



BOSCH

**Edge dewarping on
FLEXIDOME panoramic 5100i and
FLEXIDOME panoramic 5100i IR**

Table of contents

1.1	Introduction.....	3
1.2	Multi-channel dewarping views	3
1.3	Dewarped view modes supporting different applications.....	4
1.3.1	Available view modes when in ceiling or floor / table mount.....	4
1.3.2	Available view modes when in wall mount.....	6
1.4	HDMI dewarped mode	6
1.5	RTSP usage of every video channel and stream.....	7

1.1 Introduction

The new FLEXIDOME panoramic 5100i and FLEXIDOME panoramic 5100i IR cameras are discreet and aesthetic panoramic cameras for indoor and outdoor surveillance. Its stereographic, panoramic lens provides full 360° coverage without blind spots, ideal for surveillance applications that require wide area coverage in a single view. Because of the circular shape, straight lines become curved. Image distortion correction is needed to create a useful image without distortion; this is called dewarping. The high-end system on chip (SoC) provides dewarping on the camera for easy integration and flexible viewing and recording. With dewarping either on the client or on the camera, you will be able to pan, tilt and zoom in the dewarped video.

Dewarping on the camera is called Edge dewarping and it is particularly interesting for three reasons:

- 1) Easy integration; the camera sends a flat video that any VMS can display just like a traditional camera.
- 2) Lower bit rates; edge dewarping allows you to select and record only the part of the scene that is relevant.
- 3) Lower hardware requirements; viewing and dewarping of 12MP is challenging with a standard PC. Especially with multiple panoramic cameras in system. Edge dewarping reduces the computation power needed, as the camera is dewarping for you. In this paper, we will explain how use and set-up dewarping on the camera (edge dewarping).



1.2 Multi-channel dewarping views

The lens captures a circular image. The camera provides edge dewarping algorithms to transform this circular image into several different distortion-free rectangular views. By switching to the dewarped camera mode, the camera will provide three separate video channels simultaneously.

Video channel 1	Full image circle (12MP: 3008x3008 6MP: 2112x2112)
Video channel 2	Various dewarped view modes for different applications
Video channel 3	E-PTZ (up to 1920x1080)

The camera offers several dewarped views on both channel 2 and 3 while maintaining access to the original warped, circular full image on channel 1. This way no information is lost, and you will always have access to the entire Field of View (FoV) of the camera.

Instructions:

The camera can be switched to dewarped view mode mode via Configuration -> Camera -> Installer Menu -> Application variant

Note: When switching between modes, the camera will restart and configurations will be set to factory defaults.



Each video channel is capable of streaming up to four video streams. This means that when the camera runs in edge dewarping mode, it will stream up to 12 streams simultaneously. In each stream you can configure various resolutions to the maximum calculating power the camera offers.

When in edge dewarping mode (12MP camera variant), the frame rate of the dewarped view modes on video channel 2 and 3 goes up to 30fps, while the full image circle on video channel 1 is limited to 15fps. The 6MP camera variant is able to run all three video channels at 30fps.

1.3 Dewarped view modes supporting different applications

Depending on the physical camera installation (wall mount, ceiling mount or floor mount), different dewarped view modes are available on video channel 2. By means of its integrated gyro sensor the camera is capable of detecting the installation type, and, if required, this can be overwritten manually.

Instructions:

The camera installation type can be set via Configuration -> Camera -> Installer Menu -> Positioning -> Mounting position

Different view modes can be selected for video channel 2 in the *Encoder Streams* configuration page of the camera. Regardless of the selected view mode on video channel 2, you will always have simultaneous access to the full image circle on video channel 1 and an E-PTZ view on video channel 3.


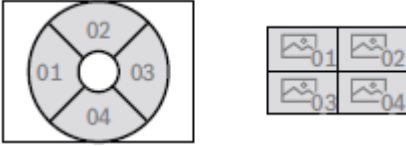
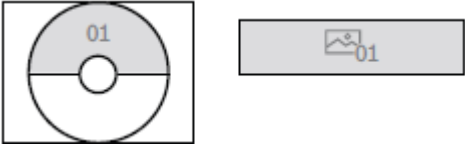
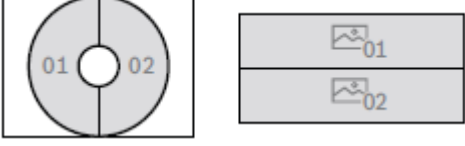
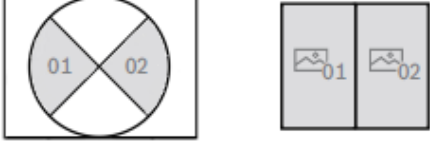
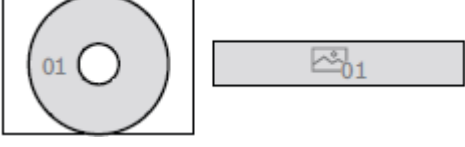
Instructions:

The dewarped view modes can be set via Configuration -> Camera -> Encoder Streams -> Video 2 -> Dewarping mode

Within a channel, only one view mode can be displayed on all streams simultaneously. So for example, channel 1 shows a full image circle on every stream, and channel 2 a quad view on all streams. Channel 2 cannot display a quad view on stream 1 and a panoramic view on stream 2 at the same time. But channel 2 can show a quad view while channel 3 shows an E-PTZ view.

1.3.1 Available view modes when in ceiling or floor / table mount

The following dewarped view modes are available on video channel 2 (all of them at 30fps):

Name	Display	Max. resolution	When to use?
E-PTZ		2.1MP – 1920x1080	For flexible undistorted viewing in the surrounding of the camera as if you're using a moving camera.
Quad		5.3MP – 3072x1728	For undistorted views of four independent hotspots or a corridor crossing to monitor all four directions.
Panoramic		1.8MP – 2560x720	For an undistorted 180° overview of broad scenes like an entry, queueing or waiting area.
Double panoramic		3.7MP – 2560x1440	For undistorted wide 2x 180° overviews of open areas at an airport, shopping malls, or transportations hubs.
Corridor		1.9MP – 1600x1200	For 2x upright corridor and aisle views in offices or stores.
Full panoramic		1.3MP – 3073x432	For an undistorted 360° overview of open areas at an airport, parking lots, detention centres, schools and entries.

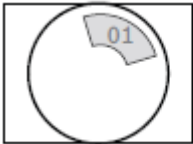

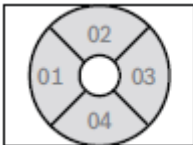
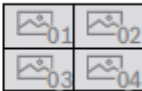
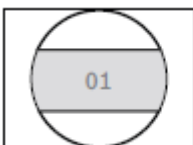

Note:
Above resolution are based on FW8.70. New modes and other resolutions might be added in future FW releases

The resolution of the dewarped view modes is the same for the 6MP and 12MP camera variant. However, the 12MP camera allows you to maintain more pixels on target when zooming in. See below a comparison of a dewarped zoomed image.



1.3.2 Available view modes when in wall mount

The FLEXIDOME panoramic 5100i and FLEXIDOME panoramic 5100i IR cover both 360° and 180° applications. When the camera is mounted on a wall, it produces a 180° overview with an optimized viewing angle for seeing people's faces. The following dewarped view modes are available on video channel 2 (all of them at 30fps):

Name	Display	Max. resolution	When to use?
E-PTZ		 2.1MP – 1920x1080	For flexible undistorted viewing in front of the camera as if you're using a moving camera.
Quad		 5.3MP – 3072x1728	For undistorted views of four independent hotspots in front of the camera.
Panoramic		 1.8MP – 2560x720	For a full 180° panoramic overview to get a total overview of an entry, customer service desk or busy area.

Note:
Above resolution are based on FW8.70. New modes and other resolutions might be added in future FW releases

In a wall mount installation, the camera's field of view can be even further optimized when used in combination with a tilt mount accessory (NDA-5080-TM or NDA-5081-TM). Together with edge dewarping, you can transform the camera into a dedicated 180° camera. See below a snapshot of the FLEXIDOME panoramic 5100i with an NDA-5081-TM generating a dewarped 180° FoV.



1.4 HDMI dewarped mode

The FLEXIDOME panoramic 5100i and FLEXIDOME panoramic 5100i IR have a direct HDMI video output with various selectable resolutions for live streaming to a public view monitor. This is ideal for retail usage or for local video display. Via its micro HDMI connector, the camera can display the full image circle or any of the desired dewarped view modes. You

can select one of the three video channels to display on HDMI-compatible devices: 1) Full Image Circle, 2) Dewarped view mode, or 3) E-PTZ.

Instructions:

The HDMI video output can be set via Configuration -> Camera -> Installer Menu -> HDMI output

From two drop down boxes, you can select the resolution and choose between full image circle or dewarped view.

1.5 RTSP usage of every video channel and stream

Each video channel and stream can also be accessed and integrated separately via Real Time Streaming Protocol (RTSP). This allows live viewing of video and replay of recorded video from the camera with a compatible standard media player. Connecting to the camera is as simple as entering a URL that specifies the protocol and the unit's IP address.

Instructions:

The three video channels in the camera are selectable through the line parameter. To connect to the dewarped view mode selected in video channel 2, the URL needs to look like: RTSP://192.68.0.40/?line=2

An RTSP connection to for example stream 2 of video channel 3 would require the following URL: RTSP://192.68.0.40/?line=3&inst=2



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