RokLUME 280N SMART User Manual





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1. Terms and abbreviations

ACL	Automatic Cornering Light. The SMART Lighting Gateway PRIME is capable to additionally connect two standard work lamps as cornering lights using direct power supply from the Gateway.
АТМ	Anti-Theft Mode. If the ATM is switched on, the SMART work lamp will work in a SMART Lighting System of HELLA only. Removed work lamps can be mounted on other vehicles having HELLA's SMART Lighting System.
CAN	Controller Area Network. A serial communication bus and protocol between Control Panel and Gateway. SMART Lighting devices use the SAE J1939 standard.
СР	Control Panel. Six button input device having 3 LEDs for each button to a simplified work lamp control using a CAN cable to the Gateway.
GWB	SMART Lighting Gateway BASE variant. GWB controls SMART work lamps only.
GWP	SMART Lighting Gateway PRIME variant. GWP controls SMART work lamps and two standard cornering lamps, additionally. Gateway PRIME includes all the functionality of Gateway BASE.
GW	Gateway . Embedded computer for the control of the connected work lamps. Common name for Gateway BASE and Gateway PRIME.
НМ	Hidden Menu at the Control Panel. This menu can be reached by entering a button combination
LTW	Lifetime Warning - if the work lamp reaches a predefined level of measured light output in combination with the operating hours and temperature, the work lamp sends a warning message to the Gateway and to the Control Panel.
PLC	Power Line Communication. PLC allows data communication and electric power transmission utilizing the same electrical line.
UID	Unique Identification Data. Unique number for the distinct identification of a smart lighting device. It can be read but not changed.
WL	Work lamp. Mutual name for standard and SMART work lamps.

2. SMART Lighting System BASE

Example SMART Lighting BASE component diagram connection



Components:

RokLUME 280N SMART work lamps (995.707-XXX)	Control Panel (333.525-001)
Cornering Light 995.706-501 (RokLUME 280N Gen. 2) or 996.476-701 (RokLUME C180)	Harness GW \leftrightarrow CP (333.557-001)

3. SMART Lighting System PRIME

Example SMART Lighting PRIME component diagram connection



Components:

RokLUME 280N SMART work lamps (995.707-XXX)	Control Panel (333.525-001)
Cornering Light 995.706-501 (RokLUME 280N Gen.2) or 996.476-701 (RokLUME C180)	Harness GW \leftrightarrow CP (333.557-001)
Gateway PRIME (333.523-001)	Harness GW ↔ Cornering Light (994.246-071)

Both SMART Lighting Systems BASE and PRIME use PLC (Power Line Communication) on the available on-board power grid of the vehicle for the communication between the Gateway and the SMART work lamps.

The Control Panel will be powered by the Gateway. Gateway and Control Panel devices use the **SAE J1939** CAN Bus standard for data communication.

3.1 SMART work lamps

HELLA work lamps of the SMART Lighting Product Family use power line communication (PLC) technique combining power supply and control data transfer on the existing on- board two wire power cable. This feature allows the communication with the Gateway.

1GA 995 707-401 Close range W/G 1GA 995 707-411 Long range W/G 1GA 995 707-421 ZEROGLARE W/G 1GA 995 707-431 Pencil beam W/G 1GA 995 707-441 Diffuse Flood W/G 1GA 995 707-451 Tunnel Flood W/G 1GA 995 707-461 Close range W 1GA 995 707-471 Long range W 1GA 995 707-481 ZEROGLARE W 1GA 995 707-491 Pencil beam W 1GA 995 707-501 Diffuse Flood W 1GA 995 707-511 Tunnel Flood W 1GA 995 707-551 Close range W/A 1GA 995 707-561 Long range W/A 1GA 995 707-571 ZEROGLARE W/A 1GA 995 707-581 Pencil beam W/A 1GA 995 707-591 Diffuse Flood W/A 1GA 995 707-601 Tunnel Flood W/A 1GA 995 707-8XX RL280 SMART Kits

W/G	White/Green
W	White
W/A	White/Amber



3.2 Gateway

The Gateway links the connected SMART work lamps on the PLC bus together for building a SMART Lighting System.



Left and right referenced in travel direction of the vehicle

Gateway connectors:

C1/C5 not use

- **C2** 2-pin Deutsch DT connector standard cornering lamp left (only available at GWP)
- C3 6-pin Deutsch DT connector SAE J1939 (CAN Bus) and PLC connection
- C4 2-pin Deutsch DT connector standard cornering lamp right (only available at GWP)

The Gateway has two variants:

a) Gateway BASE

This Gateway variant uses the 6-pin connector **C3** to connect the Control Panel through CAN Bus and the SMART work lamps through the PLC bus. Gateway BASE can control SMART work lamps only.

b) Gateway PRIME

This Gateway variant uses the 6-pin connector **C3** to connect the Control Panel through CAN Bus and the SMART work lamps through the PLC bus. Additionally, the Gateway PRIME uses two 2-pin connectors **C2** and **C4**, on the left and on the right to the 6-pin connector, to control standard cornering lamps being powered directly. This Gateway variant includes all the functions of a Gateway BASE.

Attention:

SMART work lamps should not be connected to C2 and C4 for cornering light function!

Gateway connector assignment

Gateway	Connectors for		
	CAN+PLC	ACL left	ACL right
BASE	C3	not used	not used
PRIME	C3	C2	C4

3.3 Control Panel

The Control Panel is a device to control the main functions of the SMART work lamps separately



The Control Panel is working on the CAN Bus and performs data communication with the Gateway. Six buttons are available for control command inputs and 18 LEDs can indicate User and Gateway feedback messages.

The Control Panel allows a simplified function control of the SMART work lamps. Significant feedbacks from the SMART Lighting System will be shown using the LED indicators.

3.4 Standard work lamps used as cornering light

Standard work lamps of HELLA are not programmable but they can be used as cornering lights on the vehicle in the PRIME system. The standard cornering lamps are powered directly by the Gateway PRIME, which also controls switching on and off. Recommended standard work lamps for the PRIME system are the RokLUME 280N Gen.2 995.706-501 or RokLUME C180 996.476-701.

3.5 PLC bus

Power Line Communication Bus is a combined two-wire power and data bus for the communication between Gateway and the connected SMART work lamps. These devices can use the existing on-board power network of the corresponding vehicle.

3.6 CAN Bus

The CAN Bus is a wired device connection between Gateway and Control Panel. The devices communicate by sending and receiving messages according to the CAN Bus SAE J1939 protocol.

4. System activation

After completing the assembly of the SMART Lighting System (see installation instruction), a system initialization should be executed.

4.1 Teaching

(i)

Through the teaching the SMART Lighting Gateway BASE or PRIME and the SMART Lighting work lamps receive adjustments and settings to enable data message transfer and full light control in a SMART Lighting System.

A SMART Lighting System can be used with full functionality during and after a finished successful teaching. This process runs in the background after the initial installation and at each power-up of the SMART Lighting work lamps.

SMART Lighting users can perform the system teaching with the Control Panel. Using a hidden menu, the system teaching can be executed as described in *Chapter 6.2.3.*

A Smart Lighting System consists of one Gateway and at least one Smart work lamp. All Smart Lighting devices will be delivered with preprogramed UID and device type in the Electronic Control Unit.

5. Normal operation mode

Normal operation means that all the SMART work lamps are running and are under control of the Control Panel.

To ensure a headlamp flashing function in all cases, SMART work lamps start with 100% 5000K light output each time they are turned on electrically before returning to the previous settings or adjusting the operating commands with the Control Panel.

5.1 Control Panel usage

The connected Control Panel can be used in both versions (BASE and PRIME) of a SMART Lighting System.

If the Control Panel is connected, all the light control commands can be sent to the Gateway BASE or PRIME.



The following functions are assigned to the buttons and LED indicators of a SMART Lighting Control Panel.

Control Panel buttons:

1	decrease brightness
2	increase brightness
3	colour change from white to green/amber (if applicable)
4	decrease colour temperature
5	increase colour temperature
6	memory for colour settings

Control Panel indicators:

L1 - L6 L7	brightness indicators (7 stages: 0-6 LEDs light up) green/amber (if applicable) colour mode indicator no special function
L9	white colour mode indicator
L10 - L15	colour indicators (7 stages: 0-6 LEDs light up)
L16 - L18	memory indicators 1,2 and 3

The brightness (dimming function) can be adjusted between 10% and 100% in 7 steps. The white colour temperature can be changed from 3.000 K (warm white) to 6.800 K (cold white) and the additional green/amber working light (if applicable) from light green to full green light/ from light amber to full amber light. White light and green/amber light (if applicable) can be toggled by the button 3 and current settings can be stored with button 6 (up to 3 light settings by pressing the button 6 at least for 2 seconds). Additionally, indicator LEDs above the buttons show the current setting.



5.2 Control Panel normal operation mode

Normal operation in the control panel solution allows colour temperature level, colour and brightness control using the control panel buttons. Additionally, the user can store 3 light and colour combinations.

Button operation	Control Panel action	Effects
Press 1	Decrease brightness.	Next brightness LED to the left will shine indicating the decreased level of brightness.There are 7 levels: no LED lights up, L1 to L6 light up
Press 2	Increase brightness.	Next brightness LED to the right will shine indicating the increased level of brightness.There are 7 levels: no LED lights up, L1 to L6 light up.
Press 3	Changes colour mode between Green/Amber (if applicable) and White.	L7 lights up if colour Green/Amber (if applicable) is set, L9 lights up if White is set.
Press 4	Decrease colour temperature level.	LEDs L10 – L15 indicate the colour temperature level.There are 7 levels: no LED lights up, L10 to L15 light up.
Press 5	Increase colour temperature level.	LEDs L10 – L15 indicate the colour temperature level. There are 7 levels: no LED lights up, L10 to L15 light up.
Press 6	Store a light setting: Press button 6 up to three times to choose a memory position (1, 2 or 3).	One LED from L16 – L18 lights up, to indicate the chosen memory position (1, 2 or 3).
	Make your light settings with the buttons 1 to 5.	
	Press and hold button 6 for min. 2 seconds to store this light setting on the chosen memory position.	When the light setting is stored, the LED of the initially chosen memory position (L16, L17 or L18) will flash for three seconds.
	Change a light setting: To change the light setting on a memory position, follow the same steps as for storing the setting	

Attention:

If more than one button is pressed at once operations of all pressed buttons are executed sequentially. Button action has no effect if a feature is executing, e.g. teaching!

5.3 Keylock on the Control Panel

With the Keylock the Buttons 1 to 5 can be locked. With activated keylock only the Button 6 (M) can be used. With this it will be possible to change between the pre-set light settings but not to change these settings.

5.3.1 Activate Keylock

Action	Press button sequence 5-1-3-2-4
Indication	all LEDs on the CP are blinking 2x at 2Hz
Finish	Buttons 1-2-3-4-5 are locked OR Light settings were changed (button combination was wrong, or time-out

5.3.2 De-activate Keylock

Action	Press button sequence 5-1-3-2-4
Indication	all LEDs on the CP are blinking 2x at 2Hz
Finish	Buttons 1-2-3-4-5 can be used again OR Control Panel is still locked (button combination was wrong, or time-out)

5.4 Notification of Lifetime Warning on the Control Panel

If one or more lifetime warning(s) are recognised, the Gateway sends a message to the Control Panel for indication as follows:

- all LEDs on the Control Panel are blinking 5x at 1Hz
- work lamps continue working with the last light settings

After this LTW indication the User can identify the affected work lamp(s) using the Hidden Menu.

6. Control Panel Hidden Menu mode

In the hidden menu mode of the Control Panel, SMART Lighting System configurations can be changed.

6.1 Enter and leave Hidden Menu

6.1.1 Enter Hidden Menu

Action	Press button sequence 1-5-4-3-2
Indication	all LEDs on the CP are blinking 2x at 2Hz
Finish	logged on to Hidden Menu OR Light settings were changed (button combination was wrong, or held too short)

Action	Hold button 6 down for 2 seconds
Indication	all LEDs on the CP are blinking 2x at 2Hz
Finish	logged out and last light settings restored OR Remaining logged on (button held too short)

6.2 Queries and control at Hidden Menu

6.2.1 Lifetime Warning

Query lifetime status

The LTW feature can be queried in Hidden Menu.

Action

Press **button 1** for min. 2 seconds.

Existing warning

LTW indication, if a warning exists

	<i>LEDs L1-L2-L3</i> are blinking at 1Hz until this feature or the hidden menu will be exited.		
Indication	<i>Affected work lamps</i> are blinking at 1Hz with 100% at 5000K until the submenu or the hidden menu will be exited.		

Attention:

Unaffected devices retain their settings!

Exit submenu Press *button 1* for min. 2 seconds.

No existing warning

LTW indication, if no warning exists

Indication	LEDs L1-L2-L3 light up continuously for 3 seconds.
Exit submenu	automatically after indication

6.2.2 Anti-Theft protection

The SMART Lighting System has an Anti-Theft function to protect the SMART work lamps against theft.

If the Anti-Theft function on a SMART work lamp is activated, this lamp can illuminate only after being connected to any HELLA Gateway BASE or PRIME, original or another one.

If the SMART work lamp with **activated theft mode** is mounted on a machine **without any** HELLA Gateway BASE or PRIME, no light output will come out of the work lamp.

If the SMART work lamps with **de-activated theft mode** is mounted on a machine **without any** HELLA Gateway BASE or PRIME, 100% white light with 5000K will come out of the work lamp. The SMART work lamps will have no SMART functions in this case.

The activation and deactivation of the theft protection is only possible in the hidden menu.

Indication of the activated state **LEDs L4-L5-L6** light up until leaving the Hidden Menu.

Indication of the non-activated state No *LEDs L4-L5-L6* light up on the CP.

Activation (if feature was not active)

Action	Press button 2 for min. 2 seconds
Indication	<i>LEDs L4-L5-L6</i> are blinking 3x at 1Hz then light up until leaving the Hidden Menu.

Deactivation (if feature was activated)

Action	Press button 2 for min. 2 seconds		
Indication	<i>LEDs L4-L5-L6</i> are blinking 3x at 1Hz then turn off.		

Table below shows the necessary steps.

Button operation	Control Panel action	Effects	
Press buttons 1-5-4-3-2	All 18 indicators light up 2x at 2Hz	Hidden menu mode entered.	
	Indicators L4-L5-L6 flashing 3x at 1Hz	Anti-Theft programming started	
Press 2	Indicators L4-L5-L6 light constantly.	Anti-Theft command is done, the actual status will be displayed.	
Press 6	All 18 indicators light up 2x at 2Hz	Exit hidden menu.	

The Anti-Theft function can be activated or deactivated only for all the SMART work lamps together at the machine. Using Gateway Prime the connected standard cornering lights are not affected by the Anti-Theft functionality.

6.2.3 System teaching using Control Panel Execution in Hidden Menu only.

Execution of teaching:		
Action	Press button 4 for min. 2 seconds.	
Indication	LEDs L10-L11-L12 light up one after the other with an interval of 1 second (and starts again, with all LEDs off) until the process is finished.	
Finished state	<i>LEDs L10-L11-L12</i> light up for 3 seconds then turn off	

Attention:

Unteached work lamps can still be used normally!

Table shows the necessary steps for the initialization of a SMART Lighting System.

Button operation	Control Panel action	Effects	
Press buttons 1-5-4-3-2	All 18 indicators light up 2x at 2Hz	Hidden menu mode entered.	
Press 4	Indicators L10-L11-L12 light up as running light	This process needs approx. 6 seconds for each lamp. Initialization done.	
	and then turn off		
Press 6	All 18 indicators light up 2x at 2Hz	Exit hidden menu.	

Other buttons in Hidden Menu

The button **3** and **5** are not allocated. Button **6** is to exit the hidden menu.

7. Summaries

7.1 Control Panel legend

- all LEDs on CP blinking 2x at 2Hz → enter or leave Hidden Menu activation /deactivation of the functions LTW ATM and Teaching or leaving the
- Hidden Menu (buttons1, 2, 4 and 6) → press corresponding button for min. 2 seconds
- 5x blinking at 1Hz on all LEDs on CP \rightarrow LTW notification for the operator
- 3 LEDs at button 1 on the CP at 1Hz blinking permanently → LTW message Hidden Menu
- 3 LEDs at button 1 on the CP light up for 3 seconds and then turn off → no LTW Hidden Menu available
- 3 LEDs at button 2 light up continuously → ATM activated
- no LED at button 2 light up continuously \rightarrow ATM deactivated
- 3 LEDs at button 2 on CP at 1Hz 3x blinking \rightarrow activation/deactivation of ATM
- Running light at button 4 \rightarrow Teaching in progress
- 3 LEDs at button 4 light up for 3 seconds and then turn off \rightarrow Teaching finished

7.2 Work lamp legend

- In Hidden Menu all affected work lamps are blinking at 1Hz and 100% light up at 5000K until deactivation by button 1 → LTW message to the Workshop manager
- SMART work lamps turn white and can be used right after the installation, teaching runs in the background
- SMART work lamps are delivered in uninitialized state

8. Safe operation mode

Safe (emergency) operation mode means that a SMART work lamp has no data connection to its Gateway BASE or PRIME. In this mode all the running work lamps have a constant light output of 100% at 5000K.

This operation mode is reached in the following cases.

Case #1: CAN Bus connection lost

If CAN Bus connection is lost, but the PLC data connection is active, all the SMART work lamps have light output with the last values set by the Gateway or Control Panel for 60 seconds. Afterwards all the operating work lamps have a light output of 100% at 5000K.

Case #2: PLC connection lost

If the SMART work lamps have no connection to the Gateway, they will change to the safe mode and have a light output of 100% at 5000K.

Case #3: CAN Bus and PLC connection lost

If the Gateway loses the CAN Bus connection and the SMART work lamps the PLC connection to the Gateway, as in Case #2, all the running SMART work lamps have a light output of 100% at 5000K.

After a new power-up, the SMART Lighting System tries to build up the system configuration to start in normal mode.

9. Maintenance

All components of a SMART Lighting System could be replaced separately.

9.1 Adding a new SMART work lamp

A new SMART work lamp can be added to an existing HELLA SMART Lighting System. In this case please carry out the following steps:

- switch off the power
- mount the new SMART work lamp
- · connect the new SMART work lamp to the on-board electrical system
- switch on the power

The running Gateway will begin to recognise the newly connected SMART work lamp automatically.

9.2 Removing SMART work lamps

If a SMART work lamp should be removed from the HELLA SMART Lighting System on the vehicle, please carry out the following steps:

- switch off the power
- · disconnect the SMART work lamp from the on-board electrical system
- dismount the SMART work lamp
- switch on the power

After power-up, the SMART Lighting System will recognise the configuration change and will continue working.

9.3 Connect SMART work lamp from another vehicle

HELLA SMART work lamps in a HELLA SMART Lighting System are interchangeable among vehicles. Please perform the following steps:

- switch off the power
- mount the new SMART work lamp
- · connect the new SMART work lamp to the on-board electrical system
- switch on the power
- · teaching of the work lamps will run in the background

The running Gateway will begin to identify the newly connected SMART work lamps. If the new SMART work lamps are a compatible SMART Lighting device, it will be initialised and listed on the Gateway automatically.

9.4 Replacing a Gateway

By replacing the HELLA Gateway with another HELLA SMART Lighting Gateway, the system configuration will be checked. If it is replaced by a new Gateway, all SMART work lamps will be teached newly. If it is replaced by a HELLA Gateway that has already been used in another HELLA SMART Lighting System, the list of HELLA SMART work lamps of the Gateway will be updated automatically. It is possible to replace the HELLA Gateway BASE with a PRIME version and vice versa.

9.5 Replacing a Control Panel

If necessary, the Control Panel can be replaced by another one. After the Control Panel is plugged-in, it can control the SMART work lamps through the Gateway. The Gateway will automatically recognise and configure the new device.

10. Error handling

This chapter describes the necessary actions to be taken by the user in case of erroneous behaviour of a SMART Lighting System.

Table: Error handling at the SMART system

Error No.	Device Type	Situation	Description	Possible cause	Troubleshooting
1	GW	Assembly	Device type not known	n/a	Check label and connectors (PRIME: 3 connectors, BASE: 1 connector)
2	GWP	Cornering lights	Cornering lights do not work	Pin assignment OR mounting position is not correct	Check the pin assignment AND the mounting position according to the Installation Manual. Use only standard work lamps recommended from HELLA, not SMART work lamps
3	GWP	Cornering lights	Cornering lights are in the wrong turn	Work lamps positions at GW not correct	Check assemblage due to Installation Manual
4	GW	Already initialised GW from another vehicle installed	LTW, ATM or/and other function(s) in HM do not work correctly	Device list in GW is outdated, earlier attached SMART WL probably not recognised	Run initialization using Hidden Menu at CP
5	WL	Already used SMART WL from another vehicle installed	LTW, ATM or/and other function(s) in HM do not work correctly	Device list in GW contains the old devices, newly attached SMART WL not recognised yet	Run initialization using Hidden Menu at CP
6	СР		Memory button does not react	n/a	1: Cut connection between CP and GW and connect it again 2: Replace the CP and restart SMART Lighting System
7	СР		No LED lights up (e.g. Gap at in- creased dimming)	Faulty component	Replace CP
8	СР		Single LED does not light up (e.g. light gap at increased dimming)	Communication error	1: Restart power supply (e.g. Battery cut-off) OR 2: Cut and reconnect cable harness
9	СР		Unregulated dimming changes or/and colour changes	Mechanical defect of one or more CP buttons	Replace CP
10	СР		CP is not responsive for input	CAN Bus cable to GW is broken	Check the cable harness
11	СР		No LED is flashing at start-up (power on but CP remains dark)	CP is not powered by the GW	Check the cable harness

Error No.	Device Type	Situation	Description	Possible cause	Troubleshooting
12	WL		Colour change not working (if applicable)	CAN Bus command not realised	Check if you have a version with colour change before! 1: Check CP status (indicators should light up) \rightarrow check the power supply \rightarrow replace CP 2: Check CP function (indica- tors should light up due to button control) \rightarrow check pow- er supply and cable connec- tion to the GW 3: Check the colour changes of other SMART WLs (other devices can react to changes as well)
13	СР		No indicators light up constantly (independent of WL status)	Power supply or CAN connection to GW cut	Check the cable harness to GW

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> RokLUME SW Version: 4.06 Gateway SW Version: 4.05

RokLUME HW Version: C6 Gateway HW Version: C5

