that has the master clock capability is any device which has inside a Real Time Clock (e.g. a PC, a Residential Gateway, or one set-top-box, etc.) and that may be able, optionally, to manage two times: one for the local displays and one for the communications with the external world (Call Centre). Some devices could be slave clock only. They have a non-reliable management of time (and date), e.g. the display of a household device without internal Real Time Clock. It is recommended that there is a user/installer action to select the clock server (in practice an appliance that is always on) so that there is only one active clock server at any time.

In case the master clock is not present, the appliance should switch back to autonomous mode.

5.2.7.3 Specification of the Use of MID

Table 58 – MID Flow for Time MID

Accessing device	Flow	Primitive	Addressing	Household Appliance
Transmission of MID Time with SEND operation. It is performed at least every hour.	⇒	Send	Any	

Table 59 – MID Flow for Time MID

Accessing device	Flow	Primitive	Addressing	Household Appliance
	⇐	Get	Group	Request for MID Time with GET operation. It is performed when a household appliance has lost track of the time (e.g. upon power failure) for clock discovery.
Transmission of MID Time with RETURN operation. It is performed within the next 60 s.	⇒	Return	Individual	

Table 60 – MID Flow for Time MID

Accessing device	Flow	Primitive	Addressing	Household Appliance
	⇐	Get	Individual	Request for MID Time with GET operation. It is performed when a household appliance has lost track of the time (e.g. upon power failure) and knows the clock address.
Transmission of MID Time with RETURN operation. It is performed within the next 60 s.	⇒	Return	Individual	

Table 61 – MID Flow for Date MID

Accessing device	Flow	Primitive	Addressing	Household Appliance
	⇐	Get	Group	Request for MID Date with GET operation. It is performed when the household appliance has lost track of the date (e.g. upon power failure).
Transmission of MID Date with RETURN operation. It is performed within the next 60 s.	⇒	Return	Individual	

Table 62 – MID Flow for Date MID

Accessing device	Flow	Primitive	Addressing	Household Appliance
	⇐	Get	Individual	Request for MID Date with GET operation. It is performed when the household appliance has lost track of the date (e.g. upon power failure) and knows the clock address.
Transmission of MID Date with RETURN operation. It is performed within the next 60 s.	⇒	Return	Individual	

5.2.7.4 Mandatory and Optional Profiles

Table 63 – MANAGE TIME MID Profiles

MID	WM	TD	DW	MW	OV	GT	GO	RE	FZ	WC	FR	HB/IH	HD	AC	WHI	WHS
Time	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Date	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
The following symbols are used in this table: O = MID is Optional																

5.2.8 Application Error Management

5.2.8.1 Aims and objectives

The objective of this subclause is to define the behaviour of appliances in case of application errors.

5.2.8.2 Functional Specification

The possible application error cases are described in Table 12.

5.2.8.3 Detailed Description of the Use of Application Error MID

Table 64 – MID Flow for Application Error MID with error code "Invalid OID"

Accessing device	Flow	Primitive	Addressing	Household Appliance
Transmission of not implemented MID: The OID is not supported by the appliance.	⇒	Any	Any	
	⇐	Send	Individual	Transmission of SIGNAL EVENT MID "Application Error" with value "Invalid OID". It shall be performed within a short time.

Table 65 – MID Flow for Application Error MID with error code "Not implemented Operation"

Accessing device	Flow	Primitive	Addressing	Household Appliance
Transmission of not implemented MID: The OID is supported by the appliance but the operation on the OID is not supported.	⇒	Not supported by the appliance	Any	
	⇐	Send	Individual	Transmission of SIGNAL EVENT MID "Application Error" with error code "Not implemented Operation". It shall be performed within a short time.

Table 66 – MID Flow for Application Error MID with error code “Not implemented Operation”

Accessing device	Flow	Primitive	Addressing	Household Appliance
Transmission of not implemented MID: The OID is supported by the appliance, the operation on the OID is supported, but the addressing used is not supported by the appliance.	⇒	Supported by the appliance	Not supported by the appliance	
	⇐	Send	Individual	Transmission of SIGNAL EVENT MID “Application Error” with error code “Not implemented Operation”. It shall be performed within a short time.

Table 67 – MID Flow for Application Error MID with error code “Invalid Field”

Accessing device	Flow	Primitive	Addressing	Household Appliance
Transmission of implemented MID. The MID data use not supported Field Id.	⇒	Supported by the appliance	Supported by the appliance	
	⇐	Send	Individual	Transmission of SIGNAL EVENT MID “Application Error” with error code “Invalid Field”. It shall be performed within a short time.

Table 68 – MID Flow for Application Error MID with error code “Invalid Data”

Accessing device	Flow	Primitive	Addressing	Household Appliance
Transmission of implemented MID with not supported OID data or OID Field data.	⇒	Supported by the appliance	Supported by the appliance	
	⇐	Send	Individual	Transmission of SIGNAL EVENT MID “Application Error” with error code “Invalid Data”. It shall be performed within a short time.

Table 69 – MID Flow for Application Error MID with error code “Invalid Transition”

Accessing device	Flow	Primitive	Addressing	Household Appliance
Transmission of supported MID with supported MID data.	⇒	Supported by the appliance	Supported by the appliance	This message is not in conformance with the appliance state machine.
	⇐	Send	Individual	Transmission of SIGNAL EVENT MID “Application Error” with error code “Invalid Transition”. It shall be performed within a short time.

Table 70 – MID Flow for Application Error MID with error code "Command Refused"

Accessing device	Flow	Primitive	Addressing	Household Appliance
Transmission of supported MID with supported MID data.	⇒	Supported by the appliance	Supported by the appliance	The appliance has the Remote Control disabled at this time. This message is not permitted when Remote Control is disabled.
	⇐	Send	Individual	Transmission of SIGNAL EVENT MID "Application Error" with error code "Command Refused". It shall be performed within a short time.

5.3 Network Management Functions

5.3.1 Aims and objectives

The objective of the network management functions is to verify the aliveness of appliances.

5.3.2 Functional Specification

- Devices accessing WG appliances shall check their aliveness. It is recommended that the checking rate is not faster than 5 min. Devices shall use either the "SIGNAL STATE" FB or the "IDENTIFY PRODUCT" FB. It is also expected that devices will skip aliveness checking if they have spontaneously received a MID from the WG appliances.

- In this version of the standard, WG appliances are not required to implement any mechanism to support aliveness checking. Manufacturers are free to include or not such mechanisms that will help manage aliveness. For instance, the communication part of the appliance could be always powered. Another scheme could be to have the appliance send a "switch off" message prior to powering off.

Note that it is possible that aliveness checking is also performed by the underlying protocol.

5.4 Appliance Description

5.4.1 State Machine Model

The behaviour of an appliance can be represented by the state machine model. Each state of the appliance is defined (e.g. pause, running), as well as each event that triggers a transition to another state (e.g. start command, failure detection). Examples of state machine diagrams for each appliance type are found in Annex A. The following sections specify the states and transitions that may be used in a state machine.

5.4.2 States

Appliance state are defined in Table 30 – Device Status MID States.

5.4.3 Transitions

Transitions between states may be caused by either execution of commands or other non-standardised changes in the internal appliance status.

Commands are defined in Table 17 – Execution of a Command MID Commands.

Other non-standardised transitions are not defined in this document. Example of such transition is a change in the internal appliance status, for instance, "temperature reached" or "failure detected".

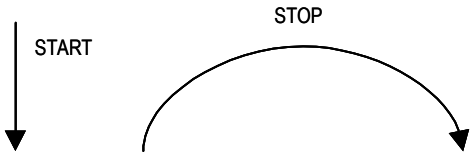
5.4.4 State Diagram Notation

State diagram notation represents the functionality of a household appliance. The states of the product are represented with a box containing the name of the state. Examples of states of a product are STAND BY (product not active) and RUNNING (product executing a cycle). States are represented by rectangles.

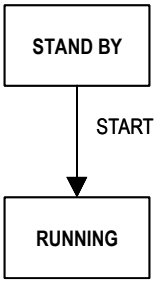
EXAMPLE 1

Transitions from one state to another are represented by arrows that connect the states. Adjacent to the branch is the command or event that has generated the transition.

EXAMPLE 2



EXAMPLE 3 To represent the transition from the STAND BY state to the RUNNING state generated by the reception of the START command, the following block diagram is used:



In the state diagrams, upper case letters (e.g. START) are used to identify the items described in this document (e.g. messages, states, events). Names, which are manufacturer dependent or are used in the state diagram to clarify the functionality but are not described in this document, are in lower case letters (e.g. Door open).

Annex A
(informative)

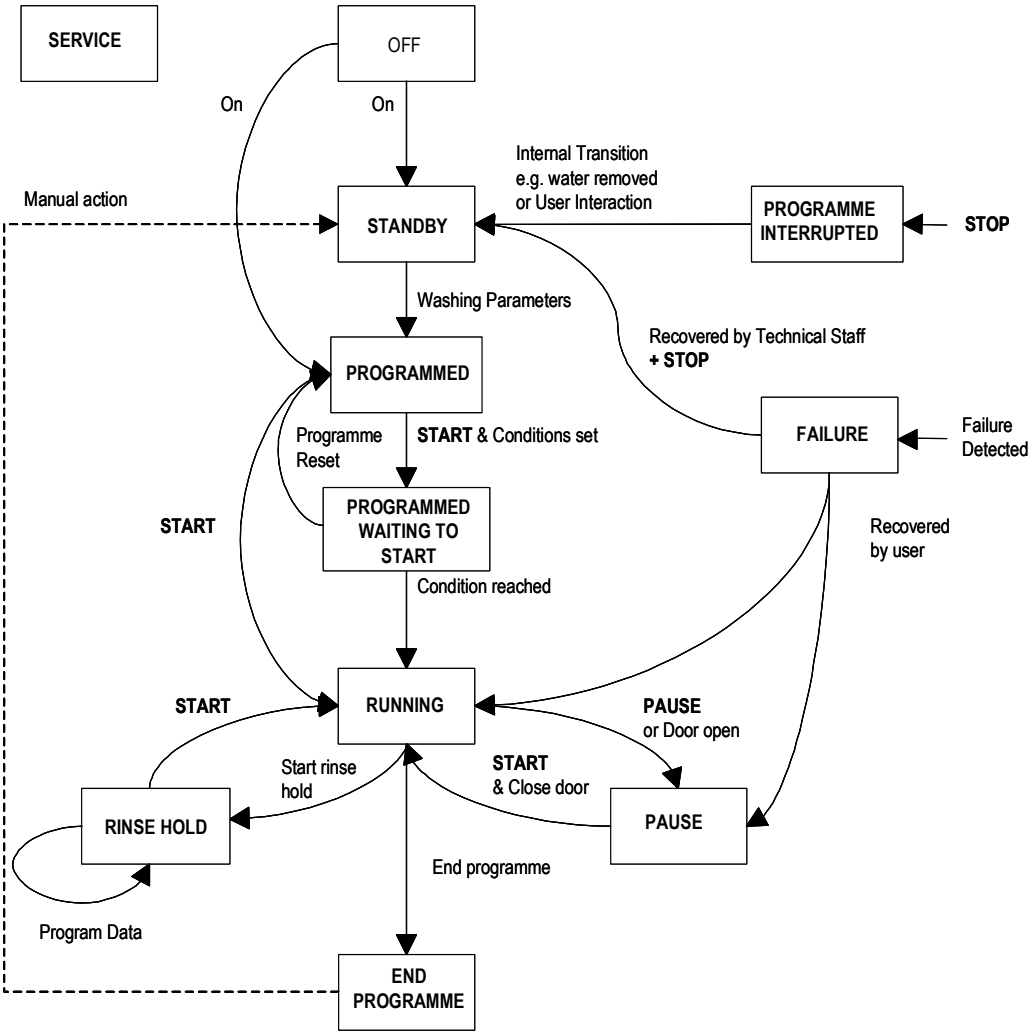
Examples of Appliances State Diagrams

A.1 Introduction

This section provides an example state diagram for each type of appliance. The diagrams are not meant to be binding (in particular most manufacturers have either different state diagrams, and/or much more sophisticated state diagrams). They are presented in order to understand the semantics of this interworking standard from a user point of view. In particular

- it is possible that some appliances do not support some of the states: for instance PROGRAMMED WAITING TO START is optional,
- it is possible that some appliances support additional states and transitions: for instance there could be a transition from all states to the SERVICE state.

A.2 Washing Machine State Diagram



NOTE 1 The Off transition is possible at any time through a local action.

NOTE 2 The End programme state will go into the STAND BY state after a local or internal operation has been carried out, e.g. when the clean clothes have been removed.

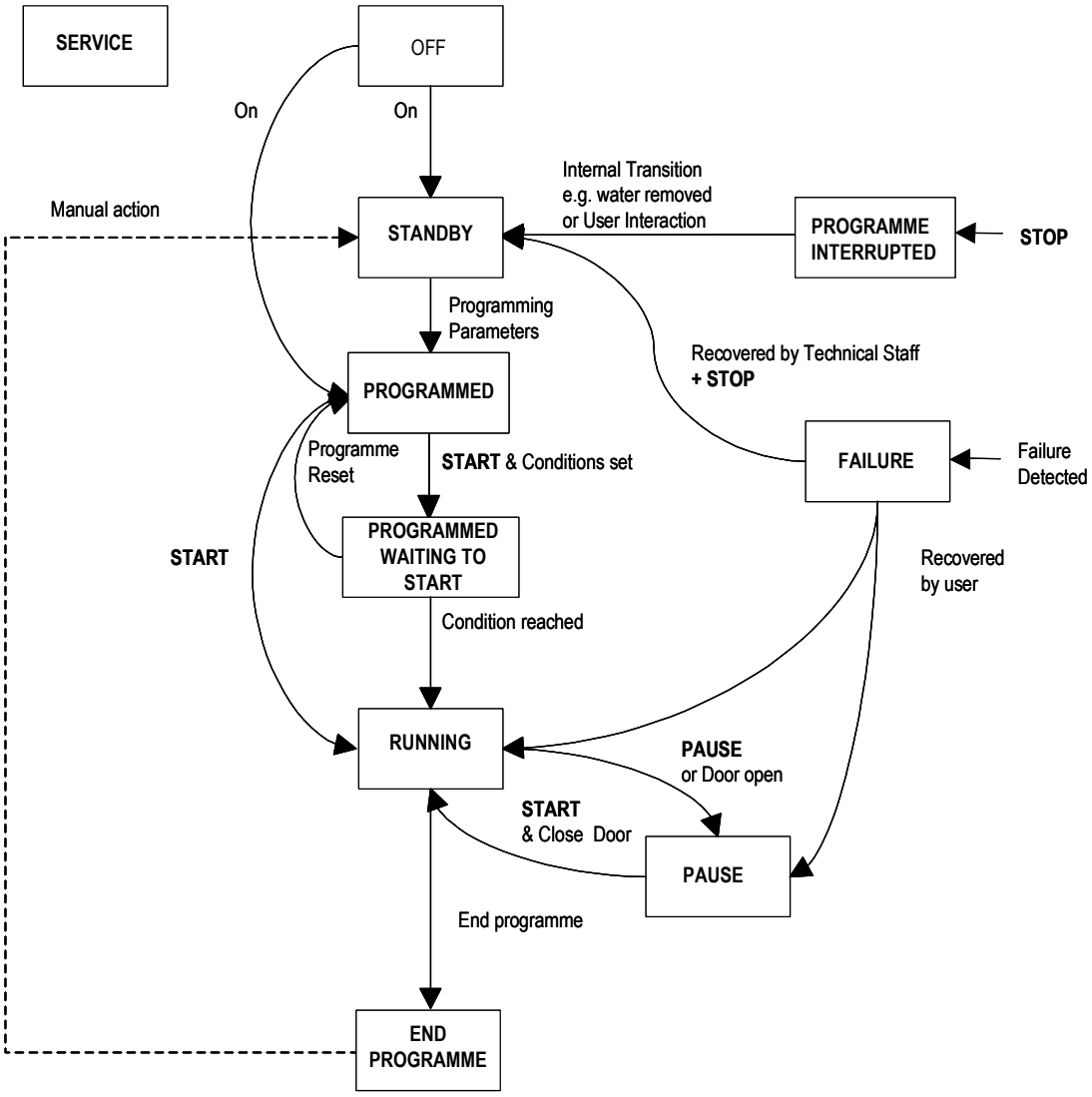
NOTE 3 An example of failure event is water leakage. The document assumes that the failure event can occur in any state. An example of failure that is recovered by user is when the tube form tap is blocked.

NOTE 4 Locally one can move from RUNNING to PAUSE or the other way round by opening and closing the door (this is a manufacturer decision; it can also take place through other actions such as pushing a button).

NOTE 5 Remotely, one can move from RUNNING to PAUSE by sending a PAUSE command and move from PAUSE to RUNNING by sending a START command (it is assumed that door must be closed).

Figure A.1 – Washing Machine State Diagram

A.3 Tumble Dryer State Diagram



NOTE 1 The Off transition is possible at any time.

NOTE 2 The END PROGRAMME state will to into the STAND BY state when the dry clothes have been removed.

NOTE 3 An example of the failure event is a blocked filter. The document assumes that the failure event can happen in any state. An example of a failure that is recovered by user is when the condensation container is full.

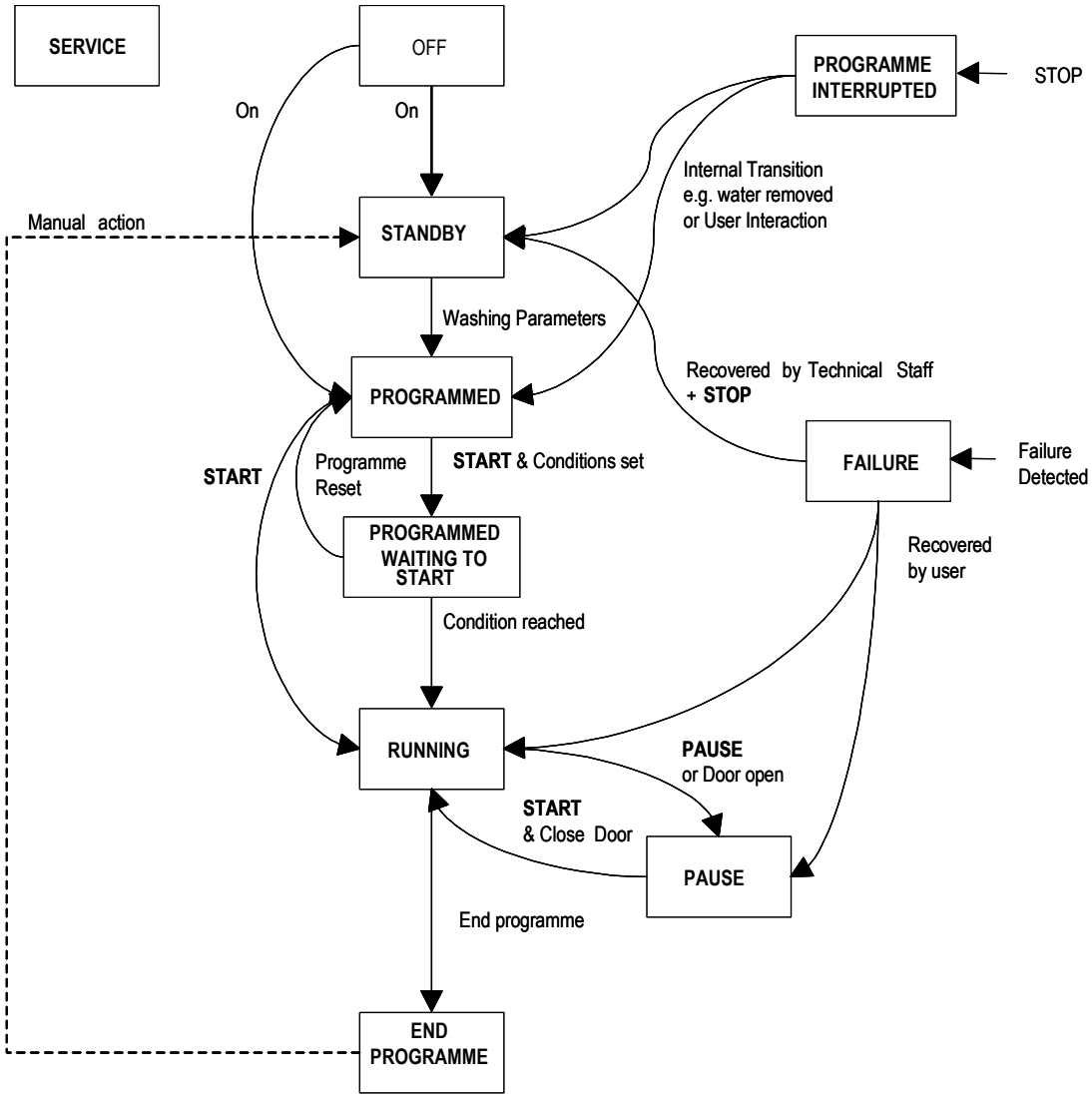
NOTE 4 Locally one can move from RUNNING to PAUSE or the other way round by opening and closing the door (this is a manufacturer decision; it can also take place through other actions such as pushing a button).

NOTE 5 Remotely, one can move from RUNNING to PAUSE by sending a PAUSE command and move from PAUSE to RUNNING by sending a START command (it is assumed that door must be closed).

NOTE 6 Parameters are transmitted through the Washing parameter MID.

Figure A.2 – Tumble Dryer State Diagram

A.4 Dishwasher State Diagram

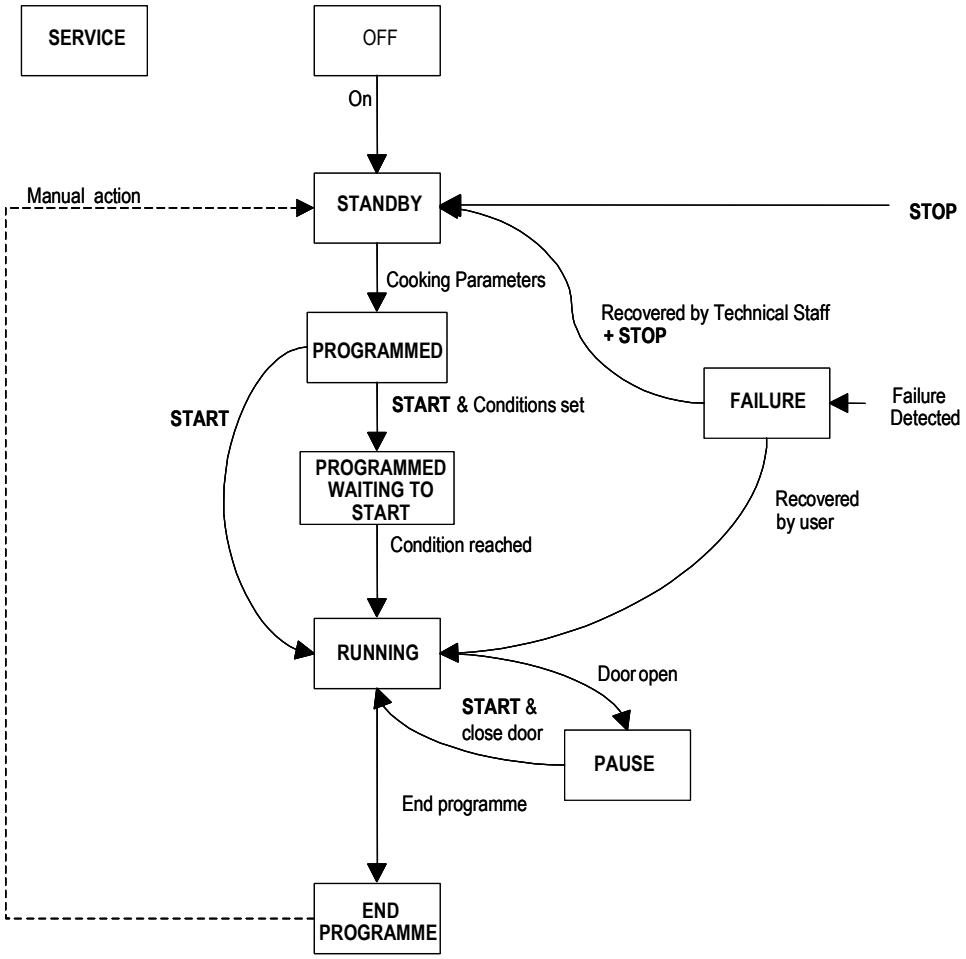


NOTE 1 The Off transition is possible at any time.

NOTE 2 The END PROGRAMME state will go into the STAND BY state when clean dishes have been removed.

Figure A.3 – Dish Washer State Diagram

A.5 Microwave Oven State Diagram

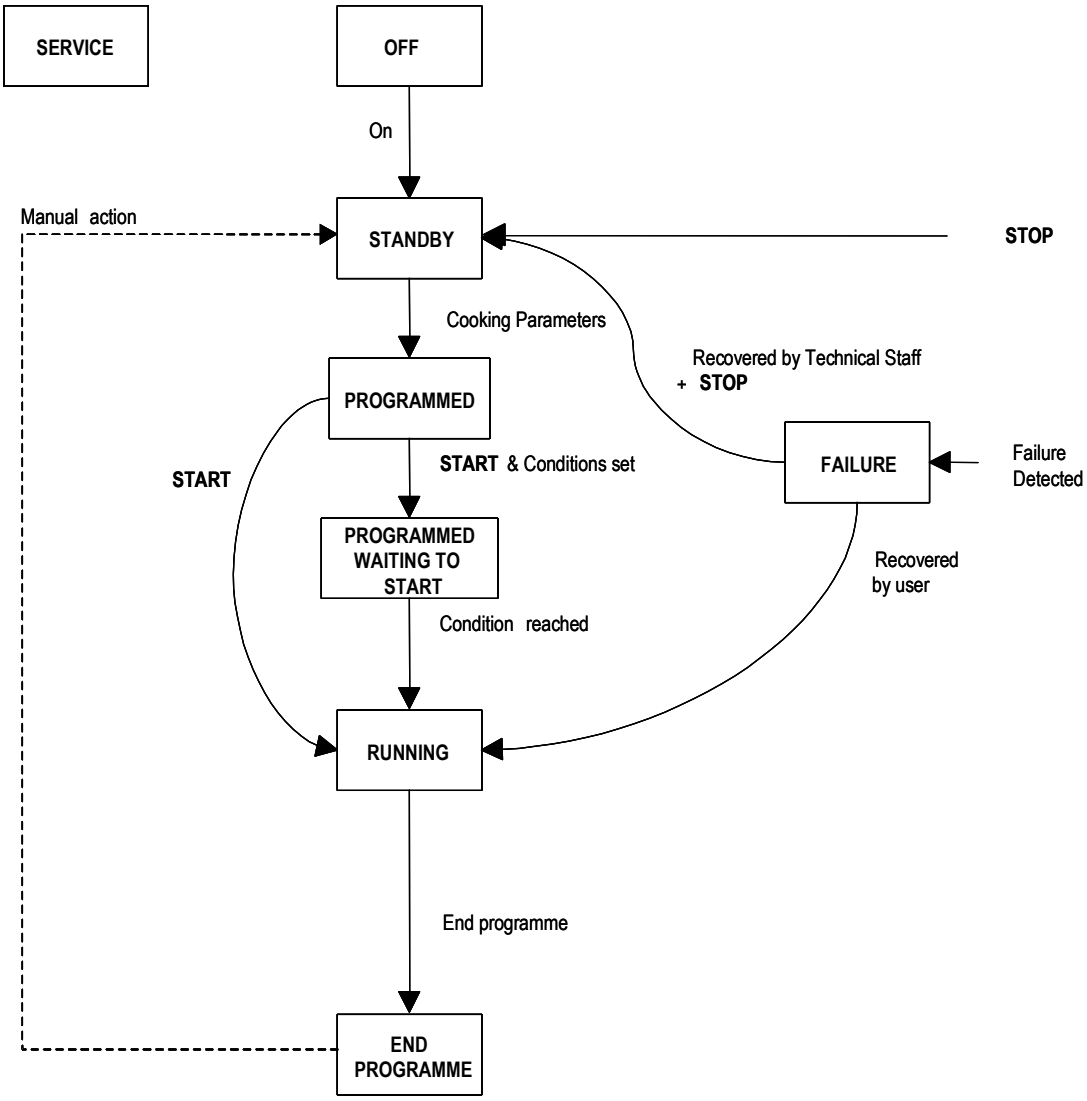


NOTE 1 The Off transition is possible at any time, but it necessitates the unplugging of the appliance, as it will usually be in state STAND BY.

NOTE 2 Microwave Ovens have a controlled cooking mode where one selects power and cooking time parameters. Their operation implies a controlled programme execution very similar to that of Washing Machines. On the other hand, Electric Ovens have more basic settings. For instance, the end of cooking need not be fixed.

Figure A.4 – Microwave Oven State Diagram

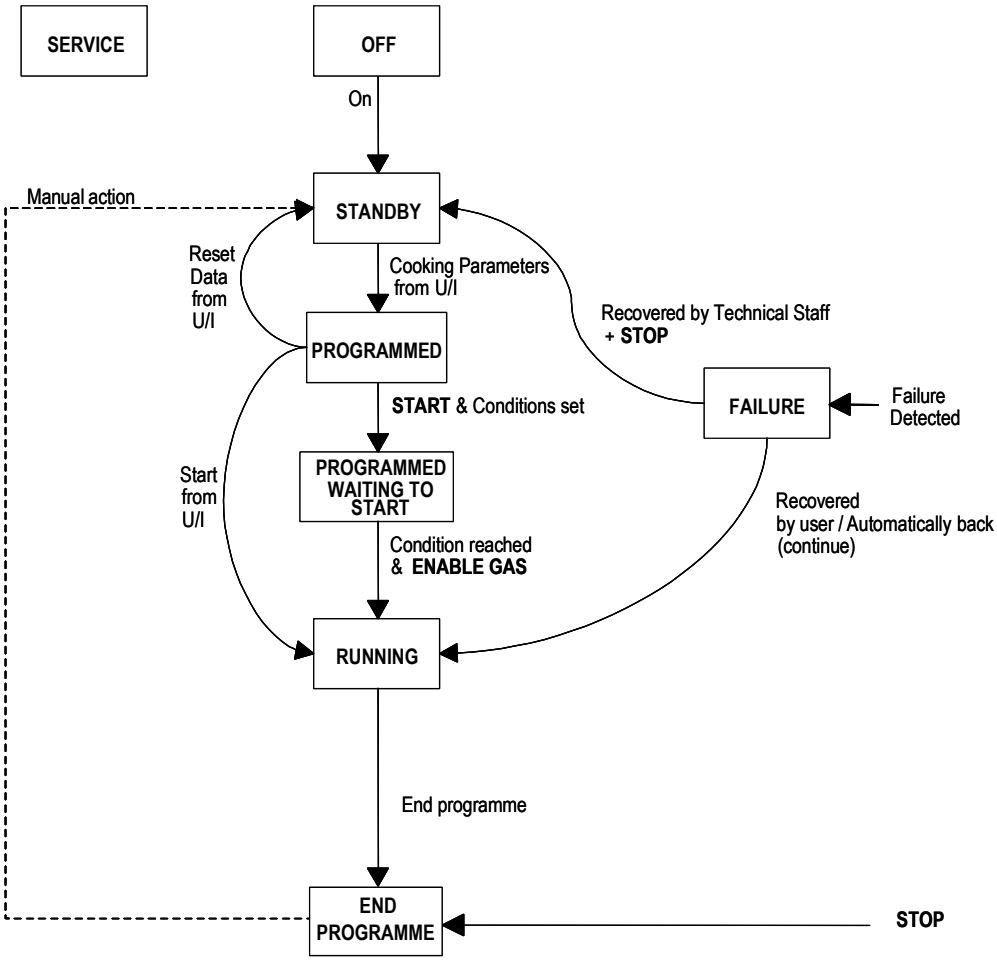
A.6 Electric Oven State Diagram



NOTE The Off transition is possible at any time, but it necessitates the unplugging of the appliance, as it will usually be in state STAND BY.

Figure A.5 – Electric Oven State Diagram

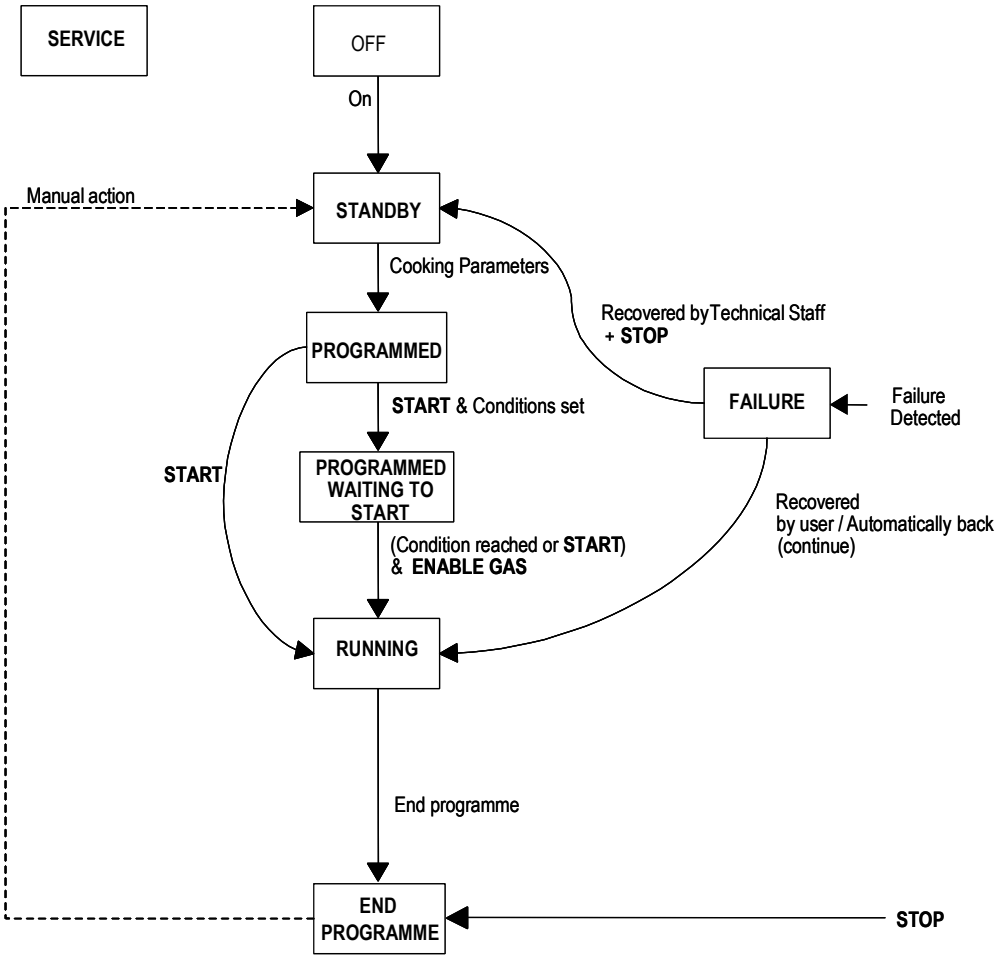
A.7 Gas Cooktop State Diagram



NOTE The Off transition is possible at any time.

Figure A.6 – Gas Cooktop State Diagram

A.8 Gas Oven State Diagram

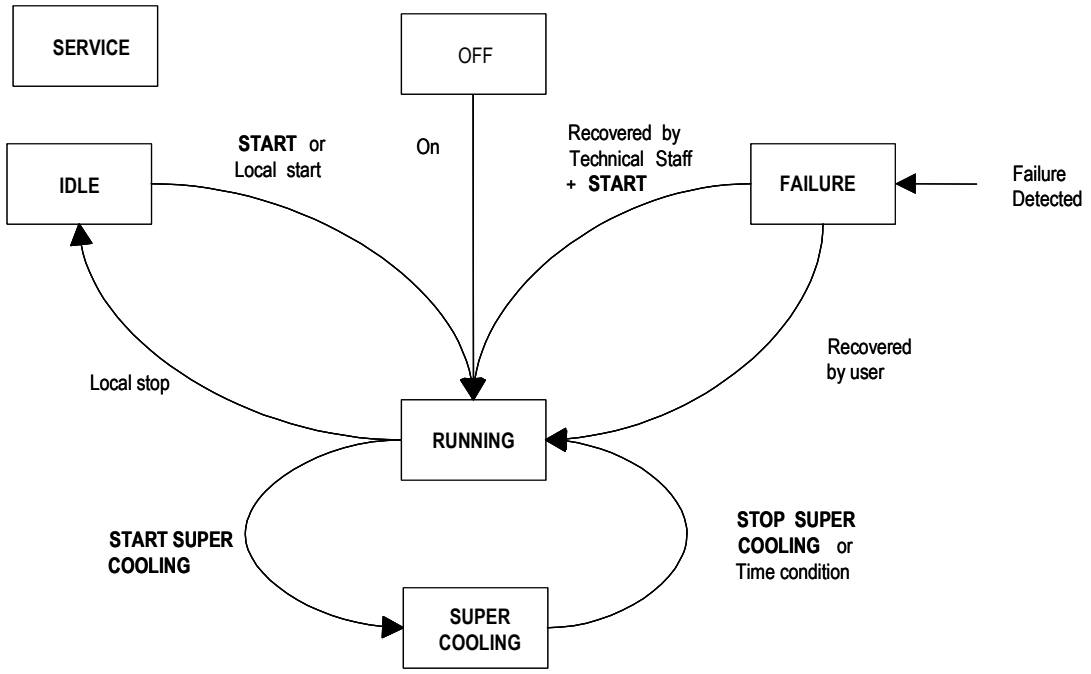


NOTE 1 The Off transition is poss ble at any time, but it necessitates the unplugging of the appliance, as it will usually be in the STAND BY state.

NOTE 2 Except for ENABLE GAS, this state diagram is the same as the Electric Oven state diagram.

Figure A.7 – Gas Oven State Diagram

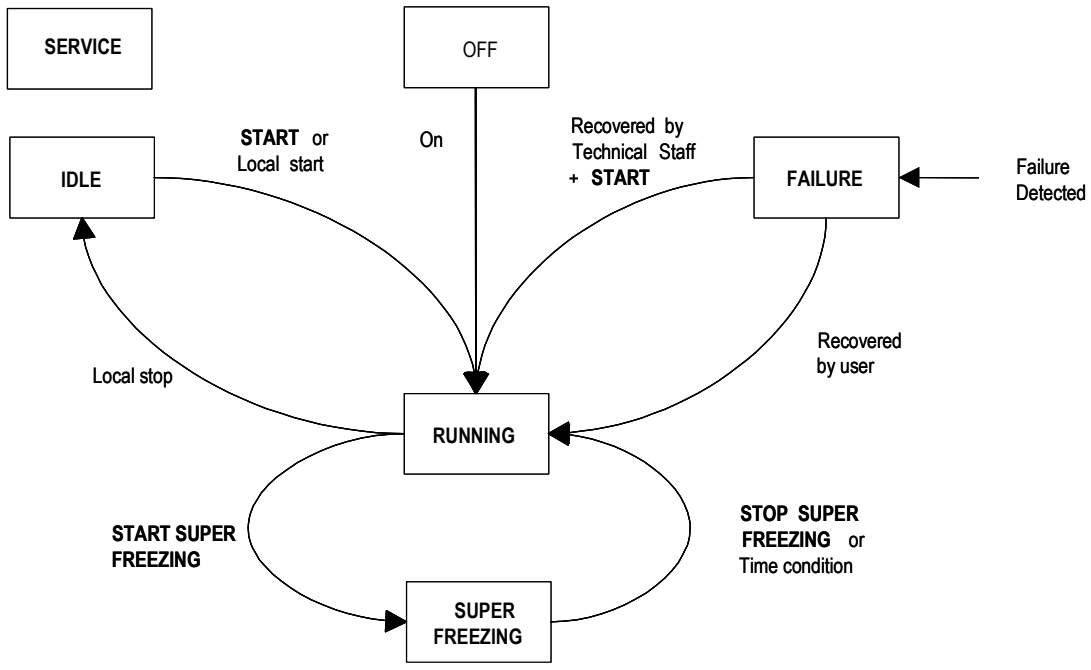
A.9 Refrigerator State Diagram



NOTE The Off transition is poss ble at any time, but it necessitates the unplugging of the appliance.

Figure A.8 – Refrigerator State Diagram

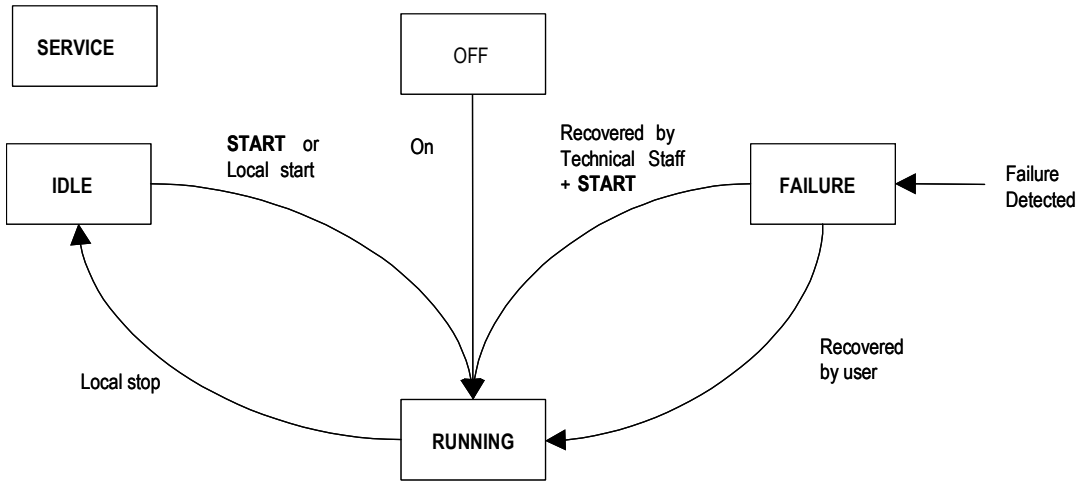
A.10 Freezer State Diagram



NOTE The Off transition is poss ble at any time, but it necessitates the unplugging of the appliance.

Figure A.9 – Freezer State Diagram

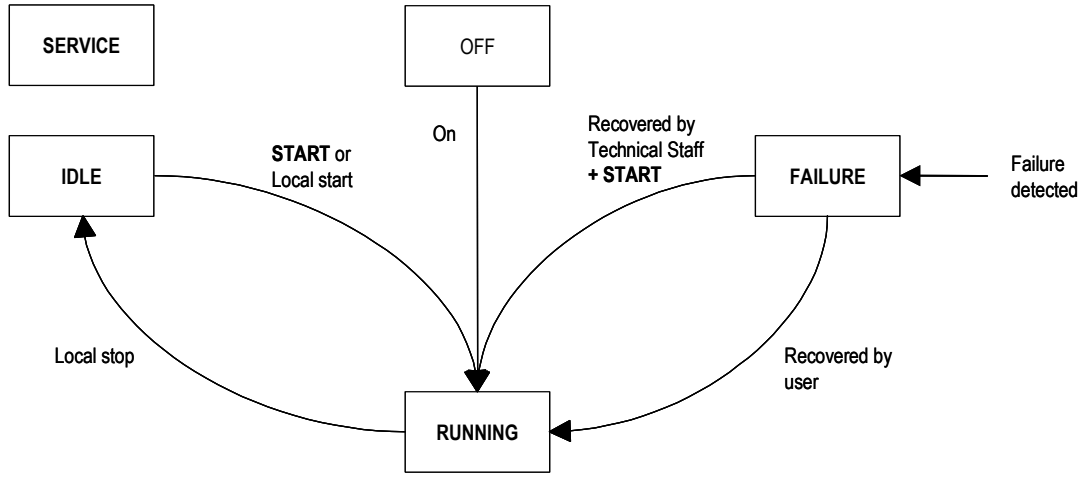
A.11 Winecabinet State Diagram



NOTE The Off transition is possible at any time, but it necessitates the unplugging of the appliance.

Figure A.10 – Winecabinet State Diagram

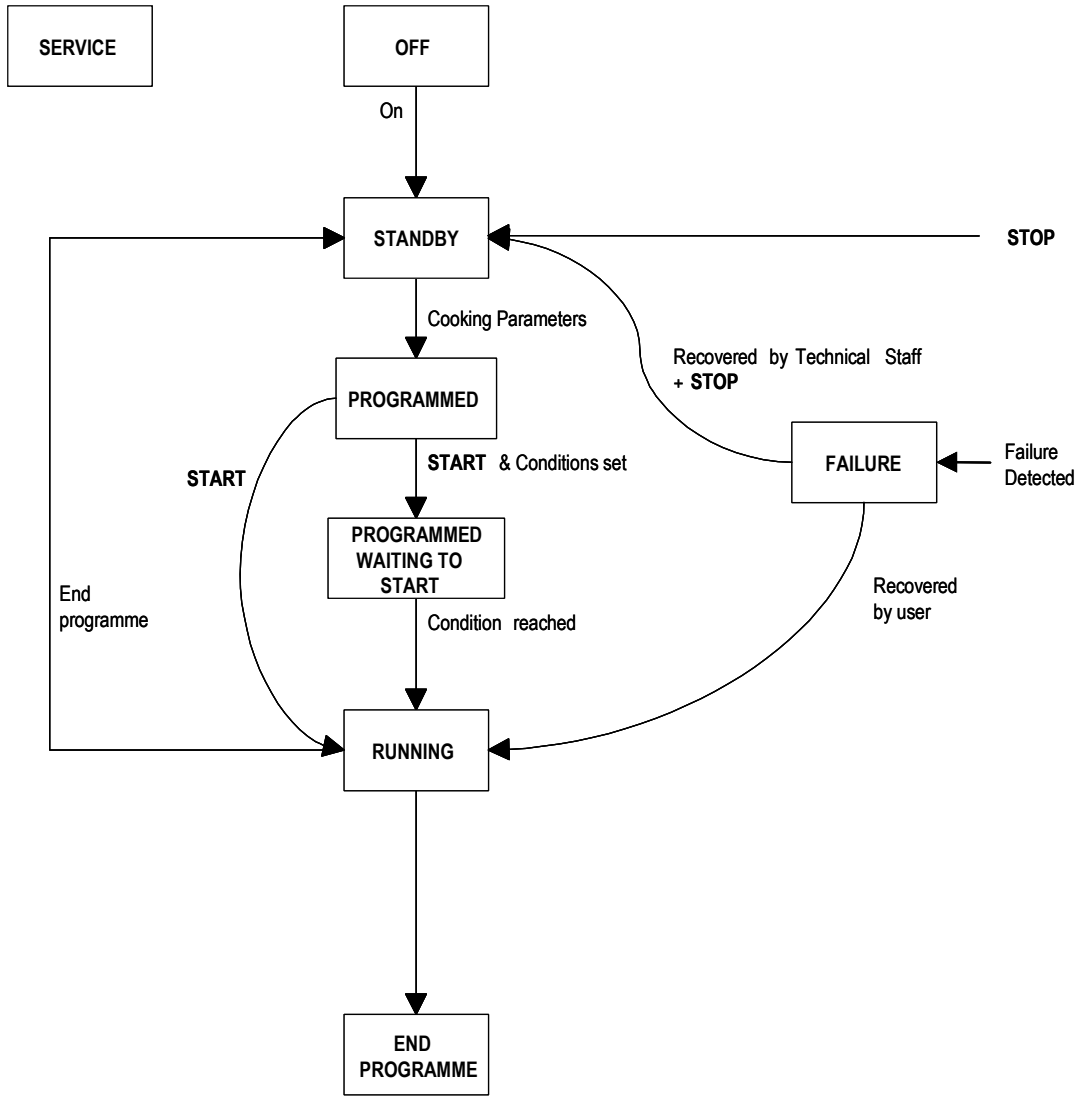
A.12 Refrigerator-Freezer State Diagram



NOTE The Off transition is possible at any time, but it necessitates the unplugging of the appliance.

Figure A.11 – Refrigerator-Freezer State Diagram

A.13 Hobs and Induction Hobs State Diagram

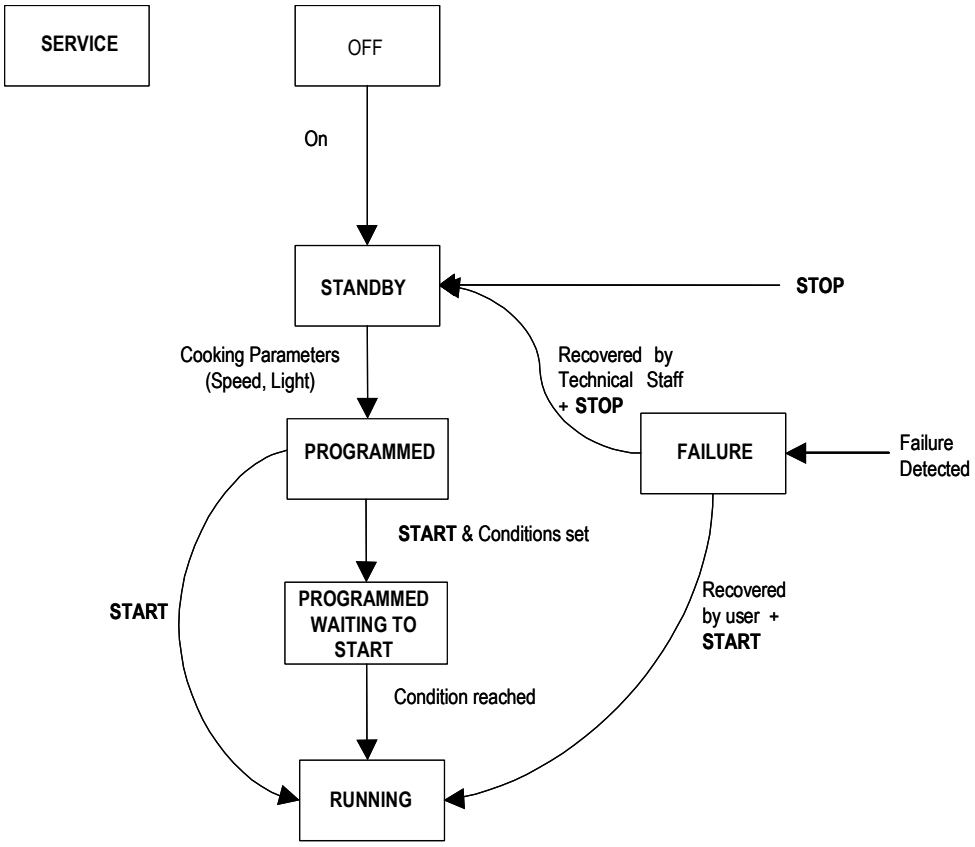


NOTE 1 The Off transition is possible at any time.

NOTE 2 Induction Hobs are considered to be the same as the conventional electrical Hobs, however the remote control may be less restrictive.

Figure A.12 – Hobs State Diagram

A.14 Hood State Diagram



NOTE 1 The Off transition is possible at any time.

NOTE 2 START could be generated automatically by the Hob.

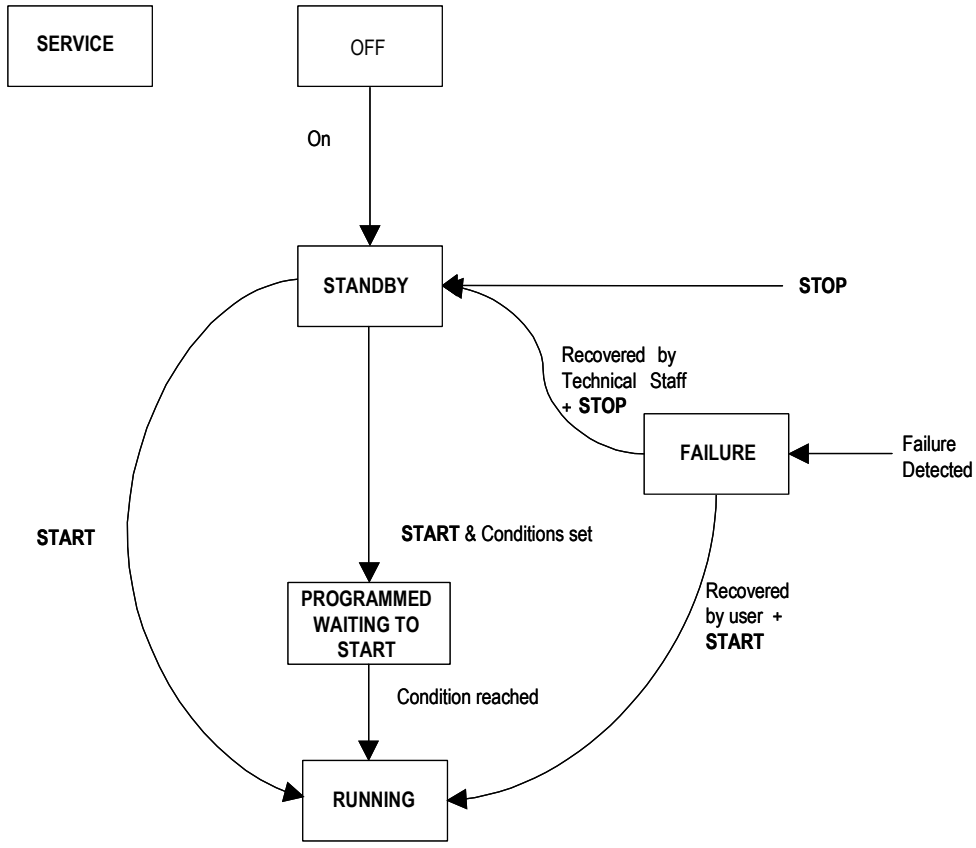
Figure A.13 – Hood State Diagram

A.15 Air conditioner State Diagram

In many ways, the mobile Air Conditioner is similar to other Household Appliances, hence it is included in this document. The Air Conditioner is similar to a refrigerator when no start or end time is selected: Either the Air Conditioner is in the Stand by state (similar to a Refrigerator Idle state), or in the Running state. In the Running state, the difference between the programmed temperature and the room temperature decides whether the compressor starts or not (as for the Refrigerator in the normal operational state). The “programming” of the temperature can follow in the Stand by state as well as in the Running state. For this reason there is no use of state Programmed for the Air Conditioner (if no temperature is selected before entering the Running state, a default value will be chosen, e.g. 18 °C).

A timer can be programmed (in Stand by as well as in the Running state). The timer can be used for defining a period for the running (e.g. repeated each 24 h), or with only start or end time. If the start condition requires the device to start temperature regulation, the device enters the Running state, otherwise it enters the Programmed waiting to start state. If only an end time is selected, the device enters Stand by upon exceeding this time.

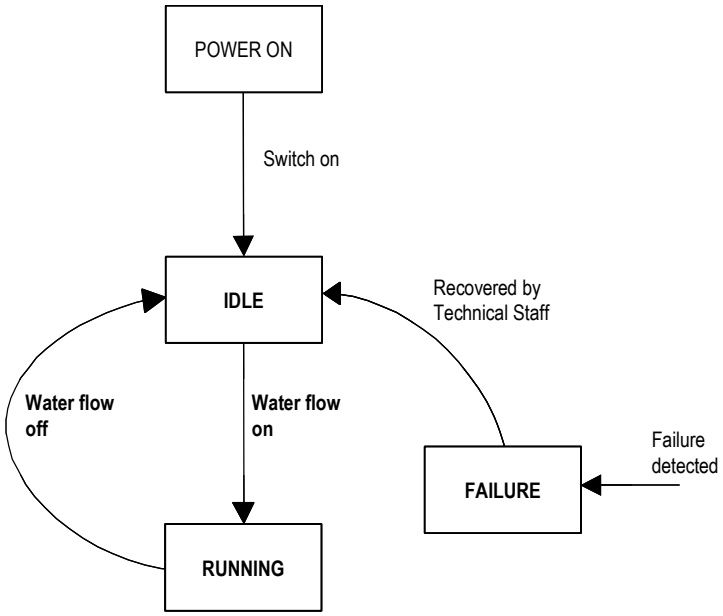
The Running state may have sub-states, for distinguishing dehumidifying, cooling and ventilation states. Note that the ventilator may run when the compressor is not running due to the reached temperature condition. The level of the ventilator may also be adjusted independently of the device state.



NOTE The Off transition is possible at any time.

Figure A.14 – Air Conditioner State Diagram

A.16 Instantaneous Water Heater State Diagram

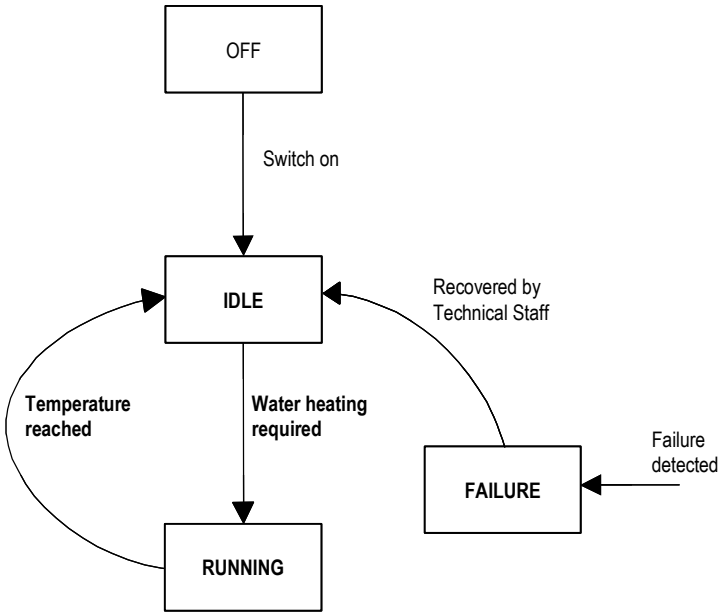


NOTE 1 Instantaneous Water Heaters usually don't have an OFF state, just put the temperature point to zero. This might be possible at any time.

NOTE 2 Unit is switching to RUNNING state automatically, if hot water tap is opened by the user.

Figure A.15 – Instantaneous Water Heater State Diagram

A.17 Storage Water Heater State Diagram



NOTE 1 The Off transition is possible at any time.

NOTE 2 Unit is switching to RUNNING state automatically, if hot water temperature is getting low.

Figure A.16 – Storage Water Heater State Diagram

Bibliography

[1] Standard for Repair Coding and Guarantee Claim Form. CECED Standard, September 2001

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