Application Descriptions

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Lighting

Lighting Sensors

Summary

This document specifies the Functional Blocks for sensors in the Lighting Application Domain.

Version 01.04.04 is a KNX Approved Standard.

This document is part of the KNX Specifications v2.1.

Document updates

Version	Date	Modifications
1.0	2006.06.08	Draft Proposal
1.1	2007.02.02	- Inclusion of Document References. - Preparation of the Draft Proposal.
1.2	2007.03.20	- Publication of the Approved Standard.
1.3	2008.12.09	- **AN080 "FBs for new channels 2005.02"** integrated.
1.3	2009.06.26	Editorial update in view of inclusion in the KNX Specifications v2.0.
1.4.01	2010.04.14	- Removed references to legacy papers. - Renamed "Switching sensor Basic" to "Light Switching Sensor Basic". - **AN124 "Photometric Sensors"** integrated.
1.4.02	2011.12.14	- Editorial update.
01.04.03	2013.09.06	- **AN150 "FB Profiles for existing FBs"** integrated. - **AN119 "FB MDL"** integrated.
01.04.04	2013.10.29	Editorial updates for the publication of KNX Specifications 2.1.

References

[01] Chapter 3/7/2 "Datapoint Types"
[02] Chapter 6/30/1 "Runtime Profiles"
[03] Chapter 7/10/1 "HVAC Sensor Functional Blocks"
[04] Chapter 7/10/2 "HVAC HMI Functional Blocks"
[05] Chapter 7/10/3 "HVAC Actuator Functional Blocks"
[06] "Principles Governing Photometry", BIPM, 1983, Monographie 1983-1

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Contents

Abbreviations

Datapoints

ASC	Absolute Setvalue Control
BE	Brightness External
BT	Brightness Threshold
IL	Indoor Luminance
IOO	Info OnOff
MT	Movement Trigger
RI	Room Illumination
RSC	Relative Setvalue Control
SOO	Switch On Off
TSS	Timed StartStop

Parameters

AS	Absolute Setvalue
EBI	Enable Brightness Independency
ETM	Enable Toggle Mode
MSLT	Movement Signal Lowpass Timer
MSPT	Movement Sensor Pause Time
MTE	Movement Trigger Evaluation
OCT	Output Control Timer
OOA	On Off Action
RT	Repetition Time
TC	Trigger Continue

Other

COV	Change Of Value
DSB	Dimming Sensor Basic
HMI	Human Machine Interface
IBS	Indoor Brightness Sensor
ILS	Indoor Luminance Sensor
LSAB	Light Switching Actuator Basic
LSSB	Light Switching Sensor Basic
MDL	Movement Detector for Lighting

1 Sensors for human interaction

1.1 FB Light Switching Sensor Basic (Object Type 421)

1.1.1 Aims and objectives

The FB Light Switching Sensor Basic is used in the Application Domain Lighting for providing input data to switching actuators. It specifies the functionality, for example contained in a switch or a push button, to switch the switching actuator on or off.

Display elements (with own FBs) can be integrated to show the status of the switching actuator.

The inputs and outputs of the Functional Block are described but not the Human Machine Interface (HMI). Consequently, the manufacturers of the button or switch have the possibility to implement their design and their operation methods.

1.1.2 Functional specification

1.1.2.1 Overview

The FB Light Switching Sensor Basic provides hardwired inputs for triggering transmission of values of output Datapoints.

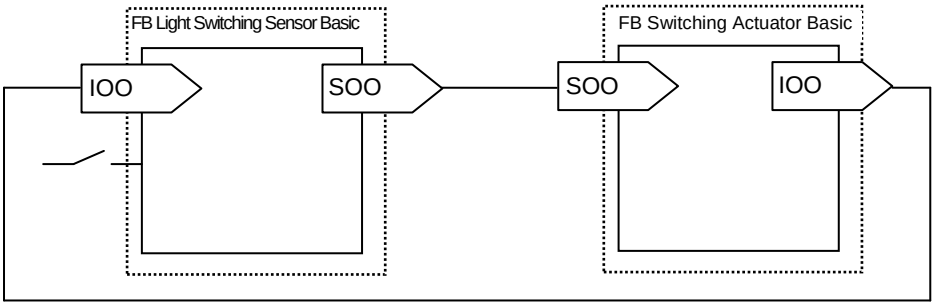


Figure 1 – Basic communication model (example)

1.1.2.2 Parameter On Off Action

The parameter On Off Action shall limit the values transmitted by the output SOO to either only 0 (“Off”) or 1 (“On”).

This mainly makes sense if an appliance is realised as a combination of two FBs LSSB each with one interaction point. This realisation however is only meaningful if the parameter ETM is not implemented or has the value “Disable”.

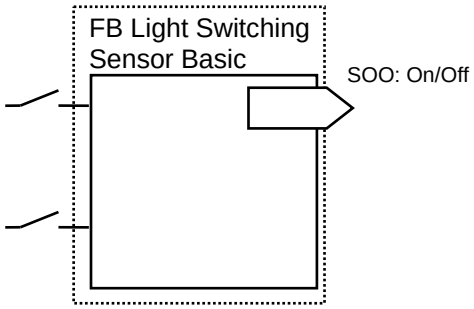


Figure 2 – One FB with two interaction points

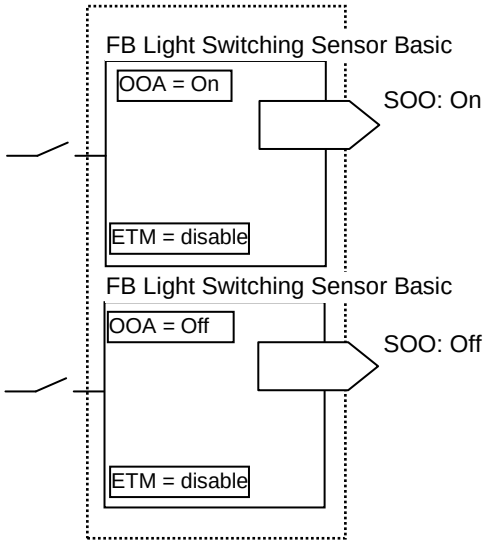


Figure 3 – Two FBs each with one interaction points

The dashed outlined areas realise the same functionality. The DP SOO in the left solution sends both On and Off. The DPs SOO in the right solution only send either On (e.g. upper FB) or Off (e.g. lower FB).

1.1.2.3 Toggle Mode

Toggle Mode denotes the behaviour where the value of the outputs SOO inverts on each transmission. The value of SOO can be calculated by the device internally or by interpreting the received value of the input InfoOnOff (IOO).

The concept of toggle mode is only meaningful in the realisation as given in Figure 3. In case the parameter Enable Toggle Mode (ETM) has the value Enable, the parameter On Off Action (OOA) becomes meaningless.

Toggle Mode implemented and active; IOO is not implemented

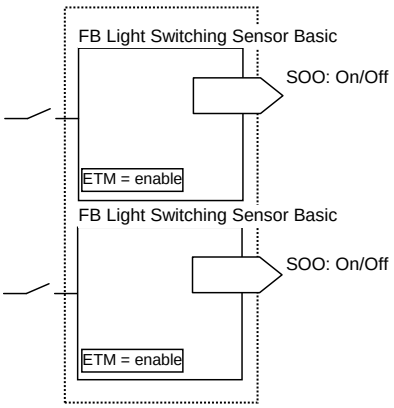


Figure 4 – Toggle Mode without IOO

Toggle Mode implemented and active; IOO is implemented

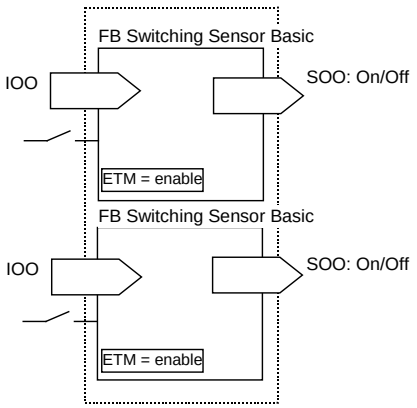


Figure 5 – Toggle Mode with IOO

Rule 1

Each subsequent transmission on the DP SOO will have an inverted value compared to the previous transmission.

$$SOO_{n+1} = NOT(SOO_n)$$

Rule 2

Rule 1 is in this case **extended** with the following: on each reception of IOO, SOO becomes the value of IOO.

$$SOO = IOO$$

The relation between IOO and Toggle Mode (Figure 5) can be summarized in the following pseudo code.

```
if(Update(DP_IOO)) {// This is rule 2.
        DP_SOO = GetValue(DP_IOO);
}
if (UserInteraction) {          // This is rule 1.
        DP_SOO = InvertValue(DP_SOO);
        SendValue(DP_SOO);
}
```

1.1.2.4 Functionality of the HMI

No requirements are specified concerning the interpretation of the HMI.

The following Datapoints shall allow coping with various HMI flavours and approaches towards controlling switching actuators.

1. Input IOO
2. Parameter Enable Toggle Mode
3. Parameter On Off Action

1.1.3 Constraints

This FB does not foresee any functionality for scene controlling. The inputs in the switching actuator for scene control can be controlled by a dedicated FB for scene purposes.

1.1.4 Functional Block Diagram

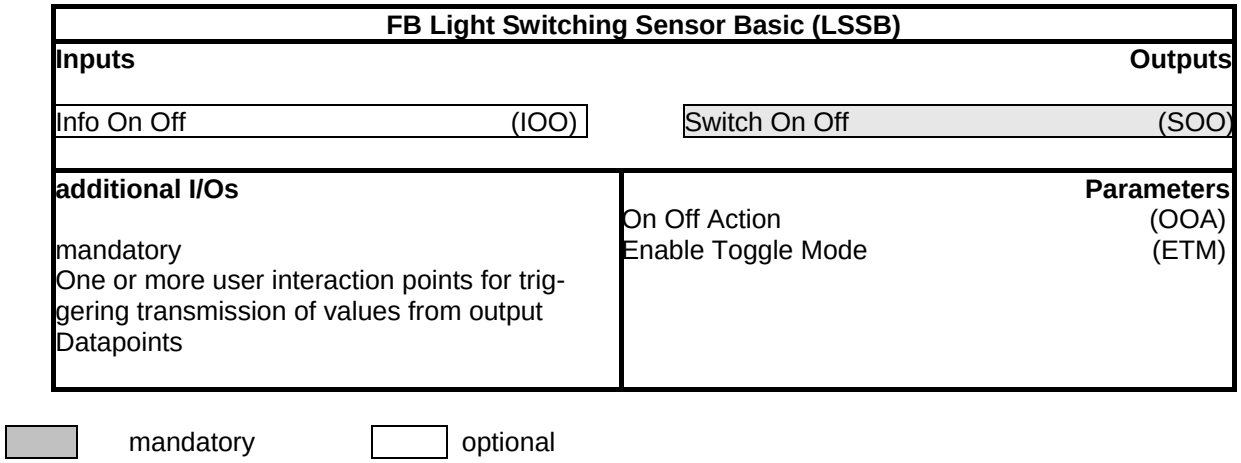


Figure 6 – Functional Block Diagram for FB Light Switching Sensor Basic

1.1.5 Datapoints

Table 1 – Datapoint overview

Datapoint	Description/Remarks	Datapoint Type
Outputs		
Switch On Off	To switch the lamp on (=1) or off (=0)	DPT_Switch (1.001)
Inputs		
Info On Off	To indicate the status of the lamp	DPT_Switch (1.001)
Parameters		
On Off Action	Limits the values sent by the output SOO to only On of Off	DPT_Switch (1.001)
Enable Toggle Mode	Specifies whether the output SOO is the inverse of the input IOO or not.	DPT_Enable (1.003)

1.1.6 FB Profiles [1)]

Features and options	Basic FB	Standard Mode: LSSB Profile 1
Output SOO	*M*	*GO*
Input IOO	*O*	*(GO)*

Figure 7: Runtime Interworking – Dependence on Configuration Mode

Table 2 - Parameters

		Basic FB	S-Mode
Parameters	OOA	**O**	**O**
	ETM	**O**	**O**

As regards the implementation of Parameters in Standard Mode or the LTE-Mode Standard Mode Interface, in case of memory mapped Datapoints the DPT may be implementation specific. In case of implementation as a Property of an Interface Object, the use of the standardised parameter specification is mandatory.

1) Please refer to [02] for the definition of the syntax and symbols used in this FB Profile definition.

1.1.7 Detailed specification of Datapoints

1.1.7.1 Output Switch On Off

DP Name:	Switch On Off	Abbr.:	SOO	Mandatory	☒
FB Name:	Light Switching Sensor Basic (LSSB)			Can be internal	☐

Description

The output Switch On Off shall be used to control the switching status of the switching actuator.

Datapoint Type

DPT_Name:	DPT_Switch		
DPT Format:	B_1	DPT_ID:	1.001

Field	Description	Supp.	Range	Unit	Default
b	This field shall indicate whether the switching actuator will switch on (1) or off (0)	M	{0, 1}	-	-

Access Type

♦ Output

this → M	☒	this → 1	☐				
Spontaneous	☒	COV:	☒	Δ-Value:		Min repetition time:	
		Cyclic	☐	Period:			
Request	☐						

Communication Type

♦ Group Object Datapoint		Mandatory:	☒
Default Group Address:	---		

Dynamics

Power down:	Save:	☐			
Power up:	Value:	No initialisation:	☒	Default value:	☐
		Saved value:	☐		☐
	Transmit on bus (only for output):		☐	Read from bus (only for input):	☐

Exception Handling

Through the parameter On Off Action it is possible that on human interaction only one value of the range is transmitted

Special Features

None.

1.1.7.2 Input Info On Off

DP Name:	Info On Off		IOO	Mandatory	☐
FB Name:	Light Switching Sensor Basic (LSSB)			Can be internal	☐

Description

The input „Info On Off" shall be used to receive the status of the switching actuator.
This information can be used solely for visualisation purposes, for realising the toggle functionality or other purposes.

Datapoint Type

DPT_Name:	DPT_Switch				
DPT Format:	B_1	DPT_ID:	1.001		
Field	Description	Supp.	Range	Unit	Default
b	Indicates the status of the switching actuator.	M	{0, 1}	-	-

Access Type

♦ Input

N → this	☐	1 → this	☒		
Spontaneous	☒	Cyclically:	☐	Time-out:	
Request	☐	Polling:	☐	Period:	

Communication Type

♦ Group Object Datapoint — Mandatory: ☒

Default Group Address: ---

Dynamics

Power down:	Save:	☐			
Power up:	Value:	No initialisation:	☒	Default value:	☐
		Saved value:	☐	Actual value:	☐
	Transmit on bus (only for output):		☐	Read from bus (only for input):	☐

Exception Handling

If this DP is not received (communication failure or configuration mistake) and the toggle functionality is implemented, then the specification the output SOO will still toggle, as specified in 1.1.2.3.

Special Features

None.

1.1.7.3 Parameter On Off Action

FB:	Light Switching Sensor Basic (LSSB)	Property Name (Server):	On Off Action (OOA)	Mandatory ☐ Optional ☒

Description:

If this parameter is implemented, then SOO shall always send one single value (Off or On).
This parameter only makes sense in certain realisation flavours of this FB: see 1.1.2.2.

DPT:	Name: DPT_Switch	DPT ID: 1.001	Datatype format: B_1		

Field	Description	Sup.	Range	Unit	Default
b	0 = Off SOO shall only send value '0' 1 = On SOO shall only send value '1'	M	{0,1}	None	None

Communication:

DP Address: (in the server)	object_type:	421	PID:	51
	start_index:	1	nr_of_elem:	1
Property access:	Read only ☐	Read/Write ☒		
Protection	Read level	-	Write level	-

Exception Handling: Value after Power-up: Stored Value ☒ Act Value ☐ Default Value ☐

None.

Special Features:

None.

1.1.7.4 Parameter Enable Toggle Mode

FB:	Light Switching Sensor Basic (LSSB)	Property Name (Server):	Enable Toggle Mode (ETM)	Mandatory ☐ Optional ☒

Description:

If this parameter has the value “Enable” then the value of the output SOO shall toggle each time it is transmitted; if this parameter has the value “Disable” then the output SOO shall not be toggled.
See 1.2.2.3.

DPT:	Name	DPT_Enable	DPT ID	1.003	Datatype format	B_1

Field	Description	Sup.	Range	Unit	Default
b	Enables or disables Toggle Mode.	M	{0,1}	None	None

Communication:

DP Address: (in the server)	object_type:	421	PID:	52
	start_index:	1	nr_of_elem:	1
Property access:	Read only ☐	Read/Write ☒		
Protection	Read level	-	Write level	-
Exception Handling:	Value after Power-up:	Stored Value ☒	Act Value ☐	Default Value ☐

None.

Special Features:

None.

1.2 FB Dimming Sensor Basic (Object Type 420)

1.2.1 Aims and objectives

The FB Dimming Sensor Basic is used in the Application Domain Lighting for providing input data to dimming actuators. It specifies the functionality, for example contained in a switch or a push button, to increase or decrease the brightness of a lamp or to switch the lamp on/off.

Display elements (with own FBs) can be integrated to show the status of the dimming actuator.

The inputs and outputs of the Functional Block are described but not the Human Machine Interface (HMI). Consequently, the manufacturers of the button or switch have the opportunity to implement their design and their operation methods.

1.2.2 Functional specification

1.2.2.1 Overview

The FB Dimming Sensor Basic provides hardwired inputs for triggering transmission of values of output Datapoints.

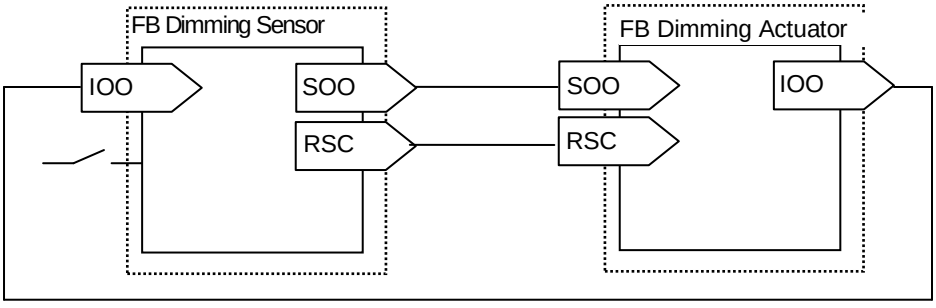


Figure 8 – Basic communication model (example with Relative Dimming Sensor)

Figure 8 gives an application example in which the lighting is controlled relatively: the set value of the dimmer is increased and decreased in relative steps starting from the current value. It is also possible to control the set value of the FB Dimming Actuator directly through the DP Absolute Setvalue Control (ASC), as shown in Figure 9. Both models can be combined in a sensor implementation.

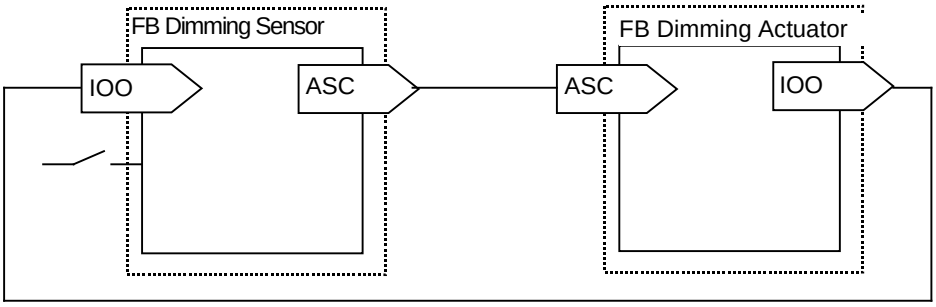


Figure 9 – Basic communication model (example with Absolute Dimming Sensor)

1.2.2.2 Parameter On Off Action

The parameter On Off Action shall limit the values transmitted by the outputs SOO and RSC to either only 0 (“Off”) and “Dimming Down/Stop” or 1 (“On”) and “Dimming Up/Stop”.

This mainly makes sense if an appliance is realised as a combination of two FBs DSB each with one interaction point. This realisation however is only meaningful if the parameter ETM is not implemented or is set to the value “Disable”.

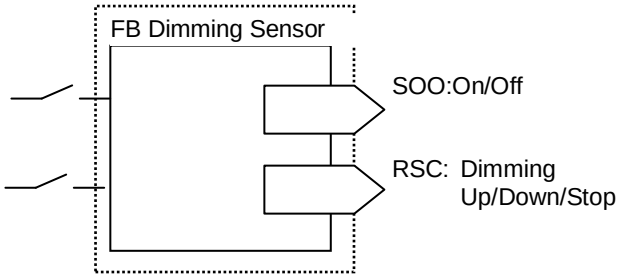


Figure 10 – One FB with two interaction points

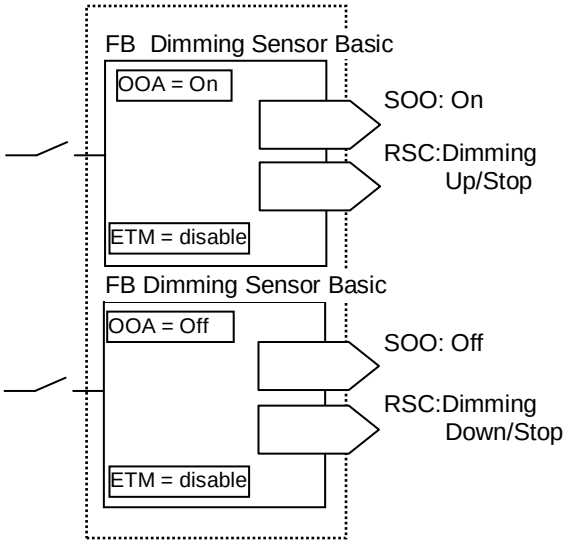


Figure 11 – Two FBs each with one interaction points

The dashed outlined areas realise the same functionality. The DP SOO in the left solution sends both On and Off. The DPs SOO in the right solution only send either On (e.g. upper FB) or Off (e.g. lower FB).

1.2.2.3 Toggle Mode

Toggle Mode denotes the behaviour where the value of the output SOO inverts on each transmission. The value of SOO can be calculated by the device internally or by interpreting the received value of the input InfoOnOff (IOO).

The concept of toggle mode is only meaningful in the realisation as given in Figure 11. In case the parameter Enable Toggle Mode (ETM) is set to the value Enable, the parameter On Off Action (OOA) becomes meaningless.

Toggle Mode implemented and active; IOO is not implemented

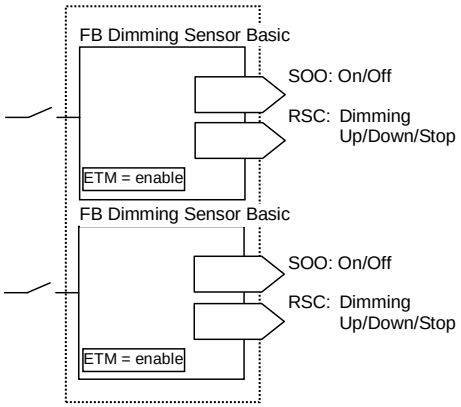


Figure 12 – Toggle Mode without IOO

Toggle Mode implemented and active; IOO is implemented

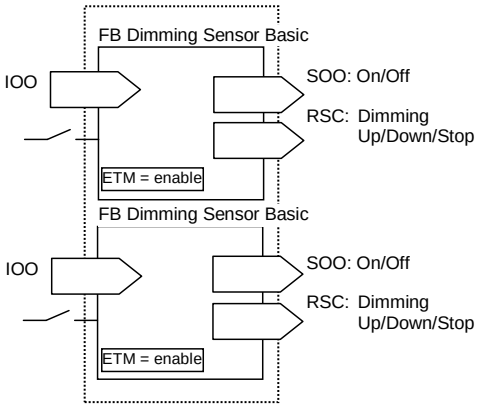


Figure 13 – Toggle Mode with IOO

Rule 1

Each subsequent transmission on the DP SOO will have an inverted value compared to the previous transmission.

$SOO_{n+1} = NOT(SOO_n)$

Rule 2

Rule 1 is in this case **extended** with the following: on each reception of IOO, SOO becomes the value of IOO.

SOO = IOO

The relation between IOO and Toggle Mode (Figure 13) can be summarized in the following pseudo code.

```
if(Update(DP_IOO)) {// This is rule 2.
        DP_SOO = GetValue(DP_IOO);
}
if (UserInteraction) {          // This is rule 1.
        DP_SOO = InvertValue(DP_SOO);
        SendValue(DP_SOO);
}
```

The interpretation of Toggle Mode concerning DP RSC and DP ASC is manufacturer specific.

1.2.2.4 Functionality of the HMI

No requirements are specified concerning the interpretation of the HMI.

The following parameters shall allow coping with various HMI flavours and approaches towards controlling dimming actuators.

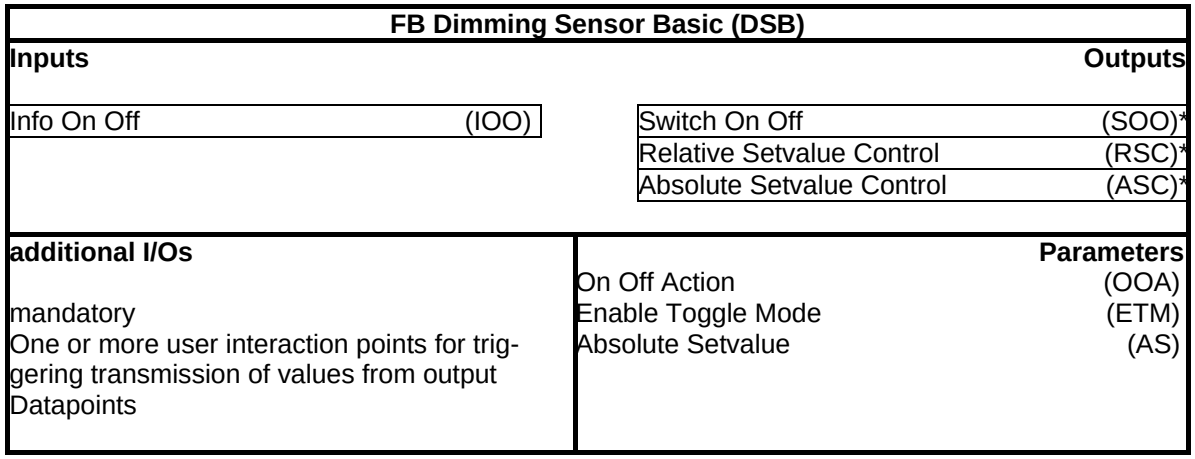
1. Input IOO
2. Parameter Enable Toggle Mode
3. Parameter On Off Action

1.2.3 Constraints

This FB does not foresee any functionality for scene controlling. The inputs in the dimming actuator for scene control can be controlled by a dedicated FB for scene purposes.

The step size for the DP Relative Setvalue Control is manufacturer specific. No standard parameter is foreseen to this purpose.

1.2.4 Functional Block Diagram



* For the allowed combination of output Datapoints see Table 4.

Figure 14 – Functional Block Diagram for FB Dimming Sensor Basic

1.2.5 Datapoints

Table 3 – Datapoint overview

Datapoint	Description/Remarks	Datapoint Type
Outputs		
Switch On Off	To switch the lamp on (=1) or off (=0)	DPT_Switch (1.001)
Relative Setvalue Control	To dim the brightness of the lamp up or down.	DPT_Control_Dimming (3.007)
Absolute Setvalue Control	To directly set the Setvalue of the dimming actuator.	DPT_Scaling (5.001)
Inputs		
Info On Off	To indicate the status of the lamp	DPT_Switch (1.001)
Parameters		
On Off Action	Limits the values sent by the output SOO / RSC to only On/Dimming Up or Off/Dimming Down	DPT_Switch (1.001)
Enable Toggle Mode	Specifies whether the output SOO is the inverse of the input IOO or not.	DPT_Enable (1.003)
Absolute Setvalue	Value for the output Absolute Setvalue Control	DPT_Scaling (5.001)

1.2.6 FB Profiles [2)]

Features and options	Basic FB	Standard Mode		LTE-Mode
		FB Profile 1	FB Profile 2	Standard Mode Interface
Input IOO	*O*	*(GO)*	*(GO)*	*(GO)*
Output SOO	*O*	*GO*	*(GO)*	*GO*
Output RSC	*O*	*GO*	*(GO)*	*(GO)*
Output ASC	*O*	*(GO)*	*GO*	*(GO)*

DSB FB Profile 1 models the Relative Dimming Sensor; *DSB FB Profile 2* models the Absolute Dimming Sensor. Table 4 exclusively specifies the allowed combinations of output Datapoints. Combination 1 is for the Relative Dimming Sensor, combination 2 is for the Absolute Dimming Sensor.

Table 4 - Combination of output Datapoints in a Dimming Sensor

	Combination	
	Relative Dimming Sensor	Absolute Dimming Sensor
Datapoints	**1**	**2**
SOO	M	O
RSC	M	O
ASC	O	M

Table 5 - Parameters

		Basic FB	S-Mode
Parameters	OOA	**O**	**O**
	ETM	**O**	**O**
	AS	**O**	**O**

As regards the implementation of Parameters in Standard Mode or the LTE-Mode Standard Mode Interface, in case of memory mapped Datapoints the DPT may be implementation specific. In case of implementation as a Property of an Interface Object, the use of the standardised parameter specification is mandatory.

2) Please refer to [02] for the definition of the syntax and symbols used in this FB Profile definition.

1.2.7 Detailed specification of Datapoints

1.2.7.1 Output Switch On Off

DP Name:	Switch On Off	Abbr.:	SOO	Mandatory	☐ a)
FB Name:	Dimming Sensor Basic (DSB)			Can be internal	☐

Description
The output Switch On Off shall be used to control the switching status of the dimming actuator.

Datapoint Type			
DPT_Name:	DPT_Switch		
DPT Format:	B_1	DPT_ID:	1.001

Field	Description	Supp.	Range	Unit	Default
b	This field shall indicate whether the dimming actuator will switch on (1) or off (0)	M	{0, 1}	-	-

Access Type								
♦ Output								
	this → M	☒	this → 1	☐				
	Spontaneous	☒	COV:	☒	Δ-Value:		Min repetition time:	
			Cyclic	☐	Period:			
	Request	☐						

Communication Type			
♦ Group Object Datapoint		Mandatory:	☒
	Default Group Address:	---	

Dynamics						
	Power down:	Save:	☐			
	Power up:	Value:	No initialisation:	☒	Default value:	☐
			Saved value:	☐		☐
		Transmit on bus (only for output):		☐	Read from bus (only for input):	☐

Exception Handling
Through the parameter On Off Action it is possible that on human interaction only one value of the range is transmitted

Special Features
None.

a) For allowed combinations of output Datapoints see Table 4

1.2.7.2 Output Relative Setvalue Control

DP Name:	Relative Setvalue Control	Abbr.:	RSC	Mandatory	☐ a)
FB Name:	Dimming Sensor Basic (DSB)			Can be internal	☐

Description

This Output shall be used to increase or decrease the brightness (StepCode ≠ 0) of the dimming actuator or to stop the ongoing dimming action (StepCode = 0).
According the requirements concerning the support of ranges by Output DPTs as specified in Chapter 3/7/1 “Interworking Model” clauses 2.1.7.2.1.1 and 2.4 it is allowed that the range of the StepCode be limited to values smaller than 111b. The value 000b shall however always be supported.

Datapoint Type

DPT_Name:	DPT_Control_Dimming		
DPT Format:	B_1U_3	DPT_ID:	3.007

Field	Description	Supp.	Range	Unit	Default
c	Shall specify whether the dimming set value shall be increased or decreased.	M	{0,1}	none	-
StepCode	Shall specify the dimming step size.	M	[000b … 111b]	none	-

Access Type

♦ Output

this → M	☒	this → 1	☐				
Spontaneous	☒	COV:	☐	Δ-Value:		Min repetition time:	
		Cyclic	☐	Period:			
Request	☐						

Communication Type

♦ Group Object Datapoint — Mandatory: ☒

Default Group Address: ---

Dynamics

Power down:	Save:	☐			
Power up:	Value:	No initialisation:	☒	Default value:	☐
		Saved value:	☐	Current value (not for input):	☐
	Transmit on bus (only for output):		☐	Read from bus (only for input):	☐

Exception Handling

Through the parameter On Off Action it is possible that on human interaction only one value of the range of the field c is transmitted. This way, it can be configured that the sensor only dims up/stops the dimming value or dims down/stops the dimming value.

Special Features

a) For allowed combinations of output Datapoints see Table 4

1.2.7.3 Output Absolute Setvalue Control (ASC)

DP Name:	Absolute Setvalue Control	Abbr.:	ASC	Mandatory	☐ a)
FB Name:	Dimming Sensor Basic (DSB)			Can be internal	☐

Description

This output shall be used to directly set the setvalue of the dimming actuator.
The algorithm to calculate the value of this output is not standardised. It may be given through the parameter Absolute Setvalue.
If the parameter On Off Action is implemented and has the value “Off”, then it is *recommended* that this output value only sends 0 %.

Datapoint Type

DPT_Name:	DPT_Scaling		
DPT Format:	U_8	DPT_ID:	5.001

Field	Description	Supp.	Range	Unit	Default
UnsignedValue	The set value for the dimming actuator.	M	[0 % … 100 %]	%	-

Access Type

♦ Output

this → M	☒	this → 1	☐				
Spontaneous	☒	COV:	☐	Δ-Value:		Min repetition time:	
		Cyclic	☐	Period:			
Request	☐						

Communication Type

♦ Group Object Datapoint	Mandatory: ☒
Default Group Address:	---

Dynamics

Power down:	Save:	☐			
Power up:	Value:	No initialisation:	☒	Default value:	☐
		Saved value:	☐	Current value (not for input):	☐
	Transmit on bus (only for output):		☐	Read from bus (only for input):	☐

Exception Handling

None.

Special Features

None.

a) For allowed combinations of output Datapoints see Table 4

1.2.7.4 Input Info On Off

DP Name:	Info On Off		IOO	Mandatory	☐
FB Name:	Dimming Sensor Basic (LSSB)			Can be internal	☐

Description

The input „Info On Off“ shall be used to receive the switching status of the dimming actuator.
This information can be used solely for visualisation purposes, for realising the toggle functionality or other purposes.

Datapoint Type

DPT_Name:	DPT_Switch		
DPT Format:	B_1	DPT_ID:	1.001

Field	Description	Supp.	Range	Unit	Default
b	Indicates the status of the dimming actuator 0 = dimming actuator off 1 = dimming actuator on	M	{0, 1}	-	-

Access Type

♦ Input

N → this	☐	1 → this	☒			
Spontaneous	☒	Cyclically:	☐	Time-out:		
Request	☐	Polling:	☐	Period:		

Communication Type

♦ Group Object Datapoint		Mandatory:	☒
Default Group Address:	---		

Dynamics

Power down:	Save:	☐			
Power up:	Value:	No initialisation:	☒	Default value:	☐
		Saved value:	☐	Actual value:	☐
	Transmit on bus (only for output):	☐		Read from bus (only for input):	☐

Exception Handling

If this DP is not received (communication failure or configuration mistake) and the toggle functionality is implemented, then the specification the output SOO will still toggle, as specified in 1.2.2.3.

Special Features

None.

1.2.7.5 Parameter On Off Action

FB:	Dimming Sensor Basic (LSSB)	Property Name (Server):	On Off Action (OOA)	Mandatory ☐ Optional ☒

Description:

If this parameter is implemented, then SOO and RSC shall always send one single value (Off respectively Dimming Down/Stop or On respectively Dimming Up/Stop).
This parameter only makes sense in certain realisation flavours of this FB: see 1.2.2.2.
The influence of this Parameter on the Output ASC is not standardised.

DPT:	Name	DPT_Switch	DPT ID	1.001	Datatype format	B_1

Field	Description	Sup.	Range	Unit	Default
b	0 = Off SOO shall only send value '0' RSC shall only send value 'dimming down/stop' 1 = On SOO shall only send value '1' RSC shall only send value 'dimming up/stop'	M	{0,1}	None	None

Communication:

DP Address: (in the server)	object_type:	420	PID:	51
	start_index:	1	nr_of_elem:	1
Property access:	Read only ☐	Read/Write ☒		
Protection	Read level	-	Write level	-

Exception Handling: Value after Power-up: Stored Value ☒ Act Value ☐ Default Value ☐

None.

Special Features:

None.

1.2.7.6 Parameter Enable Toggle Mode

FB:	Dimming Sensor Basic (LSSB)	Property Name (Server):	Enable Toggle Mode (ETM)	Mandatory ☐ Optional ☒

Description:

If this parameter has the value "Enable" then the value of the output SOO shall toggle each time it is transmitted; if this parameter has the value "Disable" then the output SOO shall not be toggled.
See 1.2.2.3.

DPT:	Name	DPT_Enable	DPT ID	1.003	Datatype format	B_1

Field	Description	Sup.	Range	Unit	Default
b	Enables or disables Toggle Mode.	M	{0,1}	None	None

Communication:

DP Address: (in the server)	object_type:	420	PID:	52
	start_index:	1	nr_of_elem:	1
Property access:	Read only ☐	Read/Write ☒		
Protection	Read level	-	Write level	-

Exception Handling: Value after Power-up: Stored Value ☒ Act Value ☐ Default Value ☐

None.

Special Features:

None.

1.2.7.7 Parameter Absolute Setvalue

FB:	Dimming Sensor Basic (DSB)	Property Name (Server):	Absolute Setvalue (AS)	Mandatory ☐ Optional ☒

Description:

This parameter shall define the value that shall be sent with the output Absolute Setvalue Control (ASC).

DPT:	Name	DPT_Scaling	DPT ID	5.001	Datatype format	U_8

Field	Description	Sup.	Range	Unit	Default
UnsignedValue	Contains the value for ASC.	M	cs	%	-

Communication:

DP Address: (in the server)	object_type:	420	PID:	53
	start_index:	1	nr_of_elem:	1

Property access:	Read only ☐	Read/Write ☒		
Protection	Read level	-	Write level	-

Exception Handling: Value after Power-up: Stored Value ☒ Act Value ☐ Default Value ☐

None.

Special Features:

None.

2 FB Movement Detector for Lighting

2.1 Aims and objectives

The “Movement Detector for Lighting“ (FB MDL) shall control actuators for lighting in function of:

- the detection of movement, and
- the detected brightness.

The brightness information may be retrieved either from a hardwired input, or from the Input Brightness External, e.g. provided by the FB Room Light Sensor.

The dependency of the functionality on this brightness is the basic difference between this FB MDL and similar FBs for HVAC and for Anti-Intrusion.

NOTE 1 This FB Movement Detector for Lighting is primarily designed for use in the application domain Lighting. Its 1 bit Outputs however allow this FB to be used in other application domains as well. Further integration in other application domains is possible through generic FBs, as FB Scene Control. See 2.2.11.

2.2 Functional specification

2.2.1 Basic functionality

The FB MDL shall be able to detect movement in a physical movement sensor, typically PIR (Passive InfrRed), and to transmit this information on the bus via at least one Output Switch On Off (SOO) or Timed StartStop (TSS).

The FB MDL may have further Inputs and functionality.

1. Input Movement Trigger shall serve for receiving movement signals from an external movement detector.
2. Input Info OnOff shall serve to suppress the faulty detection of movement at the moment that the light is switched.
3. The brightness evaluation shall serve for surpressing light switching if the brightness in the detection area is above a certain threshold level.

The combination and sequence of these functions is not specified. Further on in this specification multiple use cases are specified. The choice for the design of the realisation of this FB MDL depends on the main use case that is intended to be solved.

Figure 15 gives a possible design; alternative solutions are possible as well.

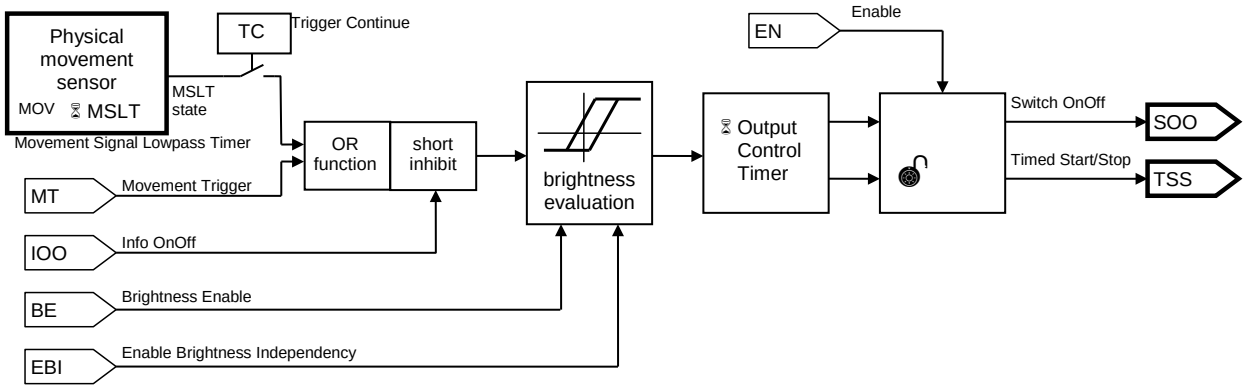


Figure 15 – Possible design of FB Movement Detector for Lighting

2.2.2 Physical means to detect movement

The FB MDL shall have a physical movement sensor to be able to detect movement. This can be done through the use of various physical means, such as PIR, microwaves … These physical means may also be combined. These means are however not modelled differently in this KNX FB MDL. All movement detectors for lighting are modelled through this one single common FB MDL without taking the physical detection method into consideration any further.

A first timer in the FB MDL shall be the Movement Signal Lowpass Timer (MSLT).

Timer MSLT is started and retriggered on any physical detection of movement. A running timer MSLT thus signals that the device has detected a valid movement signal.

Timer MSLT is the timer that shall prevent that if movement is detected with a higher frequency (e.g. multiple detections during 1 second) that this leads to as many transmissions on the bus.

The timer MSLT depends on the applied hardware, electronics, etc. and is product specific. Therefore, the timer MSLT is not available as an application parameter.

The state of the MSLT timer shall be the output signal of this physical movement sensor.

2.2.3 Outputs *Switch OnOff* and *Timed StartStop*

These Outputs reflect two typical use cases of this FB MDL.

Table 6 – Comparison SOO to TSS

Event	**Use case 1** The switch off delay of an actuator is handled in the movement detector.	**Use case 2** The switch off delay of an actuator is handled in the actuator itself.
	SOO shall	**TSS shall**
• first detection of movement	transmit the value On	transmit the value Start.
• detected movement continues	optionally repeat its value.	repeat its value periodically.
• no more movement is detected	transmit the value Off	not transmit the value Stop

2.2.4 Time dependencies

2.2.4.1 Timer definitions

Next to the above specified timer MSLT, FB MDL shall have a further timer. This second timer shall be the Output Control Timer (OCT).

Timer OCT shall be the timer that shall control

- the transmission of SOO, *or*
- the periodic transmission of TSS.

The time-out value of OCT is available as application parameter.

EXAMPLE 1 Timer MSLT is 5 s to 10 s; Timer OCT is 45 s.

2.2.4.2 For Timed StartStop

Timer MSLT shall be started on the first detection of movement. It shall be retriggered on every renewed detection of movement.

Timer OCT shall be started when Timer MSLT is started. When Timer OCT expires and Timer MSLT is running, then Timer OCT shall be automatically restarted. Timer OCT is never retriggered and never stopped.

Output TSS shall transmit the value Start when Timer OCT is started or restarted. The Output TSS shall in this case never transmit the value Stop.

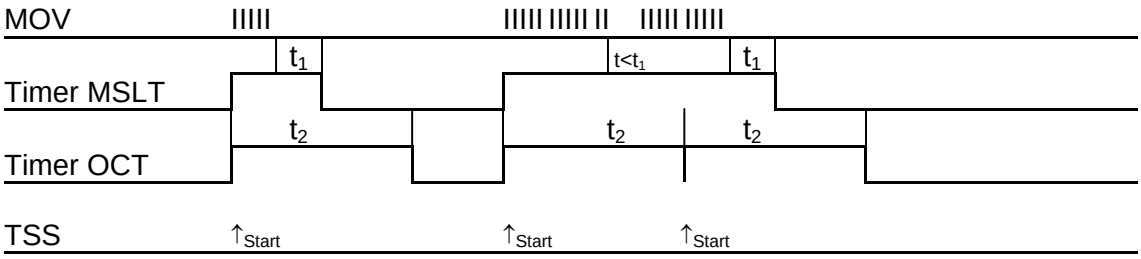


Figure 16 – Functionality of Timed StartStop

2.2.4.3 For Switch OnOff

Timer MSLT shall be started on the first detection of movement. It shall be retriggered on every renewed detection of motion.

Timer OCT shall be reset and started if Timer MSLT expires. Timer OCT is stopped if Timer MSLT is started.

Output SOO shall transmit the value On when Timer MSLT is started and Timer OCT is not running.

Output SOO shall transmit the value Off if Timer OCT expires. It is not transmitted if Timer MSLT expires or if Timer OCT is stopped.

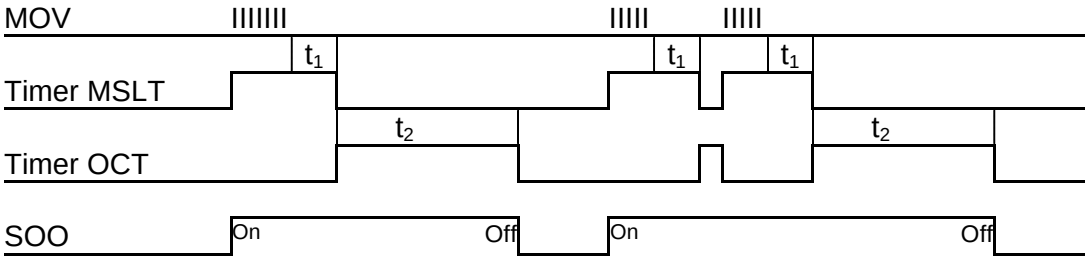


Figure 17 – Functionality of Switch OnOff

2.2.5 Brightness dependency

The functionality of the FB MDL shall further be influenced by the current brightness.

USE CASE 3 If movement is detected, the FB MDL will switch on the light if the brightness is below the threshold. The measured brightness will by this increase. Yet, this FB MDL should again switch off the light when it no longer detects any movement. This means that while OCT runs, the FB MDL works independently of the measured brightness.

If a first movement is detected, the FB MDL will switch on the light, via SOO or TSS. If further movement is detected, SOO may and TSS shall be repeated. If no more movement is detected then SOO shall transmit the value Off. This means that the brightness is only evaluated for the initial movement detection when the timers MSLT and OCT are started.

1. The initial reaction of the FB MDL, this is, on the first detection of movement, when both timers are expired, shall be as specified in Table 7.

Table 7 – INITIAL reaction of FB MDL

Current brightness	SOO	TSS
below threshold value	Shall transmit On.	Shall transmit Start.
above threshold value	No action.	No action.

2. When either one of the timers Timer MSLT or Timer OCT is running, the functionality of the FB MDL shall be independent of the measured brightness and shall be as specified in 2.2.4.

The Parameter Enable Brightness Independency (EBI) shall be used to control this brightness dependency. If EBI is not implemented, then the FB MDL shall always operate brightness dependent concerning the initial detection of movement.

The threshold value may optionally be controlled through the Parameter Brightness Threshold as specified in 2.7.7.

The current brightness is typically obtained from a built-in brightness sensor. It may as well (additionally) be received through the Input Brightness External. In case a build-in brightness sensor is combined with one or more external brightness sensors, the relation between both is implementation dependent.

2.2.6 Input Info OnOff and Parameter Movement Sensor Pause Time

The Input “Info OnOff” shall be used to receive the status of an actuator.

This shall allow the FB MDL to know the moment when a light is switched, off or on, to suppress a movement detection from the light source.

On reception any value, On or Off, on the Input Info OnOff, the FB MDL shall not evaluate the physical movement signals for a short time. This time can be fixed in the device or can be given by the parameter Movement Sensor Pause Time (MSPT). During this time the physical movement sensor signals shall not be evaluated. The implementation of this is not fixed; it may be implemented for instance as follows (informative).

- On reception of a telegram on the Input Info OnOff, the FB MDL will start a timer, with a value according the parameter MSPT if implemented, during which the internal signal MSLT will not cause the transmission of SOO or TSS.
- On detection of movement through the internal signal MSLT, a timer is started, with a value according the parameter MSPT if implemented. If any telegram is received on the Input IOO while this timer is running then there will be no transmission of SOO or TSS; if no telegram is received on the Input IOO, then SOO and TSS will be handled as normal.
- Combinations of the above and alternative solutions can be considered as well.

EXAMPLE 2 3 s

This Input shall also allow to inhibit the evaluation of the internal signal MSLT state, as explained in USE CASE 6 and in the specification of the parameter Trigger continue in clause 2.2.9.

2.2.7 Input Enable

The Input Enable shall be used to limit the transmission of the Outputs TSS and SOO. The influence of this Input may be located at multiple possible locations inside the FB MDL. Depending on this, the effect of the Input Enable may be

- to stop all communication of TSS and SOO, or
- to stop only the evaluation of the internal movement sensor, or
- to stop the evaluation of the external signal MT,

or any combination of the above.

Input Enable is however not intended to disable the brightness evaluation. To this, the Input Enable Brightness Independency shall be used (see 2.2.5).

USE CASE 4 This functionality can be used to disable the light switching by a movement detector at night e.g. without forcing (Input Forced) an actuator.

USE CASE 5 During cleaning of the area that is covered by this movement detector, this Input allows preventing that the light is switched on and off repeatedly.

2.2.8 Input Movement Trigger

The Input Movement Trigger (MT) serves for connecting external movement detecting.

The evaluation of the Input Movement Trigger (MT) is not fixed.

1. It may be evaluated in the same way as the internal physical movement sensor signal (MSLT state) of the FB MDL. It then starts the timer OCT as specified in 2.2.4. The transmission of the Outputs TSS or SOO may be under the control of the Parameter Movement Trigger Evaluation (see 2.7.10).

   USE CASE 6 If the light within a room is controlled through push buttons as well as through movement detectors, it may be wanted that the light is switched on through a push button but is switched off automatically by the movement detector. To allow this, the push button communicates through this Input with the FB MDL instead of directly with the light actuator.

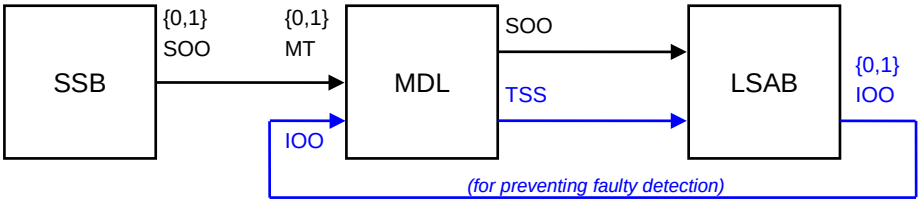


Figure 18 – USE CASE 6 – solution 1
FB MDL evaluates timers and brightness in the interpretation of MT

   - In the design of the FB MDL in this solution, the Input MT does not directly affect the Outputs, but is subject to the timer OCT. When this timer expires, it will switch off the light. This model guarantees that the light is always switched off, even if the FB MDL did not detect movement itself.
   - If the design of the FB MDL still evaluates the internal brightness sensor, it may occur that the request for switching on the light from the FB LSSB, is not passed by the FB MDL if the brightness is below the threshold value. The light is not switched on, even though it is requested by a person. This can be solved by the Parameter Movement Trigger Evaluation, which makes that the brightness is not evaluated for the Input MT.

2. The Input MT may also be evaluated elsewhere in the functional scheme of the FB MDL (Figure 15). The Input MT can be implemented so that it directly controls the transmission of the Outputs SOO or TSS, without further evaluation of timers or the brightness. This allows solving USE CASE 6 as in Figure 19.

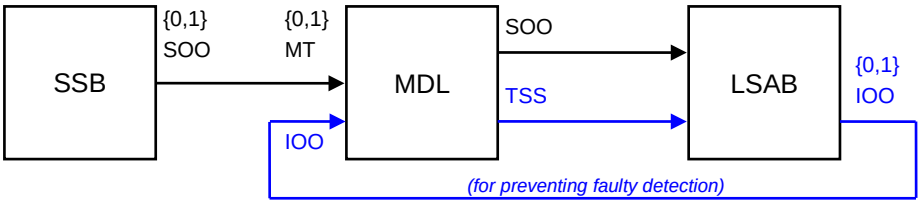


Figure 19 – USE CASE 6 – solution 2
FB MDL interprets MT regardless of timers and brightness

Alternative, more advanced interpretations of MT are possible as well.

NOTE 2 If an implementation of the FB MDL always evaluates the brightness and does not have the Parameter Movement Trigger Evaluation, the functionality can still be reached by having the LSSB and MDL work in parallel.

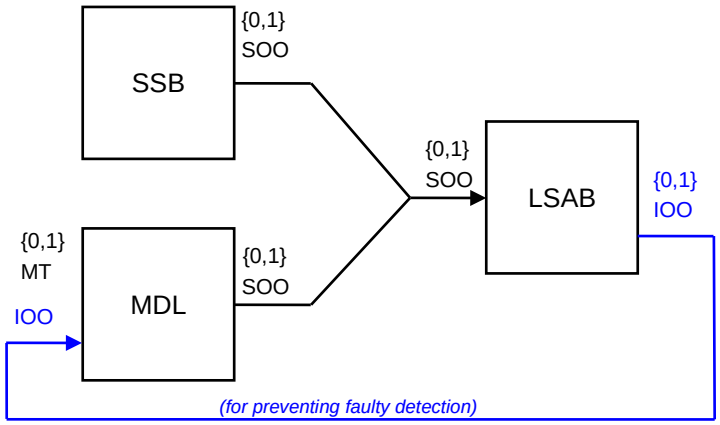


Figure 20 – USE CASE 6 – solution 3
FB MDL evaluates timers and brightness in the interpretation of MT;
LSSB is configured in parallel to MDL

- The FB LSSB can always switch the light, even if the brightness is above the threshold value of the movement sensor.
- The disadvantage of this solution is that if the person only enters the room shortly, or not at all, then the FB MDL has not detected any movement, and will thus not automatically switch off the light.

2.2.9 Trigger continue

If the Parameter Trigger Continue (TC) is set to Enable, then the motion detector shall be active only if the output of the actuator is really switched on. The FB MDL shall recognise this actuator state by its Input Info OnOff. The FB MDL then retriggers the actuator channel while cyclically sending the value On on the Output Switch OnOff.

If the Parameter Trigger Continue is set to Disable then the FB MDL works independently from the Datapoint Info OnOff except the suppression of switching of the light.

2.2.10 Master/slave relation between FB MDL

2.2.10.1 Introduction

If the lighting in a larger area is controlled by more than one movement detector, then it shall be avoided that one movement detector switches the light off, while another movement detector switches the light on. This may be solved by a master/slave concept between the movement detectors. One movement detector controls the lighting; the other movement detector(s) do not control the lighting but report their movement detection through their Outputs TSS to the master via the Input Movement Trigger of the master. The functionality of the master FB MDL is further unchanged, i.e. it is further controlled through its Inputs Enable, etc.

2.2.10.2 Master-Slave Solution 1

- Master and slave evaluate the brightness.
- Master switches LSAB if brightness is below its treshold.

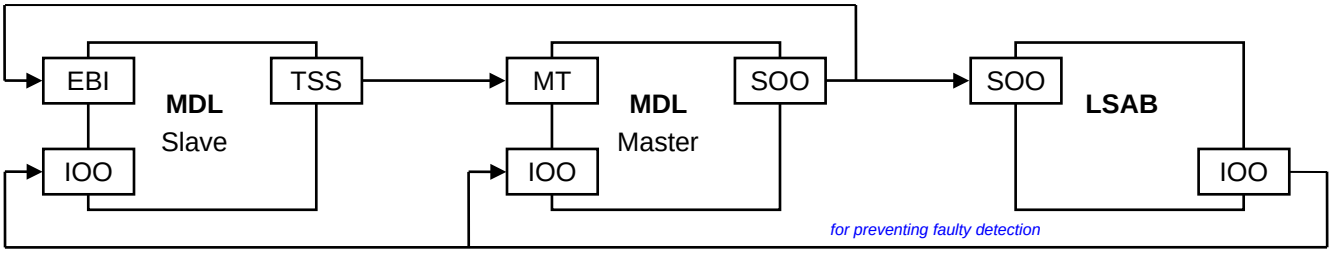


Figure 21 – Master-Slave Solution 1

USE CASE 7 It may happen that the FB MDL Master detects the first movement and switches the FB LSAB. It may then however occur that FB MDL Master does not detect any further movement and would switch off FB LSAB after timer OCT in the FB MDL Master expires, even if FB MDL Slave detects movement. This happens if the person has moved out of the detection area of FB MDL Masters into the detection area of the FB MDL Slave. This requires that the FB MDL Slave operates independently of the light brightness. This is done by linking the Output SOO of the FB MDL Master with the Input EBI of the FB MDL Slave.

USE CASE 8 If the FB MDL Slave detects the first movement and the brightness is below the threshold, it will trigger the FB MDL Master, which shall take the final conclusion about switching the light, depending on its further parameters.
If the person moves from the detection area of the FB MDL Slave into the detection area of the FB MDL Master, then the FB MDL Master detects its first movement: the OCT in the FB MDL Master is retriggered by the own movement detection in the FB MDL Master and no longer from its Input MT. This is independent of the brightness detected by the FB MDL Master: with a running OCT, the brightness is not evaluated (see 2.2.5).

2.2.10.3 Master-Slave Solution 2

- Master and slave evaluate the brightness.

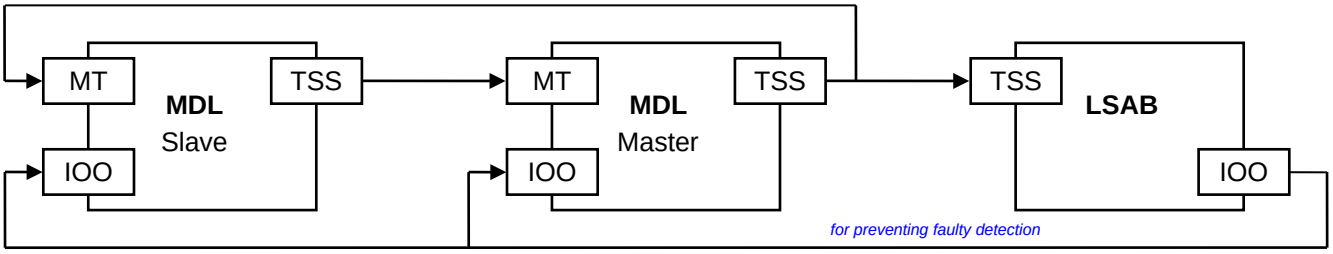


Figure 22 – Master-Slave Solution 2

USE CASE 9 The FB MDL Master detects the first movement and switches the FB LSAB through its Output TSS.
If the person moves from the detection area of the FB MDL Master into the detection area of the FB MDL Slave then the FB MDL Master will not detect any further movement and the LSAB switches off the light autonomously after its switch off delay has expired, even if FB MDL Slave detects movement. This requires that the FB MDL Slave operates independently of the light brightness. This is done by linking the Output TSS of the FB MDL Master with the Input MT of the FB MDL Slave. This shall cause the timer MSLT in the FB MDL Slave to be started, which shall in turn cause that the FB MDL Slave operates brightness independently. However, it shall be avoided that the FB MDL Slave transmits on its Output TSS back to MT of the FB MDL Master: this will cause as many transmissions of TSS signals on the bus as there are FB MDL Slaves connected to the master. This can be avoided by appropriate setting of the Parameter Movement Trigger Evaluation.

USE CASE 10 If the FB MDL Slave detects the first movement and the brightness is below the threshold, it will trigger the FB MDL Master, which shall take the final conclusion about switching the light, depending on its further parameters.
If the person moves from the detection area of the FB MDL Slave into the detection area of the FB MDL Master, then the FB MDL Master detects its first movement: the OCT in the FB MDL Master is retriggered by the own movement detection in the FB MDL Master and no longer from its Input MT. This is independent of the brightness detected by the FB MDL Master: with a running OCT, the brightness is not evaluated (see 2.2.5).

2.2.11 Extended functionality

The functionality of this FB Movement Detector for Lighting in an implementation can be extended by combining functionality of other FBs.

EXAMPLE 3 In the below example of Figure 23, FB MDL is combined with FB Scheduler. This may allow for instance to dim lights up or down to different values when movement is detected or no longer detected, to control shutters and blinds and much other functionality.

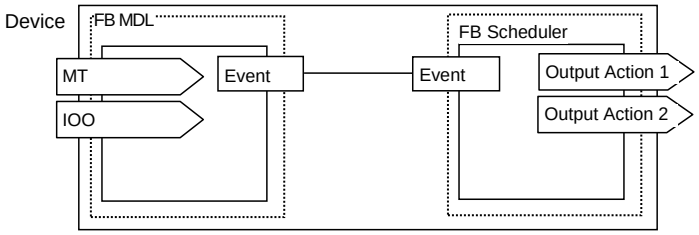


Figure 23 – FB MDL combined with FB Scheduler

2.3 Contraints

For evaluation of the illuminance from an external illuminance sensor, this FB MDL solely provides the Input Brightness External (BE), which may be compared to internal threshold values or an internal illuminance sensor. If the external illuminance sensor has an own evaluation of the illuminance and provides a 1 bit Output, then this can be linked to the Input Enable.

2.4 Functional Block diagram

FB Movement Detector for Lighting (MDL)			414
Inputs			**Outputs**
Info OnOff	(IOO)	(SOO) M1	Switch OnOff
Enable	(EN)	(TSS) M1	Timed StartStop
Brightness External	(BE)		
Movement Trigger	(MT)		
additional I/Os			**Parameters**
illuminance sensor (threshold)		(BT)	Brightness Threshold
PIR sensor		(OCT)	Output Control Time
		(TC)	Trigger Continue
		(EBI)	Enable Brightness Independency
		(MSPT)	Movement Sensor Pause Time
		(MTE)	Movement Trigger Evaluation

M1 Either one of these Datapoints is mandatory. See 2.6.

mandatory optional

Figure 24 – Functional Block Diagram for FB Switching Sensor Basic

2.5 Datapoints

Datapoint	Description/Remarks	Datapoint Type
Outputs		
Switch OnOff	Switches on or off the light.	1.001 DPT_Switch
Timed StartStop	Starts and retriggers the autonomous switching functionality at the linked actuators.	1.010 DPT_Start
Inputs		
Info OnOff	Informs on the light state of the actuator to surpress faulty detection of movement.	1.001 DPT_Switch

Datapoint	Description/Remarks	Datapoint Type
Enable	Enables and disables the detection of movement.	1.003 DPT_Enable
Brightness External	Receives the external brightness level.	9.004 DPT_Value_Lux
Movement Trigger	Add an external physical movement detector signal to the FB.	1.010 DPT_Start
Parameters		
Brightness Threshold	Threshold value above which the detection of movement is disabled.	9.004 DPT_Value_Lux
Output Control Time	The time after that the movement detector will wait for switching off the light after the last detection of moevement (expiration of MSLT timer) via SOO, or the time in-between transmissions of TSS if TSS is repeated.	7.008 DPT_TimePeriodSec
Trigger Continue	Defines the dependency of the FB MDL from its Input IOO.	1.003 DPT_Enable
Enable Brightness Independency	Controls whether or not the functionality depends on the received or measured brightness.	1.003 DPT_Enable
Movement Sensor Pause Time	Short period after reception of the value on on the Input IOO during which the detection of movement shall be surpressed.	7.004 DPT_TimePeriod100Msec
Movement Trigger Evaluation	Specifies the handling of the Input Movement Trigger.	1.003 DPT_Enable

2.6 FB Profiles [3)]

- FB Profile 1 matches use case 1: the switch off delay of an actuator is handled in the movement detector
- FB Profile 2 matches use case 2: the switch off delay of an actuator is handled in the actuator itself

Features and options	Basic FB	Standard Mode	
		FB Profile 1	FB Profile 2
select 1 of 2 {			
Output SOO + transmission and repetition conditions	*M*	*GO*	*(GO)*
Output TSS + transmission and repetition conditions	*M*	*(GO)*	*GO*
}			
Physical Movement Sensor	*M*	*M*	*M*
Inhibit false detections {	*M*	*M*	*M*
Input IOO	*O*	*(GO)*	*(GO)*
select 1 of 2 {	*M*	*M*	*M*
fixed pause time	*M*	*M*	*M*
Parameter MSPT	*M*	*M*	*M*
}			
Timer MSLT and functionality	*M*	*M*	*M*
Timer OCT and functionality	*M*	*M*	*M*
Parameter OCT time-out value	*M*	*M*	*M*

3) Please refer to [02] for the definition of the syntax and symbols used in this FB Profile definition.

Features and options	Basic FB	Standard Mode	
		FB Profile 1	FB Profile 2
IF Parameter EBI is implemented {			
brightness dependency according EBI	*M*	*M*	*M*
}			
ELSE {			
FB MDL shall work brightness dependent	*M*	*M*	*M*
}			

2.7 Detailed specification of the Datapoints

2.7.1 Output Switch OnOff (SOO)

DP Name:	Switch OnOff		Abbr.:	SOO		Mandatory	☐
FB Name:	FB Movement Detector for Lighting (MDL)					Can be internal	☐
Description							
Please refer to the functional specification. This Output shall serve for switching on and off the light. This Output shall transmit the value On on the first detection of movement. It shall transmit the value Off after the period OCT (see 2.7.7) after the last detection of movement.							
Datapoint Type							
DPT_Name:	DPT_Switch						
DPT Format:	B_1			DPT_ID:			
Field				Supp.	Range	Unit	Default
b	See DPT definition.			M	{0, 1}	none	none
Access Type							
♦ Output							
this → M	☒	this → 1	☐				
Spontaneous	☒	COV:	☒	Δ-Value:		Min repetition time:	
		Cyclic	☐	Period:			
Request	☒						
Communication Type							
♦ Group Object Datapoint						Mandatory:	☒
Default Group Address:							
Dynamics							
Power down:	Save:	☐					
Power up:	Value:	No initialisation:	☒	Default value:			☐
		Saved value:	☐	Current value (not for input):			☐
	Transmit on bus (only for output):		☐	Read from bus (only for input):			☐
Exception Handling							
None.							
Special Features							
None.							

2.7.2 Output Time StartStop (TSS)

DP Name:	Timed StartStop	Abbr.:	TSS	Mandatory	☐
FB Name:	FB Movement Detector for Lighting (MDL)			Can be internal	☐

Description

Please refer to the functional specification.
This Output shall service for switching on the light. This can be used with a lighting actuator that switches off the light autonomously, e.g. after a certain period.
This Output value shall be encoded according DPT_Start (1.010). Only the value 1 = start shall be transmitted; the value 0 = stop shall not be transmitted.
As long as the FB MDL detects movement it shall send the value 1 = start periodically with the period according the Parameter OCT.

Datapoint Type

DPT_Name:	DPT_Start		
DPT Format:	B_1	DPT_ID:	1.010

Field		Supp.	Range	Unit	Default
b	This shall switch on the light.	M	{0}	none	0

Access Type

♦ Output

this → M	☒	this → 1	☐				
Spontaneous	☒	COV:	☐	Δ-Value:		Min repetition time:	
		Cyclic	☒	Period:	See 2.7.7		
Request	☒						

Communication Type

♦ Group Object Datapoint — Mandatory: ☒

Default Group Address:

Dynamics

Power down:	Save:	☐			
Power up:	Value:	No initialisation:	☒	Default value:	☐
		Saved value:	☐	Current value (not for input):	☐
	Transmit on bus (only for output):		☐	Read from bus (only for input):	☐

Exception Handling

None.

Special Features

None.

2.7.3 Input Info OnOff (IOO)

DP Name:	Info OnOff	Abbr.:	IOO	Mandatory	☐
FB Name:	FB Movement Detector for Lighting (MDL)			Can be internal	☐

Description

Please refer to the functional specification.
When the light switches on or off in the spatial area in which the FB Movement Detector is physically mounted, this may by the electronics erroneously be detected as a movement. To prevent from this, the information to switch the light (e.g. from the light sensor) can be linked also to this Input Info OnOff. If the FB MDL receives a telegram on this Input, it will for a short period, possibly according the parameter Parameter Movement Sensor Pause Time2.7.11, not evaluate any movement sensor signal (internal signals MSLT).

Datapoint Type

DPT_Name:	DPT_Switch		
DPT Format:	B_1	DPT_ID:	

Field		Supp.	Range	Unit	Default
b	0: The light is or will be switched off. 1: The light is or will be switched on.	M	{0, 1}	none	none

Access Type

♦ Input

N → this	☐	1 → this	☒		
Spontaneous	☒	Cyclically:	☐	Time-out:	
Request	☐	Polling:	☐	Period:	

Communication Type

♦ Group Object Datapoint				Mandatory:	☒
Default Group Address:					

Dynamics

Power down:	Save:	☐			
Power up:	Value:	No initialisation:	☒	Default value:	☐
		Saved value:	☐	Current value (not for input):	☐
	Transmit on bus (only for output):		☐	Read from bus (only for input):	☐

Exception Handling

None.

Special Features

None.

2.7.4 Input Enable (EN)

DP Name:	Enable	Abbr.:	EN	Mandatory	☐
FB Name:	FB Movement Detector for Lighting			Can be internal	☐

Description

Please refer to the functional specification.
This Input shall serve to limit the transmission of the Outputs SOO and/or TSS. The transmissions may either be disabled totally, or be limited to transmissions only caused by the Input MT.

Datapoint Type

DPT_Name:	DPT_Enable		
DPT Format:	B_1	DPT_ID:	1.003

Field		Supp.	Range	Unit	Default
b	0 = disable The transmissions of the Outputs SOO and/or TSS are limited. The movement signals that are caused by the built-in movement detector shall be disabled. Other conditions for the transmission of SOO and/or TSS may still be evaluated [a)]. 1 = enable The transmissions of the Ouputs SOO and/or TSS shall not be limited by this Input.	M	{0, 1}	none	enable

Access Type

♦ Input

N → this	☒	1 → this	☐		
Spontaneous	☒	Cyclically:	☐	Time-out:	
Request	☐	Polling:	☐	Period:	

Communication Type

♦ Group Object Datapoint	Mandatory:	☒
Default Group Address:		

Dynamics

Power down:	Save:	☐			
Power up:	Value:	No initialisation:	☐	Default value:	☒
		Saved value:	☐	Current value (not for input):	☐
	Transmit on bus (only for output):		☐	Read from bus (only for input):	☐

Exception Handling

[a)] It may happen that the FB MDL is disabled while the timer OCT is running. When OCT expires, it may thus still happen that the FB MDL switches off the light. This is implementation dependent.

Special Features

None.

2.7.5 Input Brightness External (BE)

DP Name:	Brightness External	Abbr.:	BE	Mandatory	☐
FB Name:	Movement Detector for Lighting			Can be internal	☐

Description
This Input shall allow for the reception of the current brightness provided by an external room light sensor. This allows – for a FB MDL without built-in brightness sensor, or – for extra brightness information in addition to the brightness measured by the built-in brightness sensor.

Datapoint Type			
DPT_Name:	DPT_Value_Lux		
DPT Format:	F_{16}	DPT_ID:	9.004

Field		Supp.	Range	Unit	Default
FloatValue	This field shall be the current illumination from the external brightness sensor.	M		Lux	none

Access Type							
♦ Input							
	N → this	☐	1 → this	☒			
	Spontaneous	☒	Cyclically:	☐	Time-out:		
	Request	☐	Polling:	☐	Period:		

Communication Type			
♦ Group Object Datapoint		Mandatory:	☒
	Default Group Address:		

Dynamics						
	Power down:	Save:	☐			
	Power up:	Value:	No initialisation:	☒	Default value:	☐
			Saved value:	☐	Current value (not for input):	☐
		Transmit on bus (only for output):		☐	Read from bus (only for input):	☐

Exception Handling
None.

Special Features
None.

2.7.6 Input Movement Trigger (MT)

DP Name:	Movement Trigger	Abbr.:	MT	Mandatory	☐
FB Name:	Movement Detector for Lighting			Can be internal	☐

Description

This Input shall allow for the reception of external movement signals.
It can be used as an alternative to the internal signal MSLT or be evaluated in parallel with it.
The precise point where this signal is evaluated in the FB MSLT design is not fixed: it may or may not be subject to evaluation of IOO, brightness, timers, etc.
The functionality of the Input MT can be disabled through the Parameter Movement Trigger Evaluation (see 2.7.10).

Datapoint Type

DPT_Name:	DPT_Start		
DPT Format:	B_1	DPT_ID:	1.010

Field		Supp.	Range	Unit	Default
b	0 = Stop This shall be interpreted as the end of the movement detection by an external movement sensor. 1 = Start This shall be interpreted as the start of the movement detection by an external movement sensor.	M	{0, 1}	none	none

Access Type

♦ Input

N → this	☒	1 → this	☐		
Spontaneous	☒	Cyclically:	☐	Time-out:	
Request	☐	Polling:	☐	Period:	

Communication Type

♦ Group Object Datapoint	Mandatory:	☒
Default Group Address:		

Dynamics

Power down:	Save:	☐			
Power up:	Value:	No initialisation:	☒	Default value:	☐
		Saved value:	☐	Current value (not for input):	☐
	Transmit on bus (only for output):		☐	Read from bus (only for input):	☐

Exception Handling

None.

Special Features

None.

2.7.7 Parameter Brightness Threshold (BT)

DP Name:	Brightness Threshold	Abbr.:	BT	Mandatory	☐
FB Name:	Movement Detector for Lighting (MDL)			Can be internal	☒

Description

This Parameter shall be the threshold value of the detected brightness above which the movement detector will not signal detected movement, as specified in 2.2.5.
This Parameter may be implemented as well as Memory Mapped Datapoint, as Group Object or Interface Object Property. The functionality can also be realised by a hardwired input.

Datapoint Type

DPT_Name:	DPT_Value_Lux				
DPT Format:	F_{16}	DPT_ID:	9.004		
Field		Supp.	Range	Unit	Default
F_{16}	Threshold value	M	cs	Lux	none

Access Type

♦ Input

N → this	☐	1 → this	☒		
Spontaneous	☒	Cyclically:	☐	Time-out:	
Request	☐	Polling:	☐	Period:	

Communication Type

♦ Group Object Datapoint				Mandatory:	☐
Default Group Address:	none				
♦ Property				Mandatory:	☐
DP Address: (in the server)	IO Type(ID): Start-Index:	414 1	Property ID: N° of elements	51 1	
Property access:	Read only ☐		Read/Write ☒		
Protection *)	Read level	3	Write level	3	

Dynamics

Power down:	Save:	☒[1)]			
Power up:	Value:	No initialisation:	☐	Default value:	☒
		Saved value:	☒	Current value (not for input):	☐
	Transmit on bus (only for output):		☐	Read from bus (only for input):	☐

Exception Handling

[1)] On power up, either the stored value may be used or the value ex-factory.
If the ex-factory value is used, it is not required that this Parameter value be stored at power down.

Special Features

None.

2.7.8 Parameter Output Control Time (OCT)

FB:	MDL	Property Name (Server):	Output Control Time	Mandatory ☐ Optional ☒

Description:

Please refer to the functional specification.

For the Output Timed StartStop

The Parameter OCT shall in this case be the period of the periodic transmission of the Output TSS in case movement is detected continuously for a longer time; see Figure 17.

For the Output Switch OnOff

The Parameter OCT shall in this case be the period starting with the last detection of movement and after which the FB MDL shall switch off the light; see Figure 16.

DPT:	Name	DPT_TimePeriodSec	DPT_ID	7.008	Datatype format:	U_{16}

Field	Description	Sup.	Range	Unit	Resol.:	Default
b	Time period.	M	min.: 0 s max: none	s	1 s	none

Communication:

DP Address: (in the server)	Object Type:	414	Property ID:	110
	Start-Index:	1	N° of elements	
Property access:	Read only ☐ -		Read/Write ☒	
Protection	Read level	-	Write level	-

Exception Handling: Value after Power-up: Stored Value ☒ Curr Value ☐ Default Value ☐

None.

Special Features:

None.

2.7.9 Parameter Enable Brightness Independency (EBI)

DP Name:	Enable Brightness Independency	Abbr.:	EBI	Mandatory	☐
FB Name:	Movement Detector for Lighting			Can be internal	☐

Description

This Parameter shall control (enable/disable) whether the FB MDL
- functions independent of the measured or received brightness (Input Brightness External, see 2.7.5), and will thus switch the light actuatopr even if there is sufficient light in the room, or
- functions only if the measured or received brightness is below a given threshold.

This Parameter shall be implemented as a Group Object.

Datapoint Type

DPT_Name:	DPT_Enable		
DPT Format:	B_1	DPT_ID:	1.003

Field		Supp.	Range	Unit	Default
b	0 = disable (brightness is evaluated) The FB MDL shall only evaluate and possibly transmit detected movement if the brightness is below the threshold. 1 = enable (brightness is not evaluated). The FB MDL shall evaluate any detected movement regardless of the current brightness.	M	{0, 1}	none	1 = enable

Access Type

♦ Input

N → this	☐	1 → this	☒		
Spontaneous	☒	Cyclically:	☐	Time-out:	
Request	☐	Polling:	☐	Period:	

Communication Type

♦ Group Object Datapoint	Mandatory:	☒
Default Group Address:		

Dynamics

Power down:	Save:	☐			
Power up:	Value:	No initialisation:	☐	Default value:	☒
		Saved value:	☐	Current value (not for input):	☐
	Transmit on bus (only for output):		☐	Read from bus (only for input):	☐

Exception Handling

None.

Special Features

None.

2.7.10 Parameter Movement Trigger Evaluation

FB:	MDL	Property Name (Server):	Movement Trigger Evaluation	Mandatory ☐ Optional ☒

Description:

This Parameter shall control whether the Input Movement Trigger directly controls the Outputs SOO and/or TSS, or is subject to one or more internal evaluation criteria, just as MSLT state, and may thus not cause a transmission of SOO and/or TSS.

DPT:	Name		DPT_ID		Datatype format:	

Field	Description	Sup.	Range	Unit	Resol.:	Default
b	0 = disable The Input Movement Trigger does not directly affect the tranmission of the Outputs SOO and/or TSS, but is subject to one or more internal evaluations. 1 = enable The Input Movement Trigger shall directly cause the transmission of the Outputs SOO and/or TSS.	M	{0,1}	none	none	none

Communication:

DP Address: (in the server)	Object Type:	414	Property ID:	111
	Start-Index:	1	N° of elements	
Property access:	Read only ☐	-	Read/Write ☒	
Protection	Read level	-	Write level	-

Exception Handling: Value after Power-up: Stored Value ☒ Curr Value ☐ Default Value ☐

None.

Special Features:

None.

2.7.11 Parameter Movement Sensor Pause Time

FB:	MDL	Property Name (Server):	Movement Sensor Pause Time	Mandatory ☐ Optional ☒

Description:

Please refer to the functional specification.
This Parameter shall contain the short period starting with the reception of the value On on the Input IOO, during which the internal detection of light shall be supressed.

DPT:	Name	DPT_TimePeriod100Msec	DPT_ID	7.004	Datatype format:	U_{16}

Field	Description	Sup.	Range	Unit	Resol.:	Default
TimePeriod	This field shall contain the duration of the pause time.	M	min.: 0 s max: none	s	100 ms	none

Communication:

DP Address: (in the server)	Object Type:	414	Property ID:	112
	Start-Index:	1	N° of elements	
Property access:	Read only ☐	-	Read/Write ☒	
Protection	Read level	-	Write level	-

Exception Handling: Value after Power-up: Stored Value ☒ Curr Value ☐ Default Value ☐

None.

Special Features:

None.

2.7.12 Parameter Trigger Continue

FB:		Property Name (Server):	Trigger Continue (TC)	Mandatory ☐ Optional ☒

Description:

This Parameter shall allow that the FB MDL only controls the light while it knows via its Input IOO that the light is already switched on. The FB MDL will then keep the light on as long as it detects movement, this is, as long as none of its timers expire. This allows the realisation of USE CASE 6.

DPT:	Name	DPT_Enable	DPT_ID	1.003	Datatype format:	B_1

Field	Description	Sup.	Range	Unit	Resol.:	Default
b	0 = disable The motion detector shall function independently of the value of the Input IOO, except for the suppression of the switching of the light. 1 = enable The FB MDL shall only evaluate the internal signal *MSLT state* if the Input IOO has the value “on”. If the Input IOO has the value “off” then the internal signal *MSLT state* shall not be evaluated. Other timers and functions in the FB MDL shall be evaluated without change.	M	{0,1}	none	n/a	none

Communication:

DP Address: (in the server)	Object Type:	414	Property ID:	113
	Start-Index:	1	N° of elements	
Property access:	Read only ☐ -		Read/Write ☒	
Protection	Read level	-	Write level	-

Exception Handling: Value after Power-up: Stored Value ☒ Curr Value ☐ Default Value ☐

Special Features:

None.

3 Photometric sensors

3.1 Overview photometric sensors (informative)

The following types of photometric sensors exist.

1. Indoor Brightness Sensor	This measures the indoor brightness. This is modelled by the FB Indoor Brightness Sensor (FB IBS, 409) in this paper. Its main Output provides the illuminance (DPT_Value_Lux, 9.004).
2. Indoor Luminance Sensor	This measures the indoor luminance. This is modelled by the FB Indoor Luminance Sensor (FB ILS, 410) in 3.2. Its main Output provides the luminance (DPT_Value_Luminance, 14.041).
3. Daylight sensor	This measures the outdoor brightness, typically in a larger range, for instance 1 000 Lux to 100 000 Lux. It provides the illuminance to the bus and may foresee some 1 bit Outputs for threshold functions. This sensor is not yet modelled as FB in KNX.
4. Twilight sensor	This measures the outdoor brightness, typically in the lower range 0 Lux to 1 000 Lux. It mainly provides a 1 bit Output to the bus. This sensor is not yet modelled as FB in KNX.
5. Sun Intensity Sensor	This sensor measures the sun intensity and provides the data to the bus with unit Wm^{-2}. This information is mainly used in HVAC applications. This sensor is modelled in [03].

3.2 FB Indoor Brightness Sensor (Object Type 409)

3.2.1 Aims and objectives

The FB Indoor Brightness Sensor (FB IBS) shall provide the illuminance measured at a certain location and provide this to the KNX system.

NOTE 3 This relates in turn to the irradiance (Wm-2) as specified in FB Sun Intensity Sensor (see [03]) weighted by the spectral sensitivity of the human eye.

This shall be a physical sensor with a built-in or hard-wired brightness sensor.

3.2.2 Functional specification

3.2.2.1 Explanation of illuminance

The illuminance is the ratio of the luminous flux indescent on a given surface and the size of that surface.

Typical illuminance value that can be expected are listed in Table 8.

Table 8 – Typical illuminance values

Light conditions	Illuminance
Sunlight at noon in summer	100 000 Lux
Cloudy sky in summer	10 000 Lux
Rainy wheather with thunder clouds	1 000 Lux
Office lighting	500 Lux
Living room lighting	200 Lux
Staircase lighting	100 Lux
Street lighting	10 Lux
Twilight after sunset	1 Lux
Midnight at full moon	0,2 Lux
Sky with stars and no moon	0,000 5 Lux

3.2.2.2 Basic functionality

The FB IBS shall be able to detect the indoor brightness.

From the measured electronic signals, the illumination shall be calculated. This calculation is not standardised. It shall lead to the value representing the illumination on a given room element. This calculated value shall be transmitted to KNX via the Output Room Illumination encoded as DPT_Value_Lux (DPT_ID: 9.004).

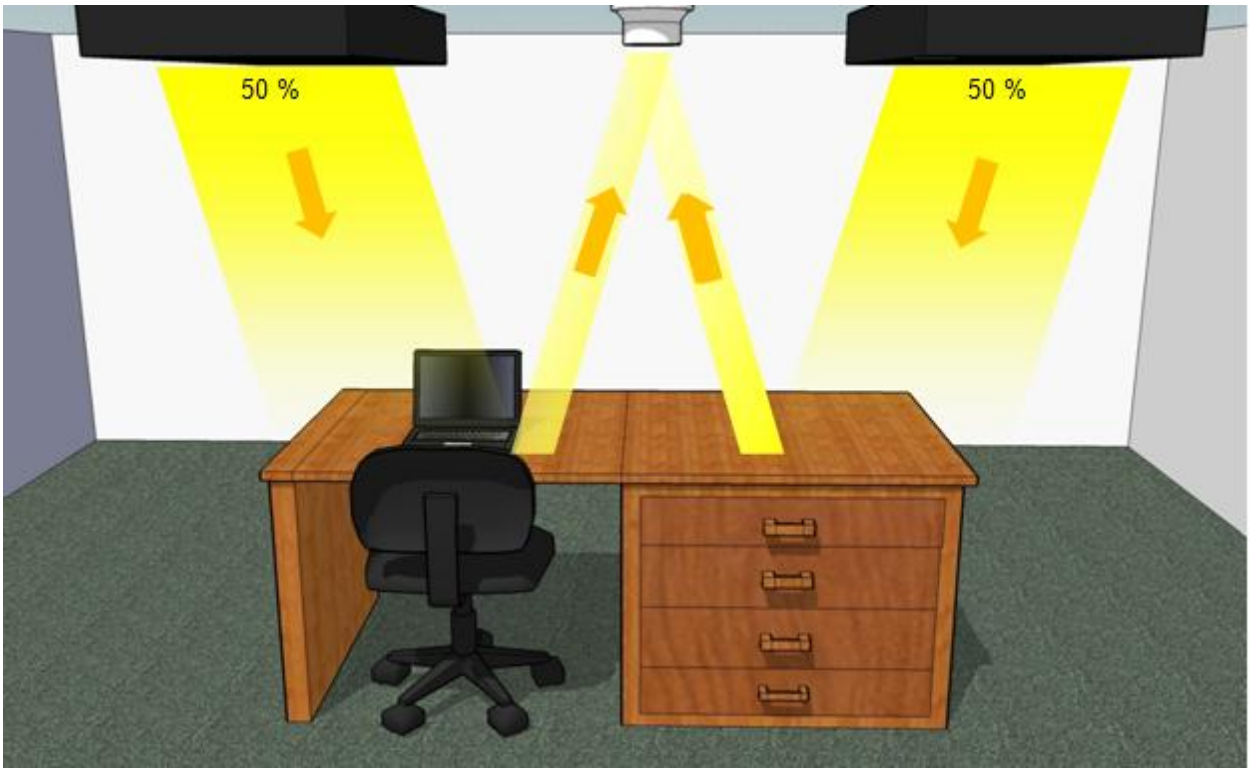


Figure 25 – Typical room brightness measurement method

3.2.2.3 Calibration

It may be necessary that the installed device that realises the FB Brightness Sensor has to be calibrated. This may be due to:

- the electronic measurement method, or
- the mechanics (optics), or
- the mounting place (e.g. in the ceiling), or
- the reflection by objects in the room (e.g. floor, furniture, walls, etc.)

The installer procedure for this calibration is not standardised.

3.2.3 Constraints

3.2.3.1 Evaluation of the calculated illuminance

The FB IBS does not further evaluate the illuminance. The evaluation of threshold values or the further control of lighting is the task for different Functional Blocks.

3.2.3.2 Luminance (cdm^{-2})

This FB IBS does not feature any measurement of the luminance. The luminance shall be provided by the FB Indoor Luminance Sensor (see [03]).

If it is wanted that both illuminance as well as luminance be provided on the bus, then both FBs Indoor Brightness Sensor and Indoor Luminance Sensor can be combined in a device.

3.2.4 Functional Block diagram

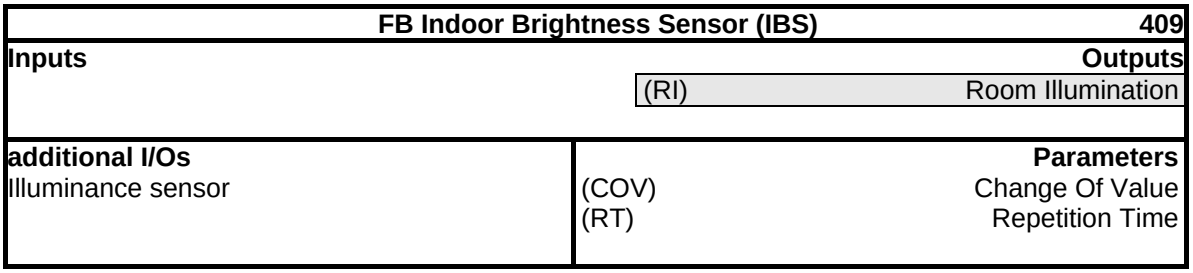


Figure 26 – Functional Block Diagram for FB Indoor Brightness Sensor

3.2.5 Datapoints

Datapoint	Abbr.	Description	Datapoint Type
Outputs			
Room Illumination	RI	Provides the calculated illuminance to the bus.	9.004 DPT_Value_Lux
Parameters			
Change Of Value	COV	Change of value in lux	9.004 DPT_Value_Lux
Repetition Time	RT	Repetition time value in seconds	7.005 DPT_TimePeriodSec

3.2.6 FB Profiles [4)]

Features and options	Basic FB	Standard Mode
		IBS FB Profile 1
Output RoomIllumination {		
Output RoomIllumination	*M*	*GO*
Change of Value	*M*	*M*
Parameter COVLux	*O*	*O*
Parameter COVPercent	*O*	*O*
Periodic transmission	*M*	*M*
}		

4) Please refer to [02] for the definition of the syntax and symbols used in this FB Profile definition.

3.2.7 Detailed specification of the Datapoints

3.2.7.1 Output Room Illumination (RI)

DP Name:	Room Illumination	Abbr.:	RI	Mandatory	☒
FB Name:	FB Indoor Brightness Sensor			Can be internal	☐

Description

This Datapoint shall represent the illumination calculated by the FB.
If the variation of calculated illumination changes more than COV then the newly calculated value shall be transmitted on the bus. If the illumination doesn't change more than COV, then the current calculated value shall be transmitted periodically.

Datapoint Type

DPT_Name:	DPT_Value_Lux		
DPT Format:	F_{16}	DPT_ID:	9.004

♦ Output

this → M	☒	this → 1	☐				
Spontaneous	☒	COV:	☒	Δ-Value	See COV	Min repetition period:	none
		Cyclic	☒	Period:	See RT		
Request	☐						

Communication Type

♦ Group Object Datapoint		Mandatory:	☒
Default Group Address:	---		

Dynamics

Power down:	Save:	☐			
Power up:	Value:	No initialisation:	☐	Default value:	☐
		Saved value:	☐	Actual value (not for input):	☒
	Transmit on bus (only for output):		☐	Read from bus (only for input):	☐

Exception Handling

None.

Special Features

None.

3.2.7.2 Parameter Change of Value (COV)

FB:	IBS	**Property Name (Server):**	Change of Value	**Mandatory** ☐ **Optional** ☒	

Description:

This represents the minimal change of the measurement that send a new value on the Output RI.

DPT:	**Name**	DPT_Value_Lux	**DPT_ID**	9.004	**Datatype format:** F_{16}

Field	Description	Sup.	Range	Unit	Resol.:	Default
FloatValue	This field shall contain the value over which the measured illuminance shall change before it is transmitted on the bus.	M	cs	Lux	1 Lux	cs

Communication:

♦ Property — Mandatory: ☐

DP Address: (in the server)	Object Type:	409	Property ID:	110
	Start-Index:	1	N° of elements	1
Property access:	Read only ☐ -		Read/Write ☒	
Protection	Read level	-	Write level	-

Exception Handling: Value after Power-up: Stored Value ☒ Curr Value ☐ Default Value ☐

Special Features:

In channel code PART_COV_Lux is used.

3.2.7.3 Parameter: Repetition Time (RT)

FB:	IBS	Property Name (Server):	Repetition Time	Mandatory ☐ Optional ☒

Description:

This represents the period of emission of the Ouptut Room Illumination (RI) when no change of value is detected.

DPT:	Name	DPT_TimePeriodSec	DPT_ID	7.005	Datatype format:	U_{16}

Field	Description	Sup.	Range	Unit	Resol.:	Default
TimePeriod	This shall specify the repetition time of the periodic transmission of the Output RI.	M	cs	s	1 s	cs

Communication:

DP Address: (in the server)	Object Type:	409	Property ID:	111
	Start-Index:	1	N° of elements	1
Property access:	Read only ☐ -		Read/Write ☒	
Protection	Read level	-	Write level	-

Exception Handling: Value after Power-up: Stored Value ☒ Curr Value ☐ Default Value ☐

None.

Special Features:

In channel code PART_Cycle_Time is used

3.3 FB Indoor Luminance Sensor (Object Type 410)

3.3.1 Aims and objectives

The FB Indoor Luminance Sensor (ILS) shall provide the luminance measured at a certain location and provides this to the KNX system.

3.3.2 Functional specification

3.3.2.1 Explanation of luminance

Luminance is defined in [06]. It represents the luminous intensity in a certain direction.

This quantity characterizes the impression of brightness, which an illuminated or a luminant surface effects in the human eye.

The luminance is independent from the distance to the observer; that means, that the impression of brightness does not change when the distance between observer and observed object changes.

Typical luminance value that can be expected are listed in Table 9.

Table 9 – Typical luminance values

Light source	Luminance
Sun at noon	1 600 000 000 cd/m²
100 W clear light bulb	10 000 000 cd/m²
Sun at sunset	5 000 000 cd/m²
100 W opal light bulb	200 000 cd/m²
Blue sky	10 000 cd/m²
Candlelight	5 000 cd/m²
Moonlight	2 500 cd/m²
sky at night	0,001 cd/m²

3.3.2.2 Basic functionality

The FB ILS shall be able to detect the indoor luminance.

The luminance is typically measured by an electronic sensor.

The measured luminance shall be provided to the KNX system through the Output Indoor Luminance (IL) encoded as DPT_Value_Luminance (14.041, F_{32}, cdm^{-2}).

3.3.3 Constraints

None.

3.3.4 Functional Block diagram

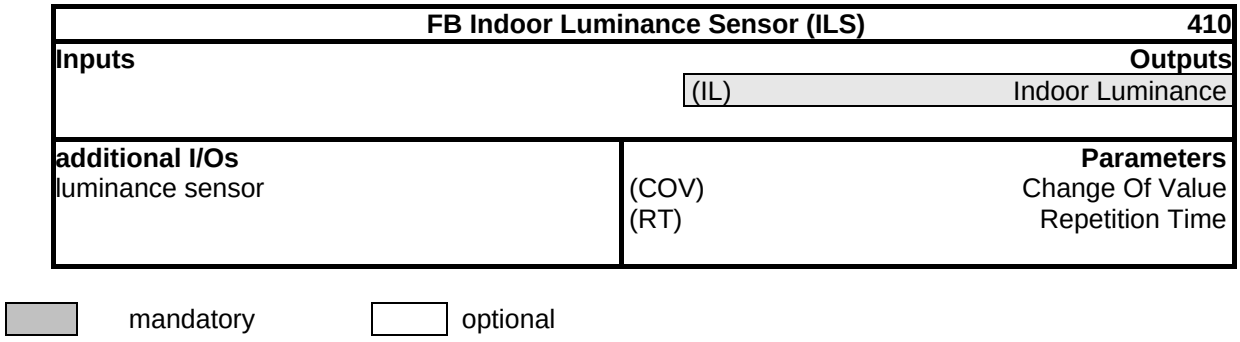


Figure 27 – Functional Block Diagram for FB Indoor Luminance Sensor

3.3.5 Datapoints

Datapoint	Abbr.	Description	Datapoint Type
Outputs			
Indoor Luminance	IL	Provides the measured luminance to the bus.	14.041 DPT_Value_Luminance
Parameters			
Change Of Value	COV	Change of value in cdm^{-2}.	14.041 DPT_Value_Luminance
Repetition Time	RT	Repetition time value in seconds	7.005 DPT_TimePeriodSec

3.3.6 FB Profiles [5)]

Features and options	Basic FB	Standard Mode: ILS FB Profile 1
Output Indoor Luminance {		
Output IL	*M*	*GO*
Change of Value	*M*	*M*
Parameter COV_cd_per_m2	*O*	*O*
Parameter COVPercent	*O*	*O*
Periodic transmission	*M*	*M*
}		

3.3.7 Detailed specification of the Datapoints

3.3.7.1 Output Indoor Luminance (IL)

DP Name:	Indoor Luminance	Abbr.:	IL	Mandatory	☒
FB Name:	FB Indoor Luminance Sensor			Can be internal	☐

Description

This Datapoint shall represent the luminance observed by the FB ILS.
If the variation of the luminance changes more than COV then the new value shall be transmitted on the bus. If the luminance doesn't change more than COV, then the current value shall be transmitted periodically.

Datapoint Type

DPT_Name:	DPT_Value_Luminance		
DPT Format:	F_{32}	DPT_ID:	14.041

♦ Output							
this → M	☒	this → 1	☐				
Spontaneous	☒	COV:	☒	Δ-Value	See COV	Min repetition period:	none
		Cyclic	☒	Period:	See RT		
Request	☐						

Communication Type

♦ Group Object Datapoint		Mandatory:	☒
Default Group Address:	---		

Dynamics

Power down:	Save:	☐			
Power up:	Value:	No initialisation:	☐	Default value:	☐
		Saved value:	☐	Actual value (not for input):	☒
	Transmit on bus (only for output):		☐	Read from bus (only for input):	☐

Exception Handling

None.

Special Features

None.

5) Please refer to [02] for the definition of the syntax and symbols used in this FB Profile definition.

3.3.7.2 Parameter Change of Value (COV)

FB:	ILS	Property Name (Server):	Change of Value	Mandatory ☐ Optional ☒

Description:

This represents the minimal change of the measurement that send a new value on the Output IL.

DPT:	Name	DPT_Value_Luminance	DPT_ID	14.041	Datatype format:	F_{32}

Field	Description	Sup.	Range	Unit	Resol.:	Default
F_{32}	This field shall contain the value over which the measured luminance shall change before it is transmitted on the bus.	M	cs	cdm^{-2}	1 cdm^{-2}	cs

Communication:

♦ Property					Mandatory: ☐
DP Address: (in the server)	Object Type:	410	Property ID:	110	
	Start-Index:	1	N° of elements	1	
Property access:	Read only ☐ -		Read/Write ☒		
Protection	Read level	3	Write level	3	

Exception Handling: Value after Power-up: Stored Value ☒ Curr Value ☐ Default Value ☐

Special Features:

None.

3.3.7.3 Parameter: Repetition Time (RT)

FB:	ILS	Property Name (Server):	Repetition Time	Mandatory ☐ Optional ☒

Description:

This represents the period of emission of the Output Indoor Luminance (IL) when no change of value is detected.

DPT:	Name	DPT_TimePeriodSec	DPT_ID	7.005	Datatype format:	U_{16}

Field	Description	Sup.	Range	Unit	Resol.:	Default
TimePeriod	This shall specify the repetition time of the periodic transmission of the Output IL.	M	cs	s	1 s	cs

Communication:

DP Address: (in the server)	Object Type:	410	Property ID:	111
	Start-Index:	1	N° of elements	1
Property access:	Read only ☐		Read/Write ☒	
Protection	Read level	3	Write level	3

Exception Handling: Value after Power-up: Stored Value ☒ Curr Value ☐ Default Value ☐

None.

Special Features:

None.

4 Functional Blocks for E-Mode Channels

4.1 Usage requirements

The Functional Block specifications below only provide complementary information to the E-Mode Channel definitions. They are only provided for completeness and understanding of these E-Mode Channel definitions.

As a consequence, no Object Types for Interface Objects are specified below. It will be a decision of KNX Association Working Group Interworking how these Functional Blocks will be continued and if any Object Type will be assigned.

These Functional Blocks shall be used only for implementation of E-Mode devices.

These Functional Block specifications shall not be used for any other goal; in particular, no implementation for S-Mode devices shall be based on these specifications.

KNX Association will take care of compatibility between any currently specified E-Mode Channel definition and the final version of these Functional Blocks.

To this, the KNX Association Application Specification Groups shall take the functionality achieved by these Functional Blocks as the minimal mandatory basis for further work.

4.2 FB_Switch_Scene_Numbered

4.2.1 Definition

- **Name:** FB_Switch_Scene_Numbered
- **Object type:** See “Usage requirements” in 4.1.

4.2.2 Functional specification

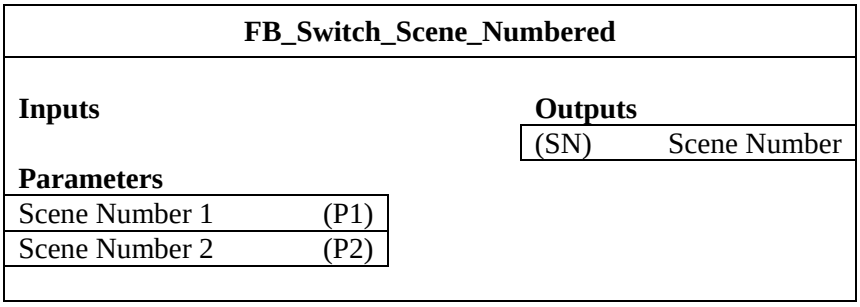
On interaction, a scene number shall be sent.

There shall be two possible interactions.

1. On interaction 1 the value of parameter Scene Number 1 (P1) shall be sent.
2. On interaction 2 the value of parameter Scene Number 2 (P2) shall be sent.

It shall not be possible to learn scenes.

4.2.3 Functional Block diagram



4.2.4 Datapoints

Datapoint	Abbr.	Description	Datapoint Type
Outputs			
Scene Number	SN	To activate the scene of this value	18.001 DPT_SceneControl
Parameters			
Scene Number 1	P1	Scene number to send on interaction 1	18.001 DPT_SceneControl
Scene Number 2	P2	Scene number to send on interaction 2	18.001 DPT_SceneControl

4.2.5 Runtime Interworking – dependence on Configuration Mode

			Standard Mode	Extended Mode	
		Basic FB	**S-Mode**	**Standard Mode Interface**	**LTE-HEE**
Outputs	SN	**GO**		-	-
Parameters	P1			-	-
	P2			-	-

4.2.6 Detailed specification of the Datapoints

4.2.6.1 Output Scene number

DP Name:	Scene Number	Abbr.:	SN	Mandatory	☒
FB Name:	FB_Switch_Scene_Numbered			Can be internal	☐

Description

This Datapoint shall hold the value that shall be sent on the bus on interaction.

Datapoint Type

DPT Name:	DPT_SceneControl		
DPT Format:	$B_1r_1U_6$	DPT_ID:	18.001

♦ Output

this → M	☒	this → 1	☐				
Spontaneous	☒	COV:	☐	Δ-Value:		Min repetition period:	
		Cyclic	☐	Period:			
Request	☐						

Communication Type

♦ Group Object Datapoint		Mandatory:	☒
Default Group Address:	---		

Dynamics

Power down:	Save:	☐			
Power up:	Value:	No initialisation:	☐	Default value:	☐
		Saved value:	☐	Actual value (not for input):	☐
	Transmit on bus (only for output):		☐	Read from bus (only for input):	☐

Exception Handling

None.

Special Features

None.

4.2.6.2 Parameter Scene Number 1

DP Name:	Scene Number 1	Abbr.:	P1	Mandatory	☒
FB Name:	FB_Switch_Scene_Numbered			Can be internal	☐

Description

This parameter shall be used to set the scene number sent on interaction 1 on the switch.

Datapoint Type

DPT_Name:	DPT_SceneControl		
DPT Format:	$B_1r_1U_6$	DPT_ID:	18.001

Fields	Description	Supp.	Range	Unit	Default
B_1	= 0 not used				
R_1	Reserved				
U_6	Scene number		[0 … 63]		

Exception Handling

None.

Special Features

None.

4.2.6.3 Parameter Scene Number 2

DP Name:	Number 2	Abbr.:	P2	Mandatory	☒
FB Name:	FB_Switch_Scene_Numbered			Can be internal	☐

Description
This parameter shall be used to set the scene number sent on interaction 2 on the switch.

Datapoint Type			
DPT_Name:	DPT_SceneControl		
DPT Format:	$B_1r_1U_6$	DPT_ID:	18.001

Fields	Description	Supp.	Range	Unit	Default
B_1	= 0 not used				
R_1	Reserved				
U_6	Scene number		[0 … 63]		

Exception Handling
None.

Special Features
None.

4.3 FB_Switch_Dimming_Value

4.3.1 Definitions

- **Name:** FB_Switch_Dimming_Value
- **Object type:** See “Usage requirements” in 4.1.

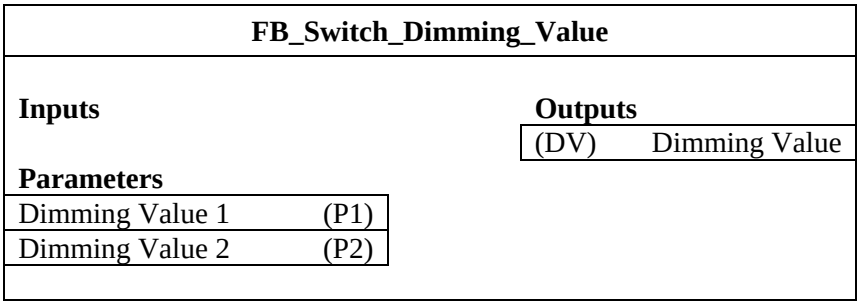
4.3.2 Functional specification

On interactions, a dimming value shall be sent.

There shall be two possible interactions.

1. On interaction 1 the value parameter Dimming Value 1 (P1) shall be sent.
2. On interaction 2 the value of para meter Dimming Value 2 (P2) shall be sent.

4.3.3 Functional Block diagram



4.3.4 Datapoints

Datapoint	Abbr.	Description	Datapoint Type
Outputs			
Dimming Value	DV	To set an absolute dimming value.	5.001 DPT_Scaling
Parameters			
Dimming Value 1	P1	Value of the dimming value to send on interaction 1.	5.001 DPT_Scaling
Dimming Value 2	P2	Value of the dimming value to send on interaction 2.	5.001 DPT_Scaling

4.3.5 Runtime Interworking – dependence on Configuration Mode

			Standard Mode	LTE	
		Basic FB	S-Mode	Standard Mode Interface	LTE-HEE
Outputs	DV	GO		-	-
Parameters	P1			-	-
	P2			-	-

4.3.6 Detailed specification of the Datapoints

4.3.6.1 Output Dimming Value

DP Name:	Dimming_Value	Abbr.:	DV	Mandatory	☒
FB Name:	FB_Switch_Dimming_Value			Can be internal	☐

Description

This Datapoint shall represent the value that shall be sent on the bus on interaction.

Datapoint Type

DPT_Name:	DPT_Scaling		
DPT Format:	U_8	DPT_ID:	5.001

♦ Output							
this → M	☒	this → 1	☐				
Spontaneous	☒	COV:	☐	Δ-Value:		Min repetition period:	
		Cyclic	☐	Period:			
Request	☐						

Communication Type

♦ Group Object Datapoint		Mandatory:	☒
Default Group Address:	---		

Dynamics

Power down:	Save:	☐			
Power up:	Value:	No initialisation:	☐	Default value:	☐
		Saved value:	☐	Actual value (not for input):	☐
	Transmit on bus (only for output):		☐	Read from bus (only for input):	☐

Exception Handling

None.

Special Features

None.

4.3.6.2 Parameter Value 1

DP Name:	Value 1	Abbr.:	P1	Mandatory	☒
FB Name:	FB_Switch_Dimming_Value			Can be internal	☐

Description

This parameter is used to set the value sent on interaction 1 on the switch

Datapoint Type

DPT_Name:	DPT_Scaling		
DPT Format:	U_8	DPT_ID:	5.001

Exception Handling

None.

Special Features

None.

4.3.6.3 Parameter Value 2

DP Name:	Value 2	Abbr.:	P2	Mandatory	☒
FB Name:	FB_Switch_Dimming_Value			Can be internal	☐
Description					
This parameter is used to set the value sent on interaction 2 on the switch.					
Datapoint Type					
DPT_Name:	DPT_Scaling				
DPT Format:	U_8		DPT_ID:	5.001	
Exception Handling					
None.					
Special Features					
None.					

4.4 FB_PB_Dimming_Value

4.4.1 Definition

- **Name:** FB_PB_Dimming_Value
- **Object type:** See “Usage requirements” in 4.1.

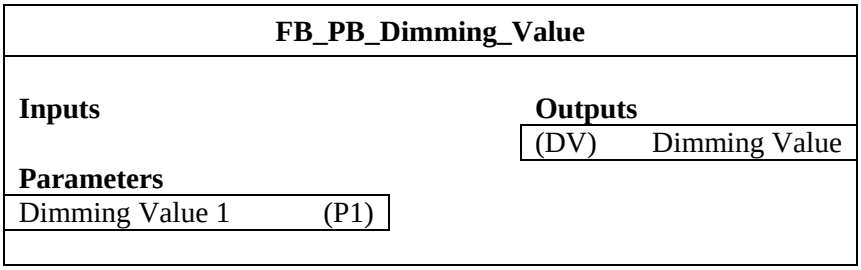
4.4.2 Functional specification

On interaction, a dimming value shal be sent.

There shall be only one possible interaction.

1. On interaction 1 (press on button for example) value of parameter Dimming Value (P1) shall be sent.

4.4.3 Functional Block diagram



4.4.4 Datapoints

Datapoint	Abbr.	Description	Datapoint Type
Outputs			
Dimming Value	DV	To set an absolute dimming value	5.001 DPT_Scaling
Parameters			
Dimming Value	P1	Value of the dimming value to send on interaction 1	5.001 DPT_Scaling

4.4.5 Runtime Interworking – dependence on Configuration Mode

			Standard Mode	Extended Mode	
		Basic FB	**S-Mode**	**Standard Mode Interface**	**LTE-HEE**
Outputs	DV	GO		-	-
Parameter	P1			-	-

4.4.6 Detailed specification of the Datapoints

4.4.6.1 Output Dimming Value

DP Name:	Dimming_Value	Abbr.:	DV	Mandatory	☒
FB Name:	FB_PB_Dimming_Value			Can be internal	☐

Description

This Datapoint represents the value sent on the bus on interaction.

Datapoint Type

DPT_Name:	DPT_Scaling		
DPT Format:	U_8	DPT_ID:	5.001

♦ Output

this → M	☒	this → 1	☐				
Spontaneous	☒	COV:	☐	Δ-Value:		Min repetition period:	
		Cyclic	☐	Period:			
Request	☐						

Communication Type

♦ Group Object Datapoint		Mandatory:	☒
Default Group Address:	---		

Dynamics

Power down:	Save:	☐			
Power up:	Value:	No initialisation:	☐	Default value:	☐
		Saved value:	☐	Actual value (not for input):	☐
	Transmit on bus (only for output):		☐	Read from bus (only for input):	☐

Exception Handling

None.

Special Features

None.

4.4.6.2 Parameter Value

DP Name:	Value 1	Abbr.:	P1	Mandatory	☒
FB Name:	FB_PB_Dimming_Value			Can be internal	☐
Description					
This parameter is used to set the value sent on interaction 1 on the switch					
Datapoint Type					
DPT_Name:	DPT_Scaling				
DPT Format:	U_8		DPT_ID:	5.001	
Exception Handling					
None.					
Special Features					
None.					