3 BCS Architecture Model

In this section, we describe the component interface specifications and their variants as well as the different architecture model variants. In addition to the core architecture model, we further list the architecture model deltas transforming the core architecture to a specific variant.

As a basis for the BCS architecture model documentation, Fig. 3.1 gives an overview of all component-connector specifications, where feature annotations are omitted for a better readability. Please note that the illustrated architecture is not a valid architecture model for the BCS SPL case study. Each component represents a specific system function defined by the corresponding feature, whereas internal connectors represent interactions between components and input/output connectors constitute the communication with the system environment. In the following, we describe in detail the various component variants and their valid combinations in architecture models for the representative subset of product variants (*P*0-*P*17).

3.1. Component Interface Specifications

Manual Power Window The standard component for the feature *Manual Power Window* is depicted in Fig. 3.2, controlling the movement of the window. The interface is defined by the following input and output signals.
Input Signals:

- *pw_but_dn* controls the downwards movement of the window
- *pw_but_up* controls the upwards movement of the window
- *pw_pos_up* indicates the upper window position
- *pw_pos_dn* indicates the lower window position
- *fp_on* stops and disables the upwards movement of the window
- *fp_off* re-enables the upwards movement

Output Signals:

- *pw_mv_up* represents the upwards movement of the window
- *pw_mv_dn* represents the downwards movement of the window

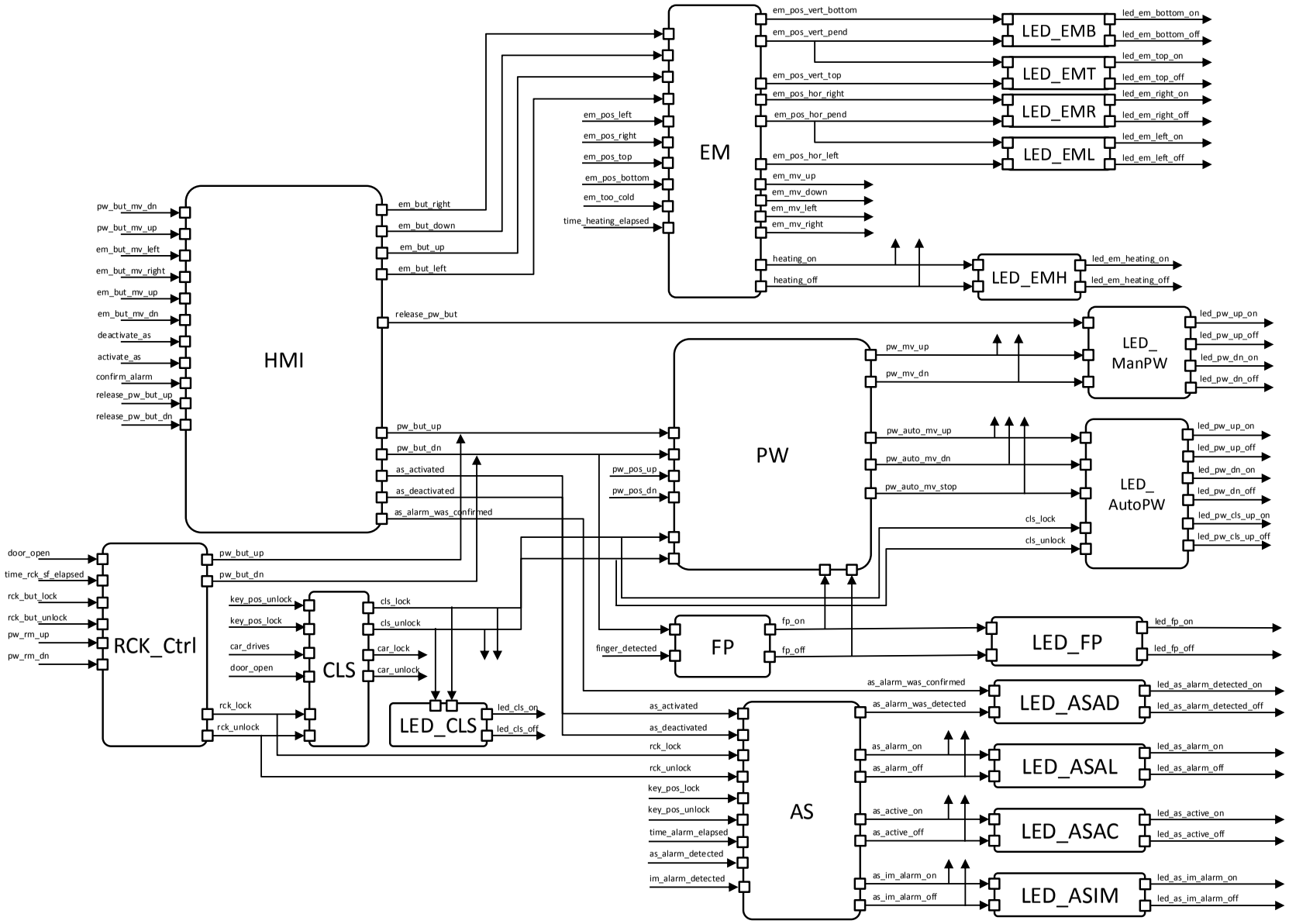

Figure 3.1.: Overview of the Variable Architecture Models

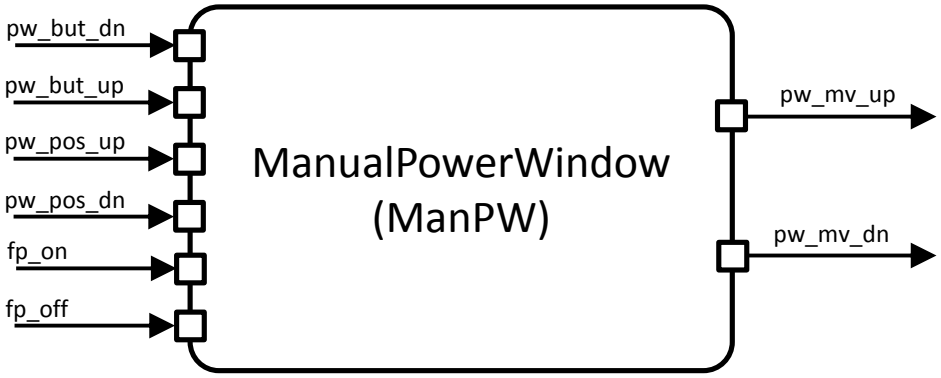

Figure 3.2.: Interface Specification of the Standard ManualPowerWindow Component

Based on the feature *Central Locking System*, the standard specification is extended such that the window movement is stopped and disabled by the locking of the car and re-enabled by unlocking the car. The new interface is shown in Fig. 3.3, defining further input signals.

- *cls_lock* stops and disables the window movement
- *cls_unlock* re-enables the window movement

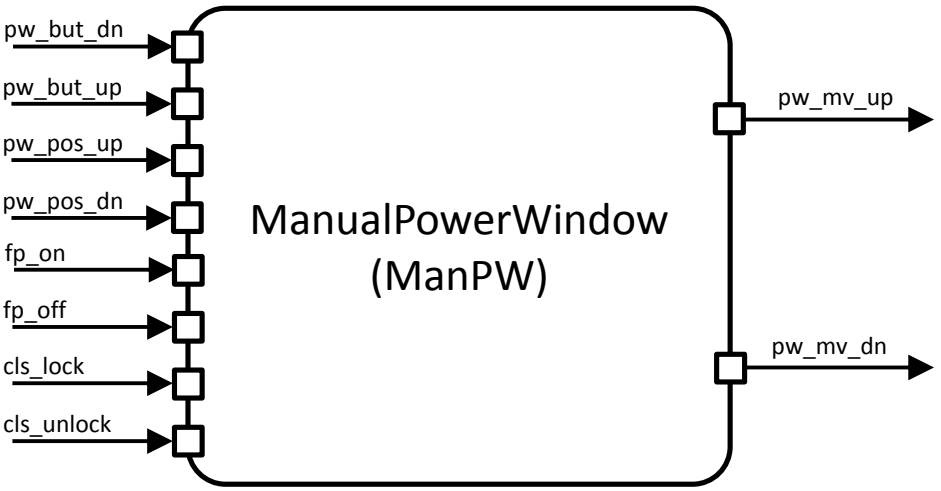

Figure 3.3.: Interface Specification of the ManualPowerWindow Component Variant with Central Locking System Feature

Automatic Power Window The standard component for the feature *Automatic Power Window* is depicted in Fig. 3.4, controlling the automated movement of the window. The interface is defined by the following input and output signals.
Input Signals:

- *pw_but_dn* controls the automated downwards movement of the window

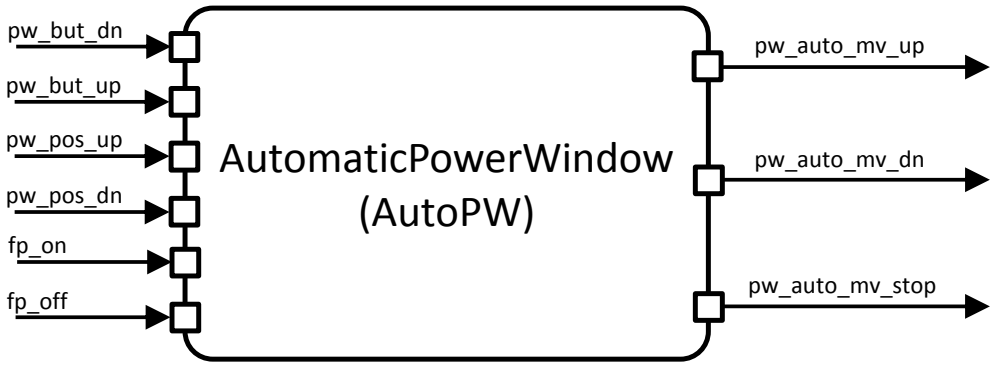

Figure 3.4.: Interface Specification of the Standard AutomaticPowerWindow Component

- *pw_but_up* controls the automated upwards movement of the window
- *pw_pos_up* indicates the upper window position
- *pw_pos_dn* indicates the lower window position
- *fp_on* stops and disables the upwards movement of the window
- *fp_off* re-enables the upwards movement

Output Signals:

- *pw_auto_mv_up* represents the automated upwards movement of the window
- *pw_auto_mv_dn* represents the automated downwards movement of the window
- *pw_auto_mv_stop* stops the automated movement of the window

Based on the feature *Central Locking System*, the standard specification is extended such that the window movement is stopped and disabled by the locking of the car and re-enabled by unlocking the car. The new interface is shown in Fig. 3.5, defining further input signals.

- *cls_lock* stops and disables the automated window movement
- *cls_unlock* re-enables the automated window movement

Finger Protection The standard component for the feature *Finger Protection* is depicted in Fig. 3.6, controlling the disabling/re-enabling of the window movement based on a clamped finger. There are no further component variants. The interface is defined by the following input and output signals.
Input Signals:

- *finger_detected* represents the detection of a clamped finger

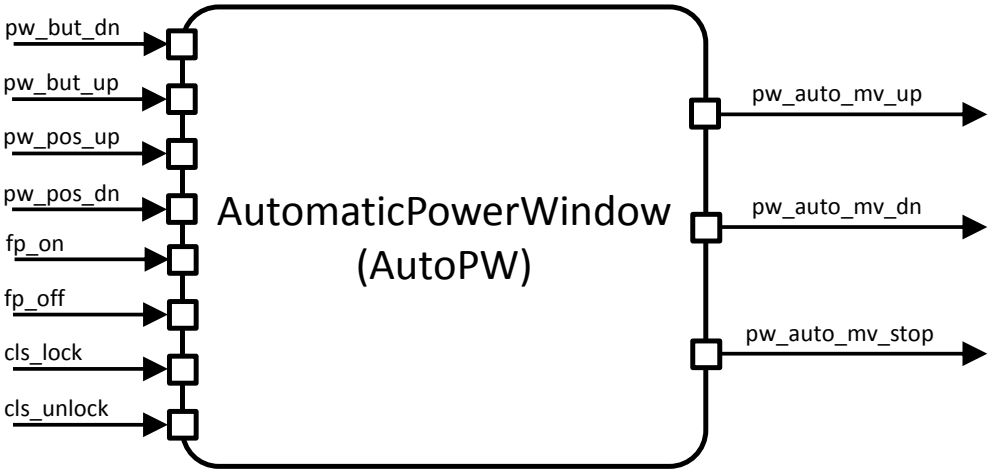

Figure 3.5.: Interface Specification of the AutomaticPowerWindow Component Variant with Central Locking System Feature

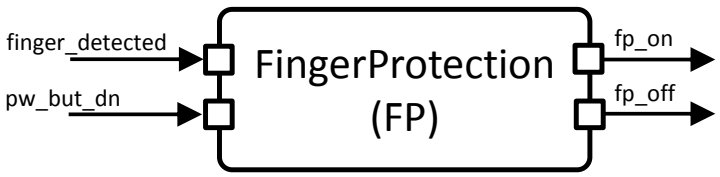

Figure 3.6.: Interface Specification of the FingerProtection Component

- *pw_but_dn* releases the finger based on the downwards movement of the window

Output Signals:

- *fp_on* represents the activation of the finger protection
- *fp_off* represents the deactivation of the finger protection

Exterior Mirror The standard component for the feature *Exterior Mirror* is shown in Fig. 3.7, controlling the mirror movement. The standard interface is defined by the following input and output signals.

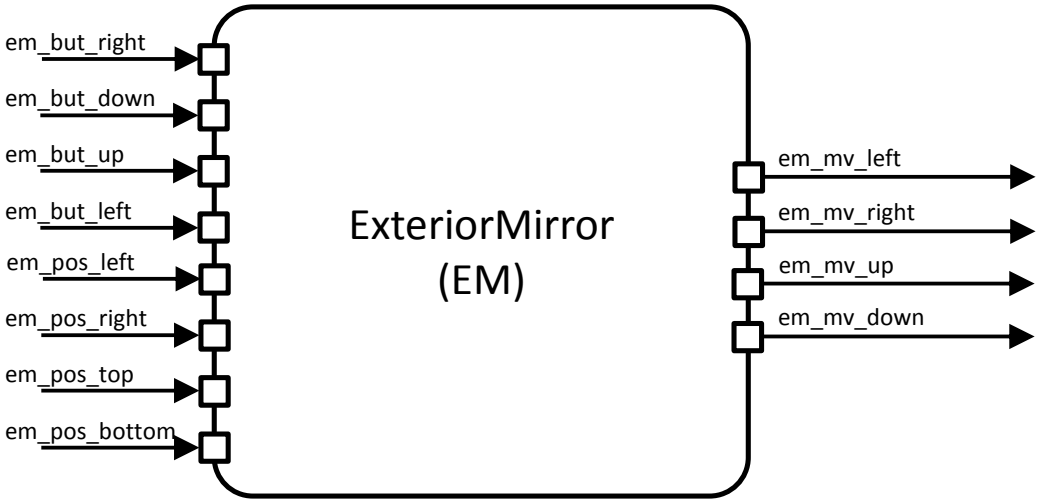

Figure 3.7.: Interface Specification of the Standard ExteriorMirror Component

Input Signals:

- *em_but_right* controls the rightwards movement of the exterior mirror
- *em_but_down* controls the downwards movement of the exterior mirror
- *em_but_up* controls the upwards movement of the exterior mirror
- *em_but_left* controls the leftwards movement of the exterior mirror
- *em_pos_left* indicates the left-most mirror position
- *em_pos_right* indicates the right-most mirror position
- *em_pos_top* indicates the upper mirror position
- *em_pos_bottom* indicates the lower mirror position

Output Signals:

- *em_mv_left* represents the leftwards movement of the exterior mirror

- *em_mv_right* represents the rightwards movement of the exterior mirror
- *em_mv_up* represents the upwards movement of the exterior mirror
- *em_mv_down* represents the downwards movement of the exterior mirror

Based on the feature *Heatable*, the mirror is heatable. The new interface is depicted in Fig. 3.8, defining further input and output signals.

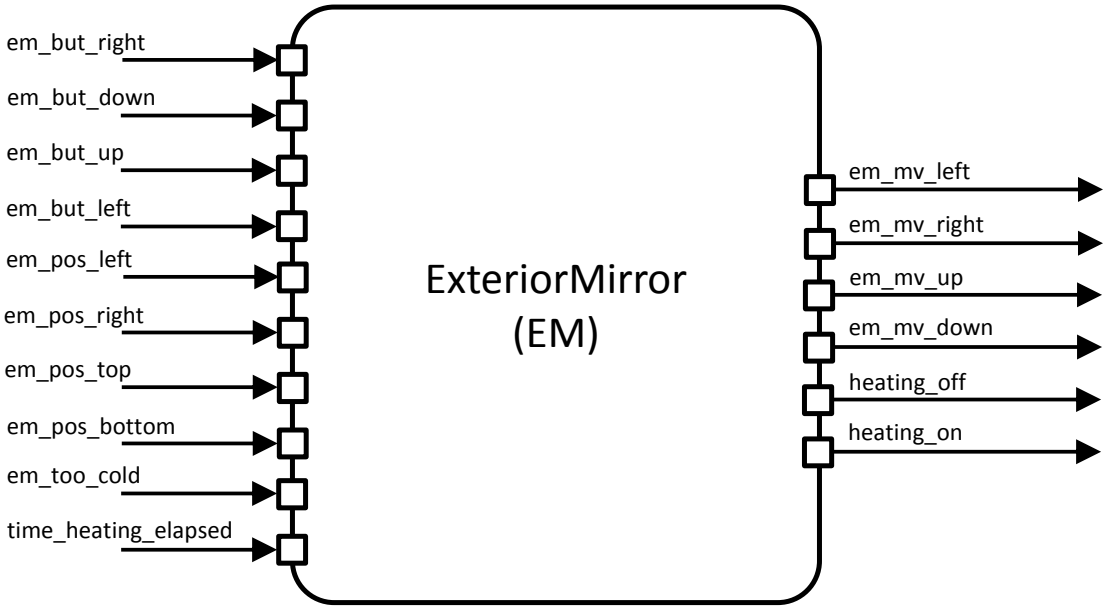

Figure 3.8.: Interface Specification of the ExteriorMirror Component Variant with Heatable Feature

Input Signals:

- *em_too_cold* controls the activation of the mirror heater
- *time_heating_elapsed* controls the deactivation of the mirror heater based on the elapsed heating time

Output Signals:

- *heating_off* stops the mirror heater
- *heating_on* starts the mirror heater

Based on the feature *LED Exterior Mirror*, the standard specification is extended such that the mirror provides the information about its current position to the corresponding LEDs. The new interface is shown in Fig. 3.9, defining further output signals.

- *em_pos_vert_pend* represents the mirror movement between the upper and lower mirror position

- *em_pos_vert_bottom* represents the lower mirror position
- *em_pos_vert_top* represents the upper mirror position
- *em_pos_hor_pend* represents the mirror movement between the left-most and right-most mirror position
- *em_pos_hor_right* represents the right-most mirror position
- *em_pos_hor_left* represents the left-most mirror position

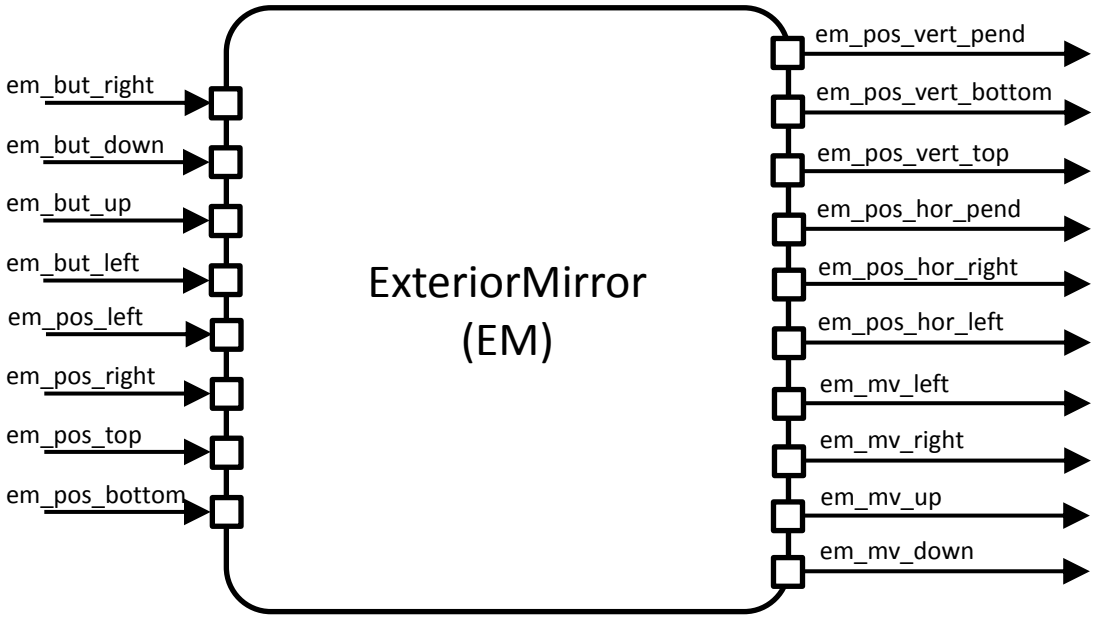

Figure 3.9.: Interface Specification of the ExteriorMirror Component Variant with LED Exterior Mirror Feature

Based on the potential feature combination *LED Exterior Mirror* and *Heatable*, another component variant is defined as depicted in Fig. 3.10, combining the signals of the standard specification as well as the signals of the two previously defined variants.

Alarm System The standard component for the feature *Alarm System* is shown in Fig. 3.11, controlling the activation/deactivation of the alarm system as well as the triggering of the alarm. The interface is defined by the following input and output signals.
Input Signals:

- *key_pos_lock* enables the alarm monitoring
- *key_pos_unlock* disables the alarm monitoring
- *as_alarm_detected* triggers the alarm
- *time_alarm_elapsed* represents the timeout after which the alarm signal stops

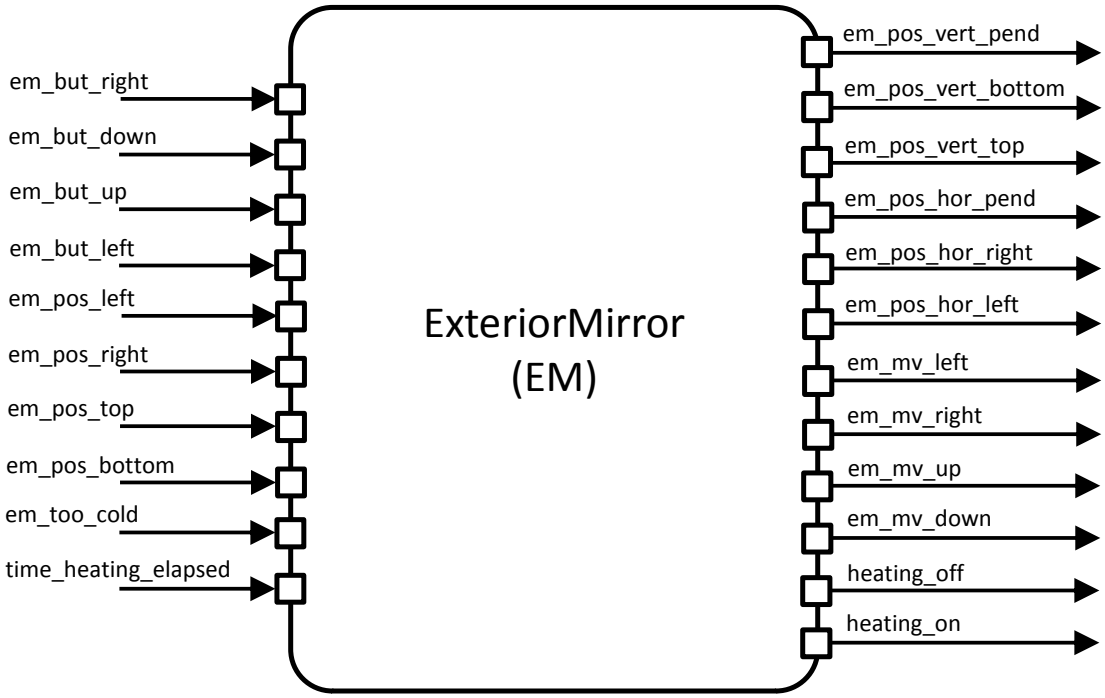

Figure 3.10.: Interface Specification of the ExteriorMirror Component Variant with LED Exterior Mirror and Heatable Features

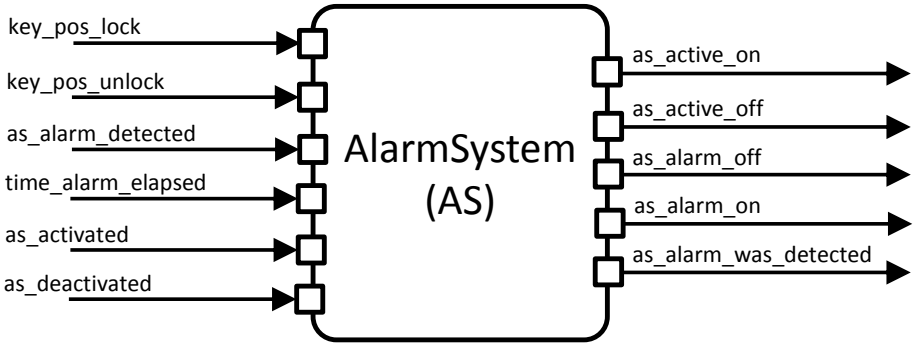

Figure 3.11.: Interface Specification of the Standard AlarmSystem Component

- *as_activated* controls the activation of the alarm system
- *as_deactivated* controls the deactivation of the alarm system

Output Signals:

- *as_active_on* activates the alarm monitoring
- *as_active_off* deactivates the alarm monitoring
- *as_alarm_off* stops the alarm signal
- *as_alarm_on* starts the alarm signal
- *as_alarm_was_detected* represents a silent alarm after the alarm time elapsed

Based on the feature *Control Alarm System*, the standard specification is extended such that the alarm monitoring of the alarm system is enabled/disabled by the remote key. The new interface specification is depicted in Fig.3.12, defining new input signals.

- *rck_lock* enables the alarm monitoring
- *rck_unlock* disables the alarm monitoring

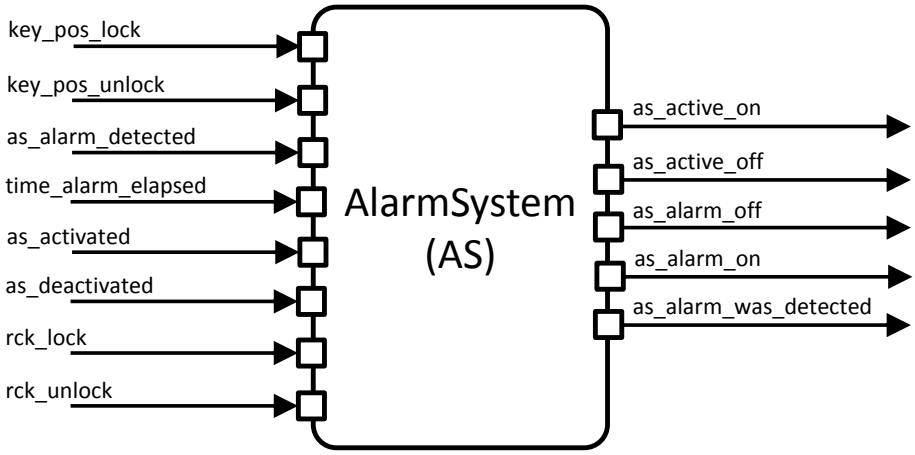

Figure 3.12.: Interface Specification of the AlarmSystem Component Variant with Control Alarm System Feature

Based on the feature *Interior Monitoring*, the standard specification is extended such that the alarm is triggered when the monitoring system detects something inside the car. The interface variant is shown in Fig. 3.13, defining further input and output signals.
Input Signals:

- *im_alarm_detected* triggers the alarm based on the interior monitoring system

Output Signals:

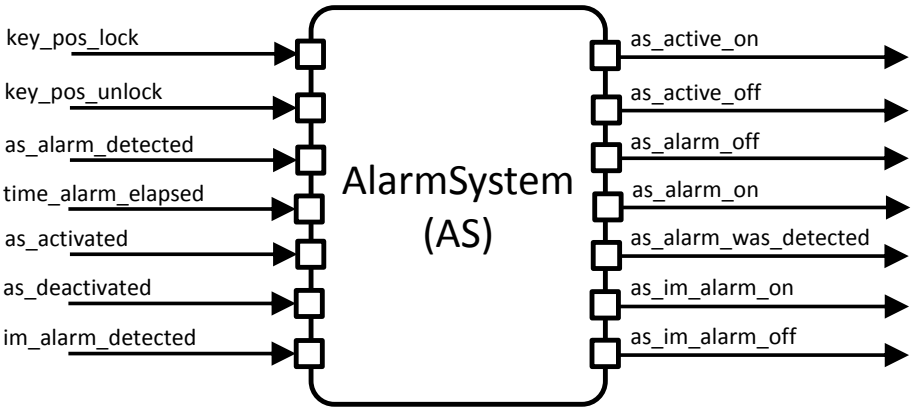

Figure 3.13.: Interface Specification of the AlarmSystem Component Variant with Interior Monitoring Feature

- *as_im_alarm_on* starts the interior alarm signal
- *as_im_alarm_off* stops the interior alarm signal

Based on the potential feature combination *Control Alarm System* and *Interior Monitoring*, another component variant is defined as shown in Fig. 3.14, combining the signals of the standard specification as well as the signals of the two previously defined variants.

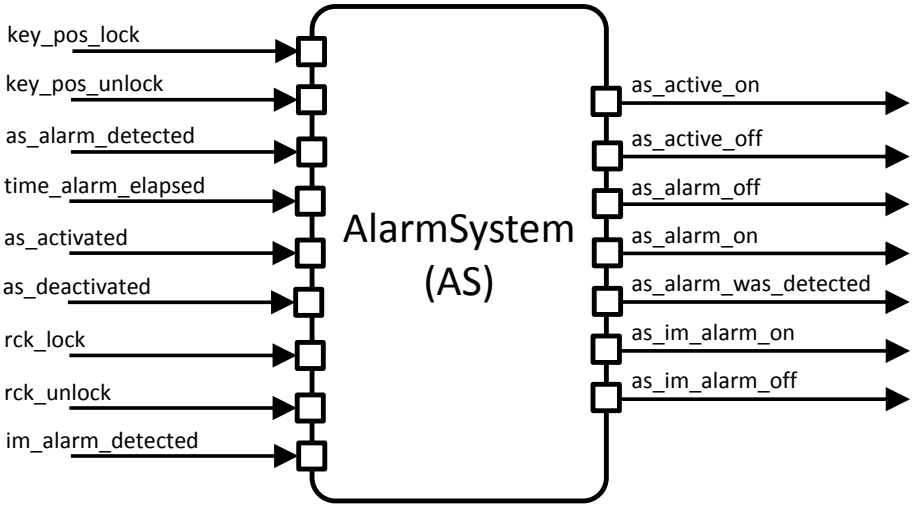

Figure 3.14.: Interface Specification of the AlarmSystem Component Variant with Control Alarm System and Interior Monitoring Features

Remote Control Key Controller The standard component for the feature *Remote Control Key* is depicted in Fig. 3.15, enabling the remote control of the central locking system. The standard interface is defined by the following input and output signals.

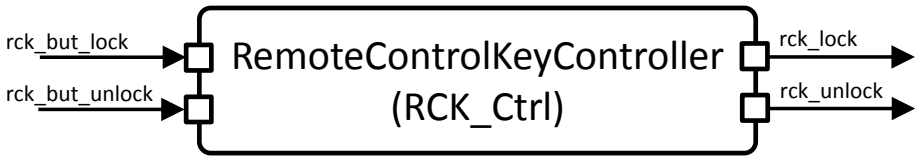

Figure 3.15.: Interface Specification of the Standard RemoteControlKeyController Component

Input Signals:

- *rck_but_lock* represents the remote signal for locking the car
- *rck_but_unlock* represents the remote signal for unlocking the car

Output Signals:

- *rck_lock* controls the locking of the car
- *rck_unlock* controls the unlocking of the car

Based on the feature *Control Automatic Power Window*, the standard specification is extended such that the remote key enables the remote control of the automated window movement. The new interface is shown in Fig. 3.16, defining further input and output signals.

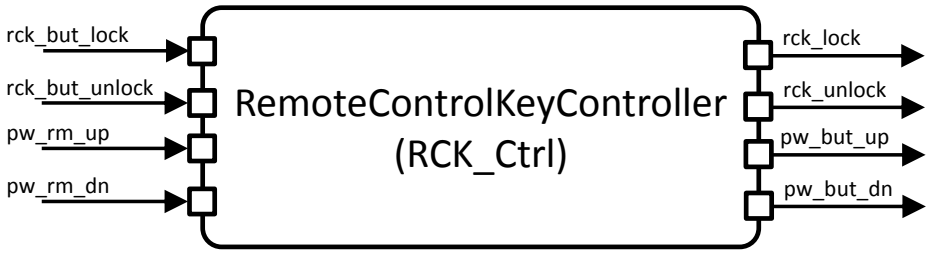

Figure 3.16.: Interface Specification of the RemoteControlKeyController Component Variant with Control Automatic Power Window Feature

Input Signals:

- *pw_rm_up* represents the remote signal for the upwards movement of the window
- *pw_rm_dn* represents the remote signal for the downwards movement of the window

Output Signals:

- *pw_but_up* controls the upwards movement of the window
- *pw_but_dn* controls the downwards movement of the window

Based on the feature *Safety Function*, the standard specification is extended such that the car is locked again (timeout occurs) if the car was unintentionally unlocked by the remote signal. The new interface is depicted in Fig. 3.17, defining further input signals.

- *door_open* represents an open door, i.e., the car was intentionally unlocked by the remote signal
- *time_rck_sf_elapsed* represents the timeout after which the car is locked again

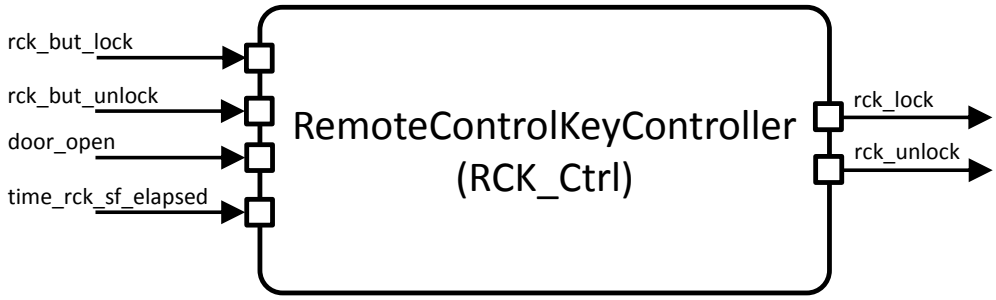

Figure 3.17.: Interface Specification of the RemoteControlKeyController Component Variant with Safety Function Feature

Based on the potential feature combination *Control Automatic Power Window* and *Safety Function*, another component variant is defined as shown in Fig. 3.18, combining the signals of the standard specification as well as the signals of the two previously defined variants.

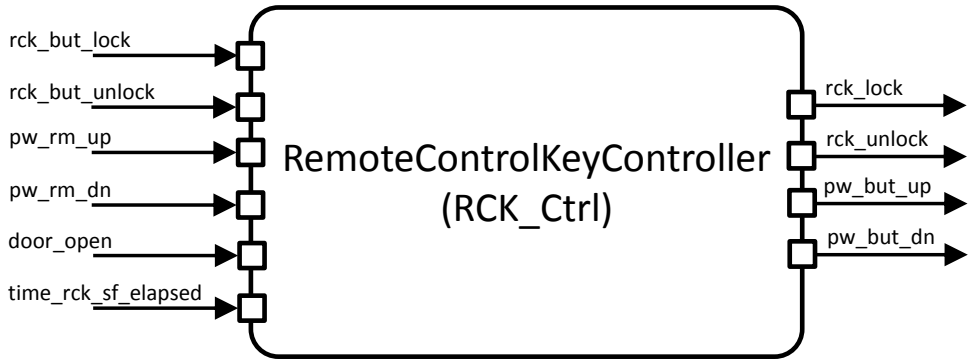

Figure 3.18.: Interface Specification of RemoteControlKeyController Component Variant with Control Automatic Power Window and Safety Function Features

Central Locking System The standard component for the feature *Central Locking System* is depicted in Fig. 3.19, controlling the locking/unlocking of the car. The standard interface is defined by the following input and output signals.
Input Signals:

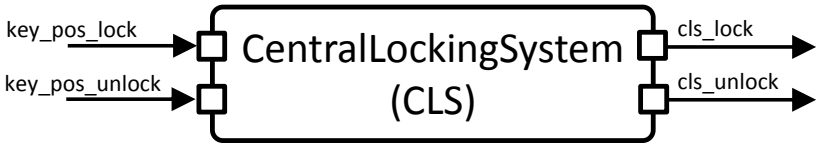

Figure 3.19.: Interface Specification of Standard CentralLockingSystem Component

- *key_pos_lock* controls the locking of the car
- *key_pos_unlock* controls the unlocking of the car

Output Signals:

- *cls_lock* locks the car and disables the window movement
- *cls_unlock* unlocks the car and re-enables the window movement

Based on the feature *Remote Control Key*, the standard specification is extended such that the locking/unlocking is further controlled by the remote key. The new interface is shown in Fig. 3.20, defining further input signals.

- *rck_lock* controls the locking of the car (remote)
- *rck_unlock* controls the unlocking of the car (remote)

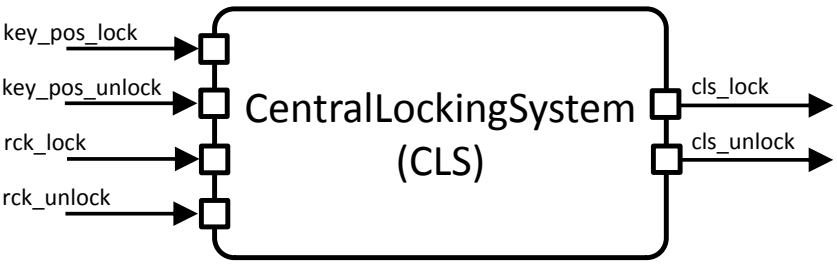

Figure 3.20.: Interface Specification of the CentralLockingSystem Component Variant with Remote Control Key Feature

Based on the feature *Automated Locking*, the standard specification is extended such that the doors are locked when the car is driving. The new interface is depicted in Fig. 3.21, defining further input and output signals.
Input Signals:

- *car_drives* controls the locking of the doors when the car is driving
- *door_open* controls the unlocking of the doors when a door is open

Output Signals:

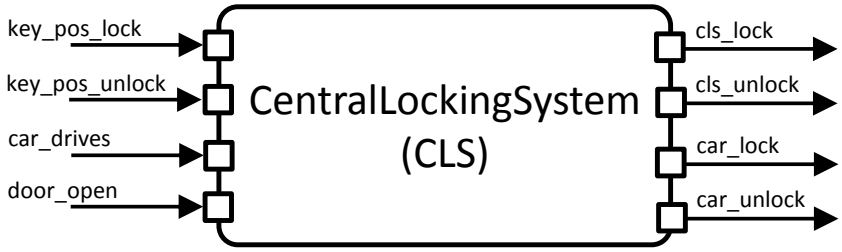

Figure 3.21.: Interface Specification of the CentralLockingSystem Component Variant with Automatic Locking Feature

- *car_lock* locks the doors without disabling the window movement
- *car_unlock* unlocks the doors

Based on the potential feature combination *Remote Control Key* and *Automatic Locking*, another component variant is defined as shown in Fig. 3.22, combining the signals of the standard specification and the signals of the two previously defined variants.

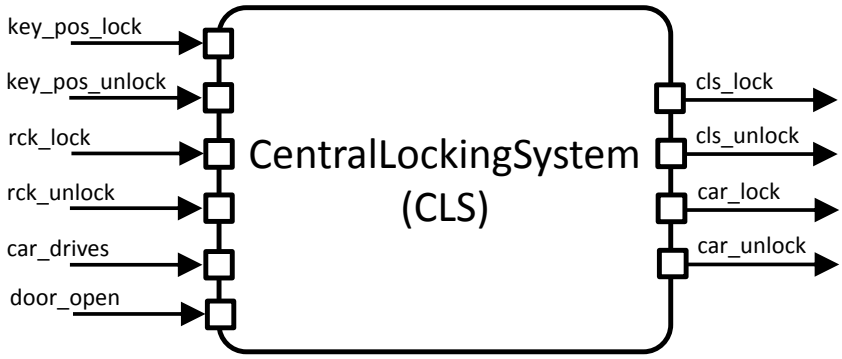

Figure 3.22.: Interface Specification of the CentralLockingSystem Component Variant with Remote Control Key and Automatic Locking Features

Human Machine Interface The standard component for the feature *Human Machine Interface* is depicted in Fig. 3.23, enabling the interaction with a driver. The standard interface is defined by the following input and output signals.
Input Signals:

- *pw_but_mv_dn* represents the signal initiating the downwards movement of the window
- *pw_but_mv_up* represents the signal initiating the upwards movement of the window
- *em_but_mv_left* represents the signal initiating the leftwards movement of the exterior mirror

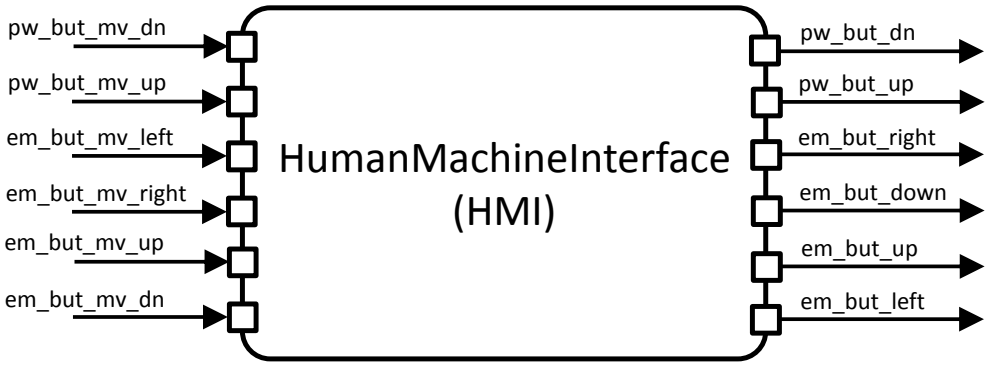

Figure 3.23.: Interface Specification of the Standard HumanMachineInterface Component

- *em_but_mv_right* represents the signal initiating the rightwards movement of the exterior mirror
- *em_but_mv_up* represents the signal initiating the upwards movement of the exterior mirror
- *em_but_mv_dn* represents the signal initiating the downwards movement of the exterior mirror

Output Signals:

- *pw_but_dn* controls the downwards movement of the window
- *pw_but_up* controls the upwards movement of the window
- *em_but_right* controls the rightwards movement of the exterior mirror
- *em_but_left* controls the leftwards movement of the exterior mirror
- *em_but_down* controls the downwards movement of the exterior mirror
- *em_but_up* controls the upwards movement of the exterior mirror

Based on the feature *Alarm System*, the standard specification is extended such that a driver controls (activation/deactivation) the alarm system. The new interface is shown in Fig. 3.24, defining further input and output signals.
Input Signals:

- *deactivate_as* represents the signal initiating the deactivation of the alarm system
- *activate_as* represents the signal initiating the activation of the alarm system

Output Signals:

- *as_activated* activates the alarm system

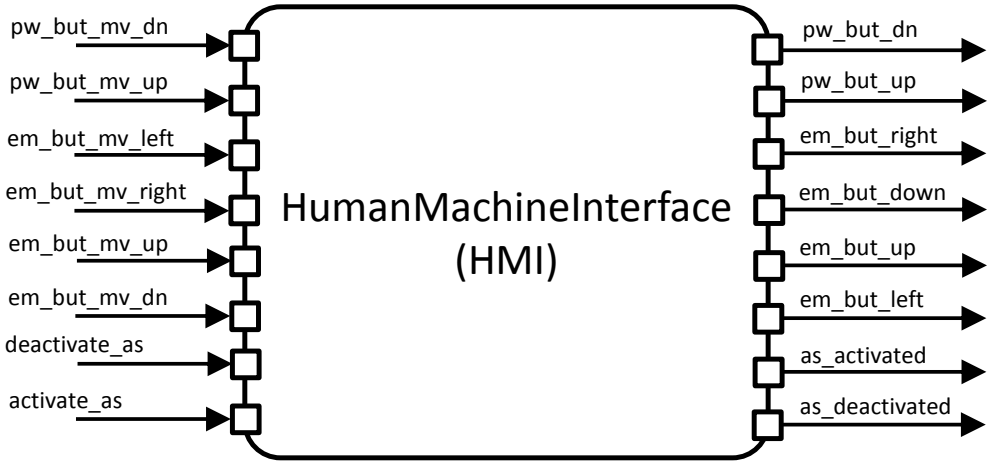

Figure 3.24.: Interface Specification of the HumanMachineInterface Component Variant with Alarm System Feature

- *as_deactivated* deactivates the alarm system

Based on the potential feature combination *Alarm System* and *LED Alarm System*, the standard specification is extended such that a driver is able to confirm the silent alarm. The new interface is depicted in Fig. 3.25, defining, in addition to the signals from the Alarm System variant, further input and output signals.

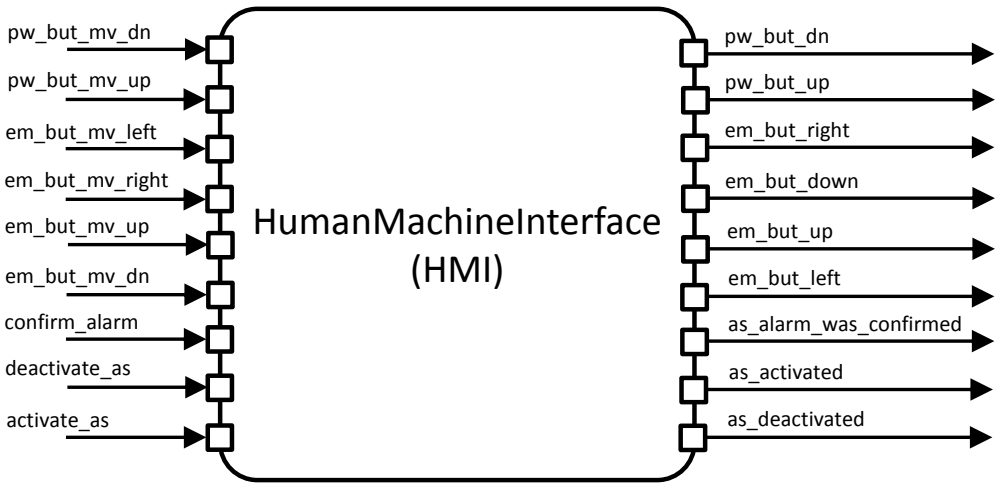

Figure 3.25.: Interface Specification of the HumanMachineInterface Component Variant with Alarm System and LED Alarm System Features

Input Signals:

- *confirm_alarm* represents the signal initiating the confirmation of the alarm

Output Signals:

- *as_alarm_was_confirmed* confirms the silent alarm

Based on the potential feature combination *Manual Power Window* and *LED Power Window*, the standard specification is extended such that the release of the buttons for the window movement controls the corresponding LEDs. The new interface is shown in Fig. 3.26, defining further input and output signals.

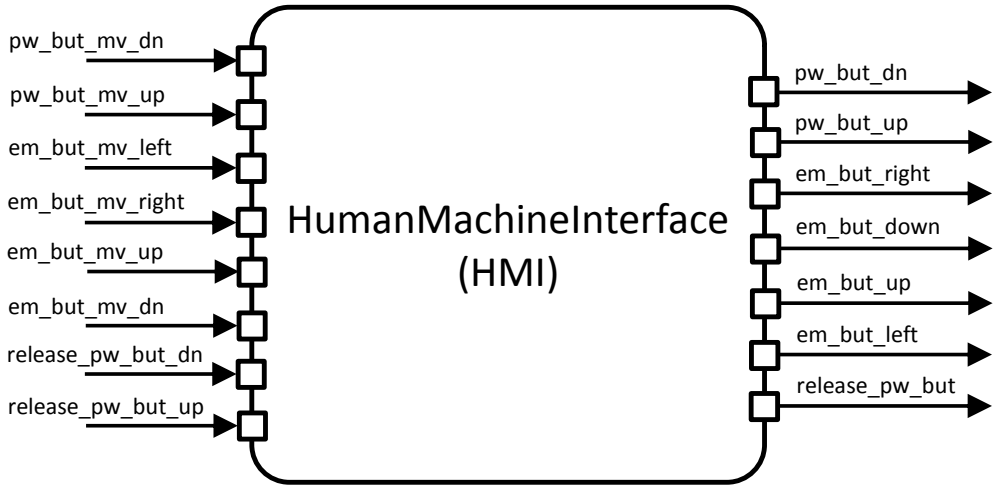

Figure 3.26.: Interface Specification of the HumanMachineInterface Component Variant with Manual Power Window and LED Power Window Features

Input Signals:

- *release_pw_but_dn* represents the releasing signal of the window down button
- *release_pw_but_up* represents the releasing signal of the window up button

Output Signals:

- *release_pw_but* represents the release of a window button

Based on the potential feature combination *Manual Power Window*, *LED Power Window* and *Alarm System*, another component variant is defined as depicted in Fig. 3.27, combining the signals of the standard specification and the signals of previously defined variants.

Based on the potential feature combination *Manual Power Window*, *LED Power Window*, *Alarm System* and *LED Alarm System*, another component variant is defined as shown in Fig. 3.28, combining the signals of the standard specification and the signals of previously defined variants.

LED Manual Power Window The first standard component for the feature *LED Power Window* is depicted in Fig. 3.29, controlling the turning on and off of one LED for the upwards movement and one LED for the downwards movement of the manual power window. There are no further component variants. The interface is defined by the following input and output signals.

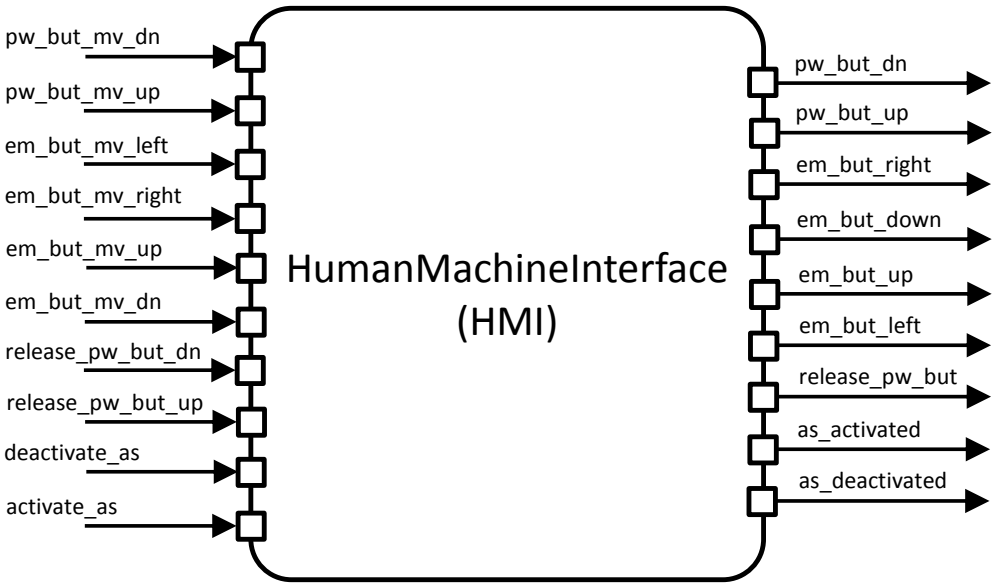

Figure 3.27.: Interface Specification of the HumanMachineInterface Component Variant with Manual Power Window, LED Power Window and Alarm System Features

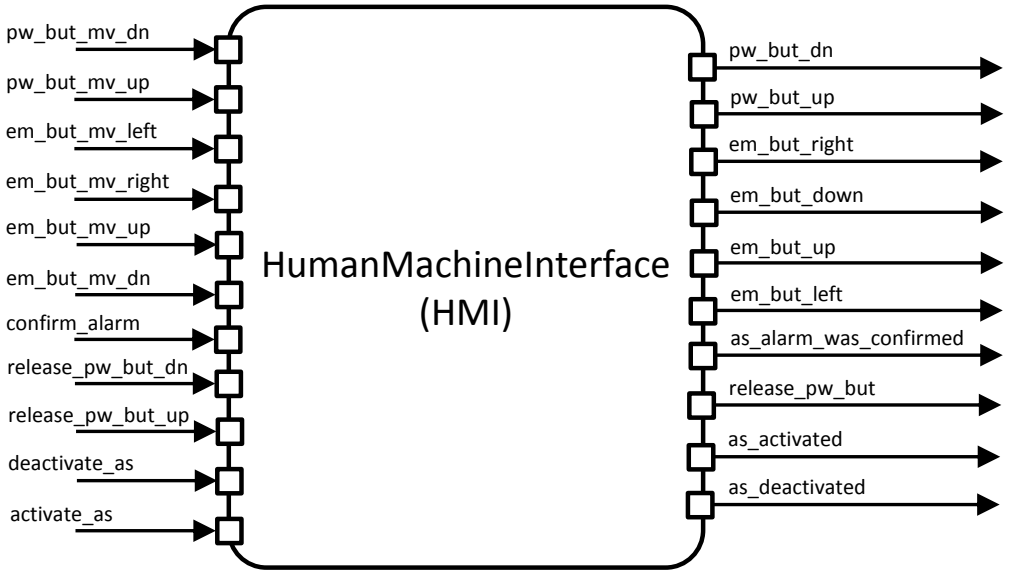

Figure 3.28.: Interface Specification of the HumanMachineInterface Component Variant with Manual Power Window, LED Power Window, Alarm System and LED Alarm System Features

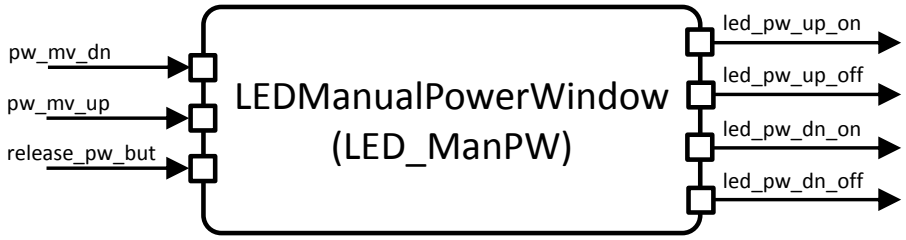

Figure 3.29.: Interface Specification of the LEDManualPowerWindow Component

Input Signals:

- *pw_mv_dn* controls the turning on of the LED for the upwards movement
- *pw_mv_up* controls the turning on of the LED for the downwards movement
- *release_pw_but* controls the turning off of the LEDs

Output Signals:

- *led_pw_up_on* switches on the LED for the upwards movement
- *led_pw_up_off* switches off the LED for the upwards movement
- *led_pw_dn_on* switches on the LED for the downwards movement
- *led_pw_dn_off* switches off the LED for the downwards movement

LED Automatic Power Window The second standard component for the feature *LED Power Window* is shown in Fig. 3.30, controlling the turning on and off of one LED for the upwards movement and one LED for the downwards movement of the automatic power window. The interface is defined by the following input and output signals.

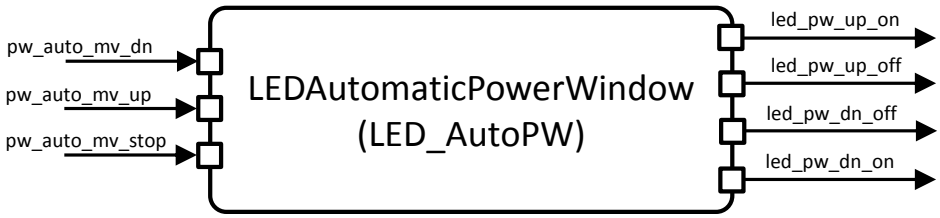

Figure 3.30.: Interface Specification of the Standard LEDAutomaticPowerWindow Component

Input Signals:

- *pw_auto_mv_dn* controls the turning on of the LED for the downwards movement
- *pw_auto_mv_up* controls the turning on of the LED for the upwards movement
- *pw_auto_mv_stop* controls the turning off of the LEDs

Output Signals:

- *led_pw_up_on* switches on the LED for the upwards movement
- *led_pw_up_off* switches off the LED for the upwards movement
- *led_pw_dn_on* switches on the LED for the downwards movement
- *led_pw_dn_off* switches off the LED for the downwards movement

Based on the feature *Central Locking System*, the standard specification is extended such that another LED exists being active when the window moves up and the car is locked. The new interface is depicted in Fig. 3.31, defining further input and output signals.

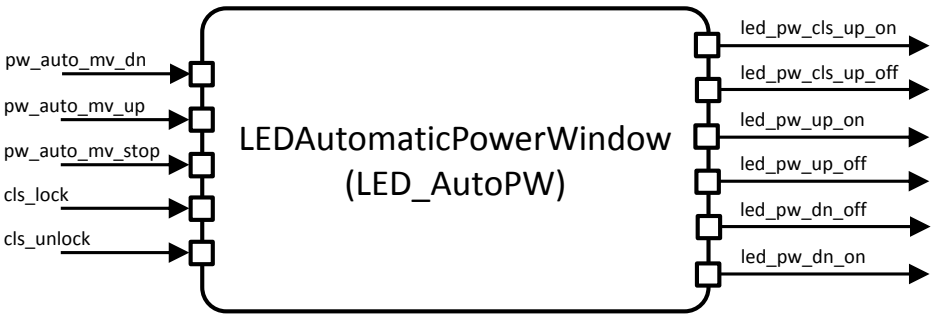

Figure 3.31.: Interface Specification of the LEDAutomaticPowerWindow Component Variant with Central Locking System Feature

Input Signals:

- *cls_lock* controls the turning on of the new LED for the upwards movement
- *cls_unlock* controls the turning off of the new LED for the upwards movement

Output Signals:

- *led_pw_cls_up_on* switches on the new LED for the upwards movement
- *led_pw_cls_up_off* switches off the new LED for the upwards movement

LED Exterior Mirror Top The first standard component for the feature *LED Exterior Mirror* is shown in Fig. 3.32, controlling the turning on and off of an LED when the exterior mirror reaches and stays in its upper position. There are no further component variants. The interface is defined by the following input and output signals.
Input Signals:

- *em_pos_vert_top* controls the turning on of the LED
- *em_pos_vert_pend* controls the turning off of the LED

Figure 3.32.: Interface Specification of the LEDExteriorMirrorTop Component

Output Signals:

- *led_em_top_on* switches on the LED
- *led_em_top_off* switches off the LED

LED Exterior Mirror Left The second standard component for the feature *LED Exterior Mirror* is depicted in Fig. 3.33, controlling the turning on and off of an LED when the exterior mirror reaches and stays in its left-most position. There are no further component variants. The interface is defined by the following input and output signals.

Figure 3.33.: Interface Specification of the LEDExteriorMirrorLeft Component

Input Signals:

- *em_pos_hor_left* controls the turning on of the LED
- *em_pos_hor_pend* controls the turning off of the LED

Output Signals:

- *led_em_left_on* switches on the LED
- *led_em_left_off* switches off the LED

LED Exterior Mirror Bottom The third standard component for the feature *LED Exterior Mirror* is shown in Fig. 3.34, controlling the turning on and off of an LED when the exterior mirror reaches and stays in its lower position. There are no further component variants. The interface is defined by the following input and output signals.
Input Signals:

- *em_pos_vert_bottom* controls the turning on of the LED
- *em_pos_vert_pend* controls the turning off of the LED

Output Signals:

- *led_em_bottom_on* switches on the LED
- *led_em_bottom_off* switches off the LED

Figure 3.34.: Interface Specification of the LEDExteriorMirrorBottom Component

LED Exterior Mirror Right The fourth standard component for the feature *LED Exterior Mirror* is depicted in Fig. 3.35, controlling the turning on and off of an LED when the exterior mirror reaches and stays in its right-most position. There are no further component variants. The interface is defined by the following input and output signals.

Figure 3.35.: Interface Specification of the LEDExteriorMirrorRight Component

Input Signals:

- *em_pos_hor_right* controls the turning on of the LED
- *em_pos_hor_pend* controls the turning off of the LED

Output Signals:

- *led_em_right_on* switches on the LED
- *led_em_right_off* switches off the LED

LED Exterior Mirror Heating The standard component for the feature *LED Heatable* is shown in Fig. 3.36, controlling the turning on and off of an LED representing the state of the mirror heater activation. There are no further component variants. The interface is defined by the following input and output signals.

Figure 3.36.: Interface Specification of the LEDExteriorMirrorHeating Component

Input Signals:

- *heating_on* controls the turning on of the LED
- *heating_off* controls the turning off of the LED

Output Signals:

- *led_em_heating_on* switches on the LED
- *led_em_heating_off* switches off the LED

LED Finger Protection The standard component for the feature *LED Finger Protection* is depicted in Fig. 3.37, controlling the turning on and off of an LED when the finger protection is active. There are no further component variants. The interface is defined by the following input and output signals.

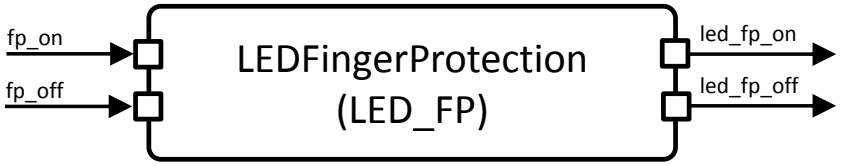

Figure 3.37.: Interface Specification of the LEDFingerProtection Component

Input Signals:

- *fp_on* controls the turning on of the LED
- *fp_off* controls the turning off of the LED

Output Signals:

- *led_fp_on* switches on the LED
- *led_fp_off* switches off the LED

LED Alarm System Active The first standard component for the feature *LED Alarm System* is shown in Fig. 3.38, controlling the turning on and off of an LED when the alarm system is enabled. There are no further component variants. The interface is defined by the following input and output signals.

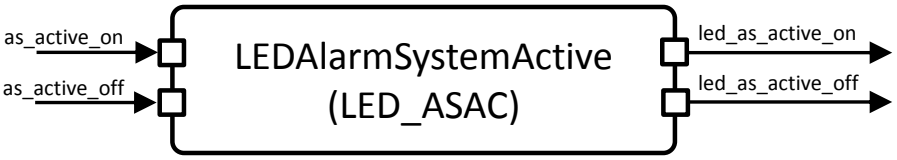

Figure 3.38.: Interface Specification of the LEDAlarmSystemActive Component

Input Signals:

- *as_active_on* controls the turning on of the LED
- *as_active_off* controls the turning off of the LED

Output Signals:

- *led_as_active_on* switches on the LED
- *led_as_active_off* switches off the LED

LED Alarm System Alarm The second standard component for the feature *LED Alarm System* is depicted in Fig. 3.39, controlling the turning on and off of an LED when the alarm of the alarm system is triggered. There are no further component variants. The interface is defined by the following input and output signals.

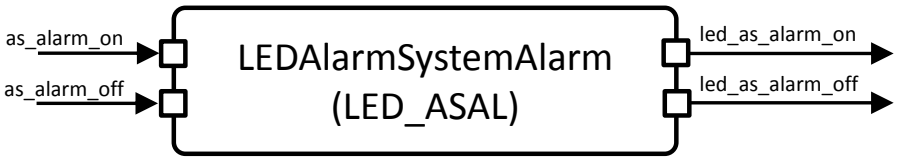

Figure 3.39.: Interface Specification of the LEDAlarmSystemAlarm Component

Input Signals:

- *as_alarm_on* controls the turning on of the LED
- *as_alarm_off* controls the turning off of the LED

Output Signals:

- *led_as_alarm_on* switches on the LED
- *led_as_alarm_off* switches off the LED

LED Alarm System Alarm Detected The third standard component for the feature *LED Alarm System* is shown in Fig. 3.40, controlling the turning on and off of an LED when the silent alarm is triggered, i.e., an alarm was detected and the alarm signal stops after the alarm time elapsed. There are no further component variants. The interface is defined by the following input and output signals.

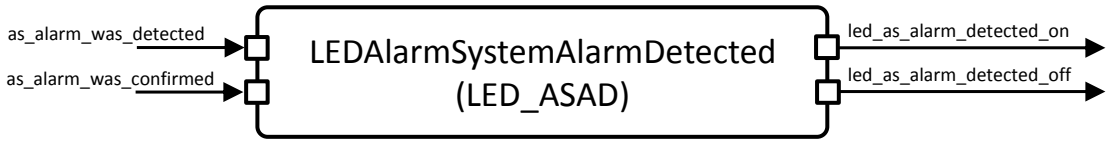

Figure 3.40.: Interface Specification of the LEDAlarmSystemAlarmDetected Component

Input Signals:

- *as_alarm_was_detected* controls the turning on of the LED
- *as_alarm_was_confirmed* controls the turning off of the LED after the driver confirmed the silent alarm

Output Signals:

- *led_as_alarm_detected_on* switches on the LED
- *led_as_alarm_detected_off* switches off the LED

LED Alarm System Interior Monitoring The standard component for the feature combination *LED Alarm System* and *Interior Monitoring* is depicted in Fig. 3.41, controlling the turning on and off of an LED when the interior alarm is triggered by the interior monitoring system. There are no further component variants. The interface is defined by the following input and output signals.

Figure 3.41.: Interface Specification of the LEDAlarmSystemInteriorMonitoring Component

Input Signals:

- *as_im_alarm_on* controls the turning on of the LED
- *as_im_alarm_off* controls the turning off of the LED

Output Signals:

- *led_as_im_alarm_on* switches on the LED
- *led_as_im_alarm_off* switches off the LED

LED Central Locking System The standard component for the feature *LED Central Locking System* is shown in Fig. 3.42, controlling the turning on and off of an LED representing the locking/unlocking state of the car. There are no further component variants. The interface is defined by the following input and output signals.

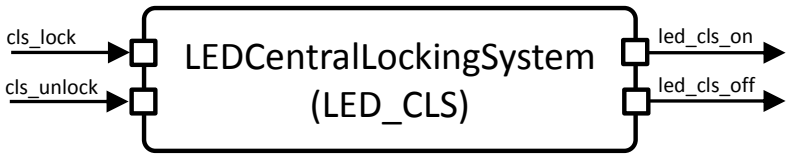

Figure 3.42.: Interface Specification of the LEDCentralLockingSystem Component

Input Signals:

- *cls_lock* controls the turning on of the LED
- *cls_unlock* controls the turning off of the LED

Output Signals:

- *led_cls_on* switches on the LED
- *led_cls_off* switches off the LED

Based on the variable component interfaces, we describe the deducible connector specifications in the next section.

3.2. Connector Specifications

The connector specifications exemplary shown in Fig. 3.1 are categorized in three types, namely *input*, *output* and *internal* connectors. Based on the interface specifications defined above, the internal connectors are directly deducible from matching input/output signals of the different component variants. For instance, the components *FingerProtection* and *ManualPowerWindow* communicate via a connector defined by the output signal *fp_on* and the input signal *fp_on*. Furthermore, we categorize the following input/output signals as input and output connectors as depicted in Tab. 3.1 and Tab. 3.2 for the communication with the system environment, where the listing is partitioned based on the corresponding features.

We use the defined component and connector specifications in the next section for the documentation of the architecture model deltas used for the definition of the architecture model variants documented in Sect. 3.4.

	Input Connectors	Output Connectors
HMI	pw_but_mv_dn pw_but_mv_up em_but_mv_left em_but_mv_right em_but_mv_up em_but_mv_dn	
HMI & AS	deactivate_as activate_as	
HMI & ManPW & LED PW	release_pw_but_up release_pw_but_dn	
HMI & LED AS	confirm_alarm	
Power Window	pw_pos_dn pw_pos_up	
Manual PW		pw_mv_dn pw_mv_up
Automatic PW		pw_auto_mv_up pw_auto_mv_dn pw_auto_mv_stop
Finger Protection	finger_detected	
Exterior Mirror	em_pos_left em_pos_right em_pos_top em_pos_bottom	em_mv_left em_mv_right em_mv_up em_mv_down
EM & Heatable	em_too_cold time_heating_elapsed	heating_on heating_off
LED EM		led_em_bottom_on led_em_bottom_off led_em_top_on led_em_top_off led_em_left_on led_em_left_off led_em_right_on led_em_right_off
LED Heatable		led_em_heating_on led_em_heating_off

Table 3.1.: Input and Output Connectors of the BCS Architecture Models (1)

	Input Connectors	Output Connectors
LED Power Window		led_pw_up_on led_pw_up_off led_pw_dn_on led_pw_dn_off
AutoPW & LED PW & CLS		led_pw_cls_up_on led_pw_cls_up_off
LED CLS		led_cls_on led_cls_off
LED Finger Protection		led_fp_on led_fp_off
LED Alarm System		led_as_alarm_detected_on led_as_alarm_detected_off led_as_alarm_on led_as_alarm_off led_as_active_on led_as_active_off
LED AS & IM		led_as_im_alarm_on led_as_im_alarm_off
Central Locking System	key_pos_lock key_pos_unlock	cls_lock cls_unlock
Automatic Locking	car_drives	car_lock car_unlock
Safety Function	door_open time_rck_sf_elapsed	
Remote Control Key	rck_but_lock rck_but_unlock	
RCK & CAP	pw_rm_up pw_rm_dn	
Alarm System	time_alarm_elapsed as_alarm_detected	as_alarm_on as_alarm_off as_active_on as_active_off as_alarm_was_detected
Interior Monitoring	im_alarm_detected	as_im_alarm_on as_im_alarm_off

Table 3.2.: Input and Output Connectors of the BCS Architecture Models (2)