# ORCA – Firmware V3.x

Revision D | 2026-09-24

> **NOTE**
>
> This document does not apply to ORCA K2 variants.

## Overview

ORCA Level Sensors can be used in IO-Link and non-IO-Link environments.

For non-IO-Link usage, the sensor features up to three digital outputs that switch on at certain fill levels and up to one analog current or voltage output, whose value scales continuously with the fill level.

The related parameters can be configured before/during deployment via IO-Link:

- Container teach-in
- Function of Pins 2, 4, and 5
  - Digital output with individual set and reset point
  - Analog current (4...20mA) or voltage (0...10V) output on Pin 2 (not available on "Lite" variant)
  - Digital input to signal a special system state via the sensor's LED
- Display of fill level by LED as a color gradient, or dedicated color for the three output set points

## IO-Link Communication

If the sensor detects IO-Link communication, it automatically switches to the IO-Link communication mode. The IO-Link standard offers different communication mechanisms:

- **Acyclic Data** (Indexed Service Data Units): Used to configure basic settings during commissioning.
- **Cyclic Process Data**: Used to receive the sensor's state and influence its behavior during runtime.
- **Events**: The sensor will report events in case of error.

In IO-Link applications the fill level is provided via cyclic Process Data for processing by a PLC. Additionally, the sensor's LED can be controlled via Process Data – either by choosing a pre-configured scene or sending RGB values directly.

> **INFO**
>
> Process Data, ISDUs and events of the sensor, their respective numeric indices, offsets, and values, are described in the IODD file of the sensor. It is highly recommended to use this file when integrating the sensor in an application.

## Device Variants

| Product ID | Name | Description |
|---|---|---|
| CLP-G2HTN2 | ORCA HT | Level Sensor for high temperature applications, thread G2, with 1 Analog and 2 Digital Outputs / 3 Digital Outputs (configurable) |
| CLP-G4OPN2 | ORCA Oil | Level Sensor for oil, 3/4" thread, with plastic cap, with 1 Analog and 2 Digital Outputs / 3 Digital Outputs (configurable) |
| CLP-G4OSN2 | ORCA Oil | Level Sensor for oil, 3/4" thread, with stainless steel cap (no LED), with 1 Analog and 2 Digital Outputs / 3 Digital Outputs (configurable) |
| CLP-G5A2N2 | ORCA | Level Sensor with 1 Analog and 2 Digital Outputs / 3 Digital Outputs (configurable) |
| CLP-G5A2K3 | ORCA Lite | Level Sensor with 3 Digital Outputs |
| CLP-LHHTN2 | ORCA HT | Level Sensor for high temperature applications, longhole mount, with 1 Analog and 2 Digital Outputs / 3 Digital Outputs (configurable) |
| CLP-M1OPN2 | ORCA Oil | Level Sensor for oil, thread M14, with plastic cap, with 1 Analog and 2 Digital Outputs / 3 Digital Outputs (configurable) |
| CLP-M1OSN2 | ORCA Oil | Level Sensor for oil, thread M14, with stainless steel cap (no LED), with 1 Analog and 2 Digital Outputs / 3 Digital Outputs (configurable) |

## Revision History

### Rev. A – 2024-04-16

- Initial release

### Rev. B – 2025-09-16

- Added HT device variants

### Rev. C – 2026-04-14

- Added note w.r.t. K2 variants

## Rev. D – 2026-09-24

- Added Oil device variants
- Adjustments for firmware V3.3
  - Teach function for pin 4
  - Value rage for set points of outputs -25 ... 125 %

# Container Teach-In

## "Empty only" Teach-In

1. Set the **Dielectric Constant** (εR) of the substance in your container via the respective IO-Link parameter.

> **NOTE**
>
> You can also order ORCA Level Sensors with the desired Dielectric Constant pre-configured.

2. Mount the sensor in the empty container.
3. Trigger the IO-Link System Command **"Teach Empty Container"**.

Low and high reference fill levels will be set to 0% (empty) and 100% (full), respectively, and the currently measured capacitance is applied as low (empty) reference value. The high (full) reference value is calculated using the configured dielectric constant.

## Two-Point Teach-In

Two-Point Teach-In offers you to use "low" and "high" reference fill levels of your choice for container teach-in.

1. Configure the desired reference "low" and "high" fill levels by setting the respective IO-Link Parameters.
2. Fill the container to the percentage given as **Container Low Fill Level**.
3. Issue the IO-Link System Command **"Container Teach In 'Low'"**.
    - The currently measured capacitance will be saved in the sensor as "low" level reference.
    - The sensor's LED may start to blink yellow. This indication of an invalid parameter set will cease after high level teach-in.
4. Fill the container to the percentage given as **Container High Fill Level**.
5. Issue the IO-Link System Command **"Container Teach In 'High'"**.
    - The currently measured capacitance will be saved in the sensor as "high" level reference.

> **NOTE**
>
> In non-IO-Link environments, the two-point teach-in can also be performed via Pin 4, provided that its function is configured to **Teach Container**. (*This feature is available from firmware V3.3 on.*)
>
> Order your Level Sensor with the desired "low" and "high" fill levels pre-configured, or set them via IO-Link before mounting the sensor in its application.
>
> Teach-in of the "low" reference point:
>
> 1. Connect Pin 4 to the supply voltage. After 1 second, the sensor's LED lights up turquoise.
> 2. Within the next 3 seconds, disconnect Pin 4 from the supply voltage. The LED flashes to confirm that the "low" reference point has been set.
>
> Teach-in of the "high" reference point:
>
> 1. Connect Pin 4 to the supply voltage. After 1 second, the sensor's LED lights up turquoise.
> 2. Keep Pin 4 connected for about another 3 seconds until the LED turns blue.
> 3. Within the next 3 seconds, disconnect Pin 4 from the supply voltage. The LED flashes to confirm that the "high" reference point has been set.

## Additional Reference Points

Optionally, up to four more reference points for fill level calculation can be set in addition to the low (empty) and high (full) references. They allow to adjust the fill level calculation for special container shapes, like funnels.

The additional reference points can be configured via their IO-Link parameters:

1. Set the desired fill level percentage of the additional reference point X (X = 1...4).

> **NOTE**
>
> When its fill level is set to -1, the reference point is disabled.

2. Fill the container to that percentage.
3. Issue the IO-Link System Command **"Set Additional Reference X"**.

## Dielectric Constant

Being a capacitive sensor, ORCA Level Sensor makes use of the dielectric constant of the substance to be measured for "Empty only" Teach-In. For conductive substances, a "magic" value of 653.55 is applied.

The IO-Link IODD files contain a short list of Dielectric Constants. For extended lists, please refer to a listing of relative permittivity values, e.g. in CAPTRON's level sensor catalog, pages 51ff.

Once the sensor was taught for a certain container, the level measurement can be adjusted to a different substance by changing the Dielectric Constant and then triggering the IO-Link command "**Adjust to changed medium**".

## Determine Dielectric Constant using ORCA

ORCA Level Sensors can determine the Dielectric Constant of a substance in a container using IO-Link controls:

1. Ensure that the parameters **Container High/Low Fill Level** are set to 100% and 0%, respectively.
2. In an empty container, trigger the **"Container Teach In 'Low'"** command.
3. Fill the container with the medium to 100%.
4. Trigger the **"Container Teach In 'High'"** command.
5. Trigger the **"Calculate Dielectric Constant"** command.
6. Read the calculated value from the parameter **"Medium Calculated Constant"**.

# Output Configuration

The function of Pins 2, 4, and 5 can be configured via the respective IO-Link parameters.

For a standard ORCA level sensor (but not for the "Lite" variant) Pin 2 can be used as an analog current or voltage output.

For the digital output functions PNP, NPN, and PushPull, a set and a reset point and the output function (Normally Open or Closed) can be set. Digital outputs will switch on when the current fill level is above the respective set point and switch off when the fill level is below the set point minus the given hysteresis value.

For an output switch to be closed when the current fill level is **below** a certain fill level, configure its output function to **Normally Closed**. The set point must be set to the desired level plus the given hysteresis value.

**Example:** The output switch shall be closed if the fill level is below 10%, with an open/close hysteresis of 3% — configure set point to 13%.

# LED

## Indication of Fill Level

The LED can indicate the fill level in two ways. This behavior can be set via IO-Link Parameter **Level Display Mode**.

- **Color Gradient** – The color changes continuously depending on the fill level.
- **Output Switch Points** – The LED behavior changes in four steps defined by the set points of the digital outputs (Pins 2, 4, 5). This method is working regardless which Pin Function is configured for the three pins.

For both modes, special "empty" and "full" states can be signaled additionally. These states have dedicated trigger fill levels, which can be configured via IO-Link Parameters **LED Set Point 'Empty'** and **LED Set Point 'Full'**.

If Pin 2 or 5 is configured to be an input, it can trigger another LED state by a high signal level to indicate a special system state.

The actual LED behavior for those states is managed by Scene settings, which can be configured via dedicated IO-Link Parameters.

### Scene Assignment

| Scene | Color Gradient Mode | Output Switch Points Mode | Example |
|---|---|---|---|
| 0 | Fill level lower than "LED Set Point Empty" | Fill level lower than "LED Set Point Empty" | Red, flashing |
| 1 | Reference color 0% | Fill level lower than all output set points | Red |
| 2 | n/a | Fill level higher than one output set point | Orange |
| 3 | n/a | Fill level higher than two output set points | Yellow |
| 4 | Reference color 100% | Fill level higher than all output set points | Green |
| 5 | Fill level higher than "LED Set Point Full" | Fill level higher than "LED Set Point Full" | Green, flashing |
| 6 | High signal on any input pin | High signal on any input pin | Blue, flashing |

## Control Options via IO-Link

In an IO-Link application, the LED can be controlled via cyclic Process Data. This feature can be enabled and configured via IO-Link Parameter **LED Control Mode**.

Three options are available:

- **Control by device** – The LED is not controlled by Process Data, but by the sensor itself as described above.
- **Scene control** – Process Data sets the active Scene (0...6) of the LED or asks the sensor to indicate the fill level with the configured Level Display Mode.
- **Advanced control** – Process Data directly controls the RGB color components, brightness, and effects of the LED.

# IO-Link Interface

IO-Link Specification: V1.1.2 (July 2013)

| Property | ORCA | ORCA Lite |
|---|---|---|
| Vendor ID | 1239 | 1239 |
| Device Family | Level Sensors | Level Sensors |
| Device Name | ORCA | ORCA Lite |
| Device ID | 1542 | 1543 |
| IODD | IODDfinder | IODDfinder |

## Communication Interface

| Property | Value |
|---|---|
| IO-Link Version | V1.1 |
| Bitrate | COM2 |
| Minimum Cycle Time | 14800 µs |
| Process Data Input Bits | 128 |
| Process Data Output Bits | 64 |
| SIO Supported | Yes |
| ISDU Supported | Yes |
| Data Storage | Yes |
| Block Parameter | No |
| Supported Profiles | FW-Update (49) |

# IO-Link Process Data

> **NOTE**
> IO-Link bit offset counts from the last byte of the data array.

## Process Data Input

128 bit / 16 bytes

| Byte | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Bit Offset** | 96 | | | | 64 | | | | 48 | | 32 | | 24 | 16 | 8 | 0 |
| **Data** | Capacitance | | | | reserved | | | | reserved | | Fill Level | | res. | Pin 5 | Pin 4 | Pin 2 |

## Field Reference

| Bit Offset | Name | Datatype | Values | Info |
|---|---|---|---|---|
| 0 | Pin 2 | 8-bit UIntegerT | 0 - Output OFF,<br>1 - Output ON,<br>2 - Output Analog,<br>4 - Input OFF,<br>5 - Input ON | Pin 2 state. Value 2 (Analog) not available on Lite variant. |
| 8 | Pin 4 | 8-bit UIntegerT | 0 - Output OFF,<br>1 - Output ON | Pin 4 state. |
| 16 | Pin 5 | 8-bit UIntegerT | 0 - Output OFF,<br>1 - Output ON,<br>4 - Input OFF,<br>5 - Input ON | Pin 5 state. |
| 24 | reserved | 8-bit IntegerT | | |
| 32 | Fill Level | 16-bit IntegerT | -32767...32767 [0.01 %],<br>-32768 - not available | Fill level in 0.01%. Value -32768 means fill level not available (during device start-up or due to parameter error). |
| 48 | reserved | 16-bit IntegerT | | |
| 64 | reserved | 32-bit UIntegerT | | |
| 96 | Capacitance | 32-bit UIntegerT | 0 ... 4294967295 [0.01 pF] | Measured electric capacitance in 0.01 pF. |

# Process Data Output

64 bit / 8 bytes

## LED Control Mode "By Device" (0)

Process Data Output is **unused**.

## LED Control Mode "Scene controlled by IO-Link Process Data" (1)

| Byte | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| **Bit Offset** | 8 | | | | | | | 0 |
| **Data** | unused | | | | | | | LED Scene |

| Bit Offset | Name | Datatype | Values | Info |
|---|---|---|---|---|
| 0 | LED Scene | 8-bit UIntegerT | 0...6, 255 - control by device | Switch between LED scenes 0 to 6. For control by the device (fill level visualization), set 255. |

## LED Control Mode "Advanced control by IO-Link Process Data" (2)

| Byte | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| **Bit Offset** | 56 | 48 | 40 | 32 | 24 | 16 | 0 | |
| **Data** | LED Frequency | LED Effect | LED Color B | LED Color G | LED Color R | LED Brightness | Active LEDs | |

| Bit Offset | Name | Datatype | Values | Info |
|---|---|---|---|---|
| 0 | Active LEDs | 16-bit UIntegerT | 0...1 | Bitmask defining which LEDs are active. |
| 16 | LED Brightness | 8-bit UIntegerT | 0...100 [%] | Brightness of LED in percent. |
| 24 | LED Color R | 8-bit UIntegerT | 0 ... 255 | Red component of LED color. |
| 32 | LED Color G | 8-bit UIntegerT | 0 ... 255 | Green component of LED color. |
| 40 | LED Color B | 8-bit UIntegerT | 0 ... 255 | Blue component of LED color. |
| 48 | LED Effect | 8-bit UIntegerT | 0 - Static, 1 - Flash, 2 - Pulse | |
| 56 | Effect Frequency | 8-bit UIntegerT | 1...60 [0.1 Hz], 0 - Default Frequency | Frequency of LED effect in 0.1 Hz, range: 0.1 ... 6 Hz. |

# IO-Link Events & Commands

## Events

| Event Code | Type | Definition and recommended maintenance action |
|---|---|---|
| 6144 | Error | Output Overload – Output current too high – max. 200 mA |
| 6145 | Error | Voltage Output Overload – Current on analog voltage output too high |
| 6146 | Warning | Current Output Overload – Resistance on current output too high |
| 16912 | Warning | Device temperature over-run (above 90°C) – Clear source of heat |
| 16928 | Warning | Device temperature under-run (below -20°C) – Insulate device |
| 20496 | Error | Component malfunction – Repair or exchange |
| 20752 | Warning | Primary supply voltage over-run (above 30V) – Check tolerance |
| 20753 | Warning | Primary supply voltage under-run (below 16.8V) – Check tolerance |
| 25376 | Error | Parameter error – Check data sheet and values |

## Commands

ISDU Index 2 – System Command

### General Commands

| Value | Name | Description |
|---|---|---|
| 128 | Device Reset | Restart the device |
| 130 | Restore Factory Settings | Restore Factory Settings |

## Calibration Commands

| Value | Name | Description |
|---|---|---|
| 164 | Container Teach In 'Low' | Stores the current sensor value as Low Level reference point |
| 165 | Container Teach In 'High' | Stores the current sensor value as High Level reference point |
| 166 | Calculate Dielectric Constant | Calculate Medium Dielectric Constant from Capacitance of High and Low Level Reference points |
| 167 | Set Additional Reference 1 | Stores the current sensor value as additional reference point 1 |
| 168 | Set Additional Reference 2 | Stores the current sensor value as additional reference point 2 |
| 169 | Set Additional Reference 3 | Stores the current sensor value as additional reference point 3 |
| 170 | Set Additional Reference 4 | Stores the current sensor value as additional reference point 4 |
| 171 | Teach Empty Container | Note: will change Low and High reference points |
| 172 | Adjust to changed medium | Note: will change High reference point |

# IO-Link ISDU Indices

Access Rights: **ro** – Read Only, **rw** – Read/Write, **wo** – Write Only

## System Command

| Name | Index | Bytes | Access | Values | Description |
|---|---|---|---|---|---|
| System Command | 2 | 1 | wo | see Events & Commands | |

## Identification

| Name | Index | Bytes | Access | Values | Description |
|---|---|---|---|---|---|
| Vendor Name | 16 | 23 | ro | CAPTRON Electronic GmbH | |
| Product Name | 18 | 4 / 9 | ro | ORCA (Lite) | |
| Product ID | 19 | 10 | ro | CLP-xxxxxx | |
| Product Text | 20 | 20 | ro | Order Code | |
| Rod Length | 193 | 4 | ro | [mm] | |
| Hardware Identification Key | 17342 | 9 | ro | A0002001A | |
| Serial Number | 21 | 13 | ro | | |
| Firmware Version | 23 | 4 | ro | V3.x | |
| Application Specific Tag | 24 | 32 | rw | *** | |

# Measurement Configuration

| Name | Index | Bytes | Access | Values | Description |
|---|---|---|---|---|---|
| Averaging Time Constant | 327 | 2 | rw | 0 - No additional filter, 1...65535 [ms] | |
| Medium Dielectric Constant | 325 | 2 | rw | 100...65535 | See common values below . 65535 = Conductive Medium. |

## Dielectric Constant Values

| Value | Substance |
|---|---|
| 150 | Resin |
| 180 | Sugar |
| 200 | Benzine, Glue |
| 210 | Chlor, fluid |
| 220 | Propanol (propyl alcohol) |
| 230 | Hot glue |
| 270 | Silicone oil |
| 400 | Phosphorus salt |
| 420 | Phenetole |
| 520 | Nitro varnish |
| 740 | Phenol resin |
| 800 | Phenol |
| 1070 | Isoquinoline |
| 1350 | Benzyl alcohol |
| 1620 | Ethanol (ethyl alcohol) |
| 1830 | Cresol resin, Tooth paste |
| 2060 | Allyl alcohol |
| 2150 | Acetone |
| 2190 | Sulfuric acid |
| 2400 | Vinegar |
| 2500 | Bore oil emulsion |
| 3160 | Ammonia solution (25%) |
| 3200 | Soft soap |
| 3700 | Glycol |

| Value | Substance |
|---|---|
| 65535 | Conductive Medium |

# Container Teach-In

## High Fill Level

| Name | Index | Bytes | Access | Values | Description |
|---|---|---|---|---|---|
| Container High Fill Level | 287 | 1 | rw | 0 ... 100 [%] | Fill level in percent of High Level reference point. |
| Capacitance "High Level" | 289 | 4 | rw | 1 ... 1000000 [0.01 pF] | Sensor value for High Level reference point. Will be set to current Capacitance value when triggering "Calibrate High Level", and adjusted when triggering the "Teach Empty Container" command. |

## Low Fill Level

| Name | Index | Bytes | Access | Values | Description |
|---|---|---|---|---|---|
| Container Low Fill Level | 286 | 1 | rw | 0 ... 100 [%] | Fill level in percent of Low Level reference point. |
| Capacitance "Low Level" | 288 | 4 | rw | 1 ... 1000000 [0.01 pF] | Sensor value for Low Level reference point. Will be set to current Capacitance value when triggering "Calibrate Low Level" or "Teach Empty Container" command. |

## Additional Reference Points

### Reference Point 1 (Index 328)

| Subindex | Name | Bytes | Access | Values | Description |
|---|---|---|---|---|---|
| 1 | Level | 1 | rw | -1 - not set, 0...100 [%] | Fill level in percent. |
| 2 | Capacitance | 4 | rw | 0 - not set, 1...1000000 [0.01 pF] | Sensor value. |

## Reference Point 2 (Index 329)

| Subindex | Name | Bytes | Access | Values | Description |
|---|---|---|---|---|---|
| 1 | Level | 1 | rw | -1 - not set, 0...100 [%] | Fill level in percent. |
| 2 | Capacitance | 4 | rw | 0 - not set, 1...1000000 [0.01 pF] | Sensor value. |

## Reference Point 3 (Index 330)

| Subindex | Name | Bytes | Access | Values | Description |
|---|---|---|---|---|---|
| 1 | Level | 1 | rw | -1 - not set, 0...100 [%] | Fill level in percent. |
| 2 | Capacitance | 4 | rw | 0 - not set, 1...1000000 [0.01 pF] | Sensor value. |

## Reference Point 4 (Index 331)

| Subindex | Name | Bytes | Access | Values | Description |
|---|---|---|---|---|---|
| 1 | Level | 1 | rw | -1 - not set, 0...100 [%] | Fill level in percent. |
| 2 | Capacitance | 4 | rw | 0 - not set, 1...1000000 [0.01 pF] | Sensor value. |

# Pin Configuration

## Pin 2 – Digital / Analog Output / Input

| Name | Index | Bytes | Access | Values | Description |
|---|---|---|---|---|---|
| Pin 2 Function | 315 | 1 | rw | 0 - NPN, 1 - PNP, 2 - PushPull, 3 - Current Output 4...20mA *, 4 - Voltage Output 0...10V *, 5 - Input (active high) | * Not available on Lite variant. Input mode sets LED Scene 6. |
| Output Function | 318 - 1 | 1 | rw | 0 - NO (Normally Open), 1 - NC (Normally Closed) | Applies only if Pin function is NPN, PNP, or PushPull. |
| Output Set Point | 318 - 2 | 1 | rw | -25 ... 125 [%] | Fill level above which Output will switch ON. 125% = never switch on.<br>*For FW versions before V3.3, the value range is 0 ... 100%* |
| Output Hysteresis | 318 - 3 | 1 | rw | 0 ... 100 [%] | Output will switch OFF when fill level is below Set Point minus this value. |
| Output Minimum Impulse Time | 318 - 4 | 4 | rw | 10 ... 300000 [ms] | Applies only if Pin function is NPN, PNP, or PushPull. |

## Pin 4 – Digital Output / IO-Link / Teach Input

| Name | Index | Bytes | Access | Values | Description |
|---|---|---|---|---|---|
| Pin 4 Function | 316 | 1 | rw | 0 - NPN, 1 - PNP, 2 - PushPull, 5 - Teach Container | *Teach Container is supported from firmware version 3.3 on* |
| Output Function | 319 - 1 | 1 | rw | 0 - NO (Normally Open), 1 - NC (Normally Closed) | |
| Output Set Point | 319 - 2 | 1 | rw | -25 ... 125 [%] | Fill level above which Output will switch ON. 125% = never switch on. *For FW versions before V3.3, the value range is 0 ... 100%* |
| Output Hysteresis | 319 - 3 | 1 | rw | 0 ... 100 [%] | Output will switch OFF when fill level is below Set Point minus this value. |
| Output Minimum Impulse Time | 319 - 4 | 4 | rw | 10 ... 300000 [ms] | |

## Pin 5 – Digital Output / Input

| Name | Index | Bytes | Access | Values | Description |
|---|---|---|---|---|---|
| Pin 5 Function | 317 | 1 | rw | 0 - NPN, 1 - PNP, 2 - PushPull, 5 - Input (active high) | Input mode sets LED Scene 6. |
| Output Function | 320 - 1 | 1 | rw | 0 - NO (Normally Open), 1 - NC (Normally Closed) | Applies only if Pin function is NPN, PNP, or PushPull. |
| Output Set Point | 320 - 2 | 1 | rw | -25 ... 125 [%] | Fill level above which Output will switch ON. 125% = never switch on. *For FW versions before V3.3, the value range is 0 ... 100%* |
| Output Hysteresis | 320 - 3 | 1 | rw | 0 ... 100 [%] | Output will switch OFF when fill level is below Set Point minus this value. |
| Output Minimum Impulse Time | 320 - 4 | 4 | rw | 10 ... 300000 [ms] | Applies only if Pin function is NPN, PNP, or PushPull. |

# LED

| Name | Index | Bytes | Access | Values | Description |
|---|---|---|---|---|---|
| LED Control Mode | 293 | 1 | rw | 0 - By Device, 1 - Scene controlled by IO-Link Process Data, 2 - Advanced control by IO-Link Process Data | See LED for details on each mode. |
| Level Display Mode | 290 - 1 | 1 | rw | 0 - Color Gradient, 1 - Output Switch Points | **Color Gradient** : LED color changes continuously with fill level between color of Scene 1 (0%) and 4 (100%). **Output Switch Points** : LED settings chosen from Scenes 1 to 4 depending on number of outputs switched on. |
| LED Set Point 'Empty' (Scene 0) | 290 - 2 | 1 | rw | 0 ... 100 [%] | Fill level below which LED Scene 0 is set. A value of 0% disables the "Empty" state. |
| LED Set Point 'Full' (Scene 5) | 290 - 3 | 1 | rw | 0 ... 100 [%] | Fill level above which LED Scene 5 is set. A value of 100% disables the "Full" state. |
| LED Brightness | 285 | 1 | rw | 0 ... 100 [%] | Brightness of LED in percent. |

# Observation & Diagnosis

| Name | Index | Bytes | Access | Values | Description |
|---|---|---|---|---|---|
| Sensor Temperature | 257 | 2 | ro | -32768 ... 32767 [0.1 °C] | |
| Supply Voltage | 256 | 2 | ro | 0 ... 65535 [0.001 V] | |
| Voltage on Analog Output | 281 | 2 | ro | 0 ... 65535 [0.001 V] | |
| Intermediate voltage | 326 | 2 | ro | 0 ... 65535 [0.001 V] | |
| MCU Voltage | 279 | 2 | ro | 0 ... 65535 [0.001 V] | |
| Charge Code | 280 | 4 | ro | 0 ... 4294967295 | |
| Error Code | 282 | 2 | ro | 0 ... 65535 | |
| Flash Erase Count | 259 | 2 | ro | 0 ... 65535 | |
| Device Access Locks | 12 | | rw | | |

# LED Scenes

ORCA has 7 LED scenes (0–6), each configured with:

- **LED Color** – The color of the LED
- **LED Effect** – The behavior (Static, Flash, Pulse)
- **Effect Frequency** – Frequency of animated effects in 0.1 Hz (range: 0.1 ... 6 Hz)

## Available LED Colors

| Value | Color |
|---|---|
| 1 | Red |
| 2 | Green |
| 3 | Blue |
| 4 | Yellow |
| 5 | Magenta |
| 6 | Cyan |
| 10 | Orange |
| 11 | Violet |
| 12 | Turquoise |
| 13 | Off |
| 14 | Clean Blue |
| 128 | Custom Color 1 |
| 129 | Custom Color 2 |

# Scene ISDU Indices

| Scene | Condition | LED Color | LED Effect | Effect Frequency |
|---|---|---|---|---|
| Scene 0 | Empty | 295 - 1 | 295 - 2 | 295 - 3 |
| Scene 1 | 0% / Step 1 | 296 - 1 | 296 - 2 | 296 - 3 |
| Scene 2 | Step 2 | 297 - 1 | 297 - 2 | 297 - 3 |
| Scene 3 | Step 3 | 298 - 1 | 298 - 2 | 298 - 3 |
| Scene 4 | 100% / Step 4 | 299 - 1 | 299 - 2 | 299 - 3 |
| Scene 5 | Full | 300 - 1 | 300 - 2 | 300 - 3 |
| Scene 6 | Input active | 301 - 1 | 301 - 2 | 301 - 3 |

# Custom Scene Colors

## Custom Color 1 (Index 306)

| Subindex | Component | Values |
|---|---|---|
| 1 | R | 0 ... 255 |
| 2 | G | 0 ... 255 |
| 3 | B | 0 ... 255 |

## Custom Color 2 (Index 307)

| Subindex | Component | Values |
|---|---|---|
| 1 | R | 0 ... 255 |
| 2 | G | 0 ... 255 |
| 3 | B | 0 ... 255 |

# Self-Diagnosis and Error Codes

ORCA Level Sensors include the following diagnosis features:

- **Self-Test**: When triggered by the respective IO-Link System Command, the RGB LED is checked electrically.
- **Monitoring** of Supply and internal Voltages and MCU Temperature
- **Overload Detection** on digital and analog outputs

Detected errors are indicated via IO-Link Events and/or in the **Error Code** IO-Link Parameter, as well as by blinking patterns of the LED.

## Error Codes

| Blink Code | IO-Link Error Code | Description |
|---|---|---|
| 1 | 0x0001 | Internal error |
| 2 | 0x0002 | Error with intermediate voltage |
| 4 | 0x0008 | Supply voltage overrun / underrun |
| 8 | 0x0080 | Parameter memory error |
| 9 | 0x0100 | Parameter error |
| 12 | 0x0800 | LED error |
| 13 | 0x1000 | Overload on digital output |
| – | 0x2000 | Overload on analog output |
| 15 | 0x4000 | Temperature overrun |