DATALOGIC

DB0431

OEM Decoder



Integration Guide

Datalogic S.r.l.
Via S. Vitalino, 13
40012 Lippo di Calderara di Reno
Bologna - Italy
Telephone: (+39) 051-3147011
Fax: (+39) 051-3147205

© 2020 Datalogic S.p.A. and/or its affiliates

◆ All rights reserved. ◆ Without limiting the rights under copyright, no part of this documentation may be reproduced, stored in or introduced into a retrieval system, or transmitted in any form or by any means, or for any purpose, without the express written permission of Datalogic S.p.A. and/or its affiliates. Owners of Datalogic products are hereby granted a non-exclusive, revocable license to reproduce and transmit this documentation for the purchaser's own internal business purposes. Purchaser shall not remove or alter any proprietary notices, including copyright notices, contained in this documentation and shall ensure that all notices appear on any reproductions of the documentation. Should future revisions of this manual be published, you can acquire printed versions by contacting your Datalogic representative.
Electronic versions may either be downloadable from the Datalogic website (www.datalogic.com) or provided on appropriate media. If you visit our website and would like to make comments or suggestions about this or other Datalogic publications, please let us know via the "Contact Datalogic" page.

Disclaimer

Datalogic has taken reasonable measures to provide information in this manual that is complete and accurate, however, Datalogic reserves the right to change any specification at any time without prior notice.
Datalogic and the Datalogic logo are registered trademarks of Datalogic S.p.A. in many countries, including the U.S.A. and the E.U. Halogen is a trademark of Datalogic S.p.A. and/or its affiliates.
All other trademarks and brands are property of their respective owners.

Patents

See www.patents.datalogic.com for patent list.

Table of Contents

INTRODUCTION 1
About this Manual 1
Manual Conventions 1
Outline 2
Technical Support 2
Support Through the Website 2
Reseller Technical Support 2
About the DB0431 2
Unpacking the Decoder 2
OEM Decoder Care 3
System Overview 3
Regulatory 3
INSTALLATION 4
Mounting the OEM Decoder 4
General Considerations 4
Connection to Host and Scan Engine 4
Mechanical Size 5
Mounting Holes 6
ELECTRICAL INTEGRATION 7
Supply Voltages and I/O levels 7
Power Supply Noise 7
Integration Notes 8
Grounding 8
ESD 8
EMC considerations 8
Heat Dissipation 8
Electrical Interface 8
Power Supply and I/O Voltage 11
Power-up Sequence 11
Scan Engine PARALLEL or MIPI Connection 13
Connector and Flat Cable (Host Interface) 14
Scan Engine Connector and Flat cable 14
USB Powered Host and USB Interface Design Recommendations 15
OEM Decoder Operation 15
Communication 18
TECHNICAL SPECIFICATIONS 19
Shielded Double Side FLEX 21 Example Drawing 21
ORDERING INFORMATION 22

NOTES

Chapter 1
Introduction

About this Manual

This Integration Guide is provided to give instruction, electrical, mechanical details, and design considerations to integrate the DB0431 decoder (designated as "OEM decoder" in this manual) specifically into equipment-integrated scanning applications.

DB0431 includes two interfaces on the same model (on the host connector as will be described in the chapter 3: electrical integration):

- TTL-UART
- USB (COM, Keyboard, OEM, Composite)

The OEM decoder implements also the USB interface on a dedicated micro-USB connector. The decoder is intended to be completed with a Datalogic undecoded scan engine to feed it with images to be decoded. The decoder is implementing MIPI CSI-2 interface as well as PARALLEL video interface.

In the following chapters, all those models will be described in details along with mechanical and electrical characteristics.

Manual Conventions

The following conventions are used in this document:

The symbols listed below are used in this manual to notify the reader of key issues or procedures that must be observed when using the reader:



Notes contain information necessary for properly diagnosing, repairing and operating the reader.



CAUTION

The CAUTION symbol advises you of actions that could damage equipment or property.

Outline

Chapter 1, Introduction (this chapter) presents information about manual conventions and an overview of the engine models, their features and operation.

Chapter 2, Installation provides information about unpacking, cable connection information and setting up the scan engine for optimum scan engine performance.

Chapter 3, Electrical Integration offers information about electrical components, interfaces and operating mode.

Appendix 4, Technical Specifications lists physical characteristics and performances, as well as environmental and regulatory specifications.

Appendix 5, Ordering Information lists the available models of decoder demo kits and compatible scan engines.

Technical Support

Support Through the Website

Datalogic provides several services as well as technical support through its website. Log on to (www.datalogic.com).

For quick access, from the home page click on the search icon, and type in the name of the product you're looking for. This allows you access to download Data Sheets, Manuals, Software & Utilities, and Drawings.

Hover over the Support & Service menu for access to Services and Technical Support.

Reseller Technical Support

An excellent source for technical assistance and information is an authorized Datalogic reseller. A reseller is acquainted with specific types of businesses, application software, and computer systems and can provide individualized assistance.

About the DB0431

The Datalogic DB0431 decoder is a compact, high performance decoder to be connected to a MIPI CSI-2 or PARALLEL Datalogic scan engine in order to enable the decoding of linear and 2D barcodes and to transmit the decoded information to a host by means of a TTL, UART or USB COM or HID Keyboard interface.

Unpacking the Decoder

The decoder is shipped in custom packaging. Carefully open the package, and inspect for the following:

- DB0431 OEM decoder

If any parts are damaged or you need additional hardware, please contact Technical Support.

OEM Decoder Care

The OEM decoder contains sensitive components which require special handling. Datalogic may not warrant damage due to improper handling.

- Do not disassemble the decoder. Doing so will void the warranty.
- Use standard ESD precautions & policies when handling the DB0431 OEM decoder.

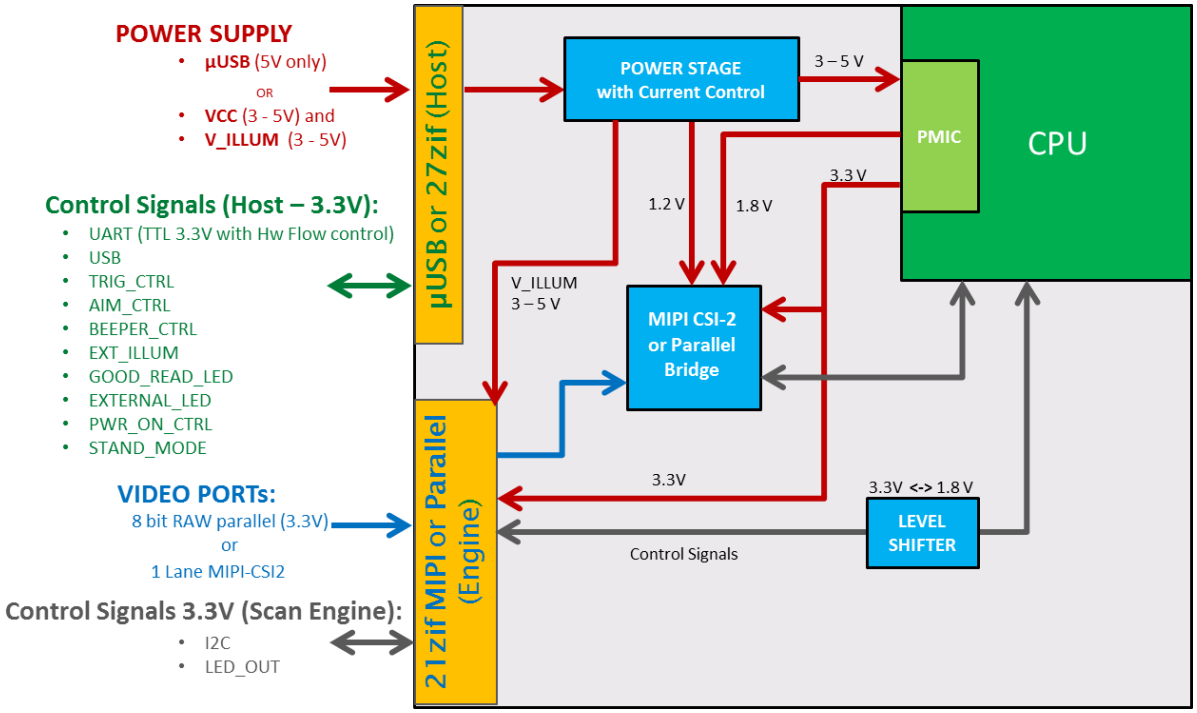
System Overview

The Datalogic DB0431 OEM decoder features a digital platform based on a Microchip ARM A5 processor, able to capture and decode images from either a MIPI or PARALLEL video interface. The video interfaces are compatible with any Datalogic 2D undecoded scan engine.

The high performance, low power micro-processor runs the decoding algorithms and handles communication with the external host and manages the connected scan engine. The host interface is available as a 27-poles zif connector along with a standard micro-USB connector.

The 27-poles connector is exporting all the possible interfaces on the same model. The form factor of the connector is 27-poles 0.5 mm pitch zif as described in chapter 3.

Figure 1. Decoder Block Diagram



The 27-poles connector exports all of the user interface (control signals and UART TTL and USB) and receives power from the host. The micro-USB connector is used to interface USB if a single cable USB user interface application is implemented. The block called CPU is implementing the digital processing part and the control of all OEM decoder submodules.

Regulatory

See scan engines documentation for details about LED and Laser safety certifications.

Chapter 2
Installation

This section describes how to design the mounting area for optimum OEM decoder installation.

Mounting the OEM Decoder

General Considerations

A typical system uses the decoder connected to an interface board, a cable for communication with host and a 2D Datalogic undecoded scan engine mounted inside a host enclosure, with an opening for the illumination system light to exit and illuminate the label and to read bar codes. For additional details on the scan engine, please refer to the appropriate scan engine integration manual. This integration manual refers specifically to the OEM decoder only.

Connection to Host and Scan Engine

Always make sure that OEM Decoder is powered off before connecting Scan Engine to the 21 poles connector. Only connect one Scan Engine at a time. Connect only Datalogic 2D MIPI Scan Engines to the MIPI 21-poles connector and connect only Datalogic 2D parallel Scan Engines to the parallel 21-poles connector.

Always make sure that no voltage is present on Host connector before connecting the 27 poles host interface to OEM Decoder.

In order to avoid USB communication issues and power rail electrical conflicts, do not connect micro-USB port if also 27poles zif is connected.

Figure 2 - Scan Engine PARALLEL or MIPI connection



Mechanical Size

Nominal size:
30 mm (width) x 6.45 mm (height) x 30 mm (depth)

Maximum size:
30.1 mm(width) x 6.55 mm (height) x 30.1 mm (depth)

Figure 3 - Decoder Size

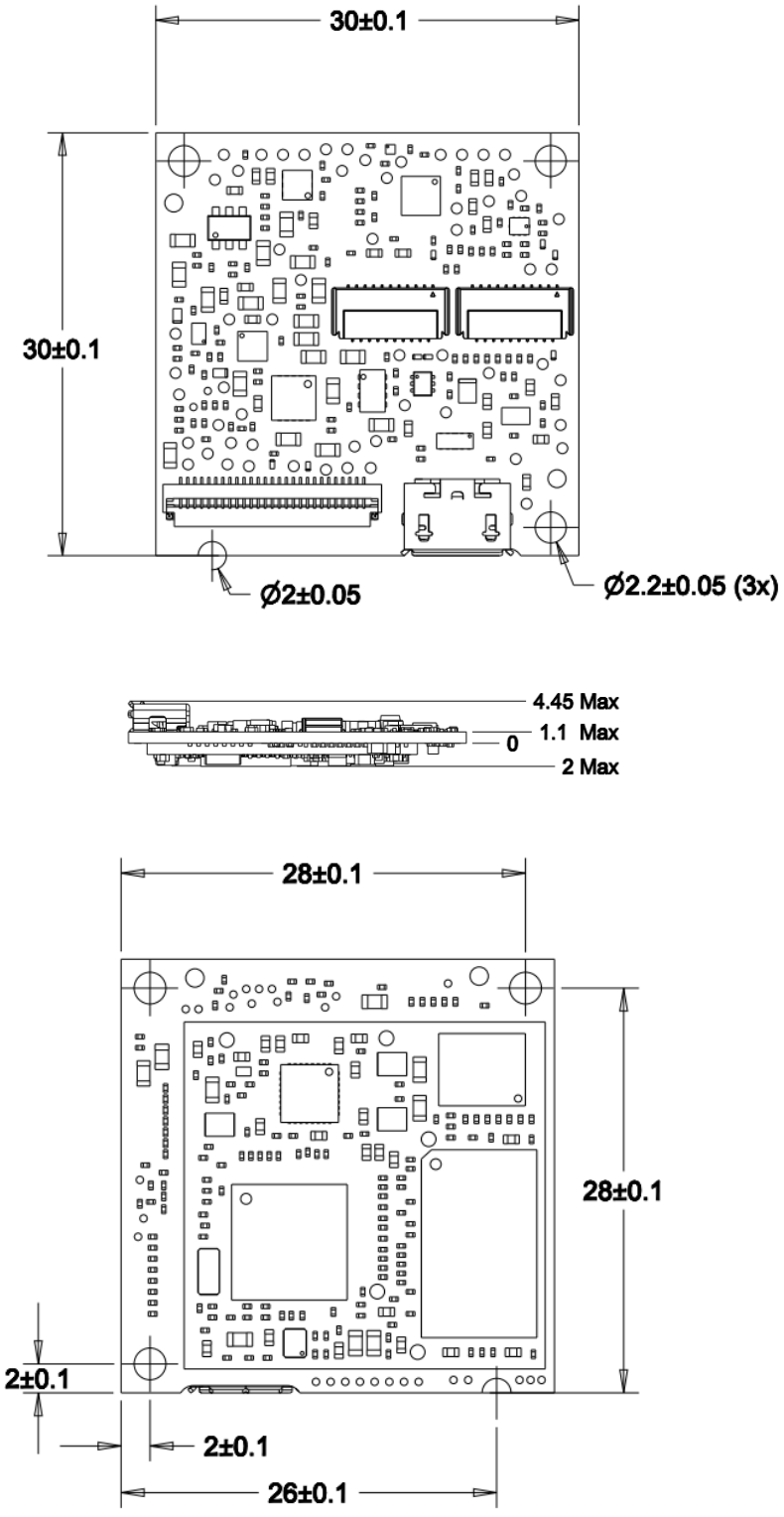
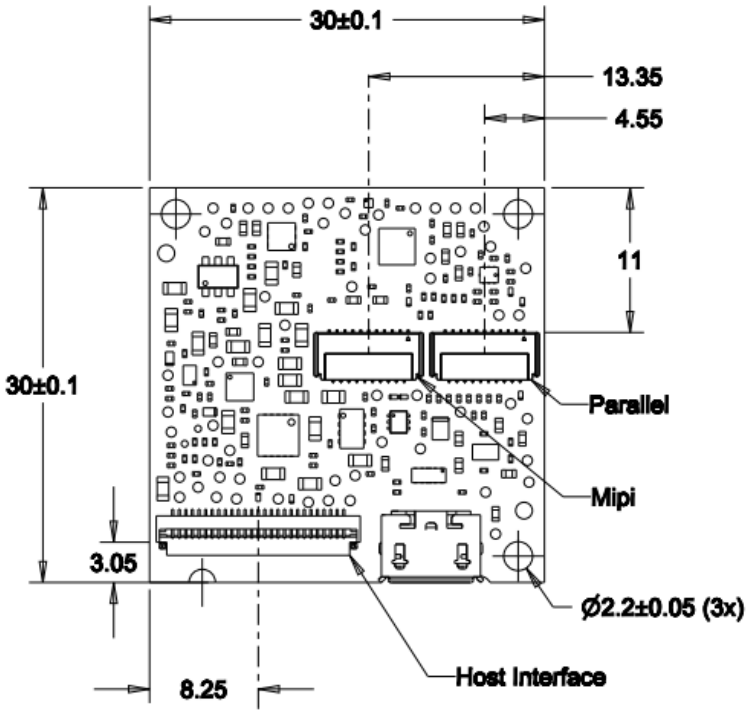


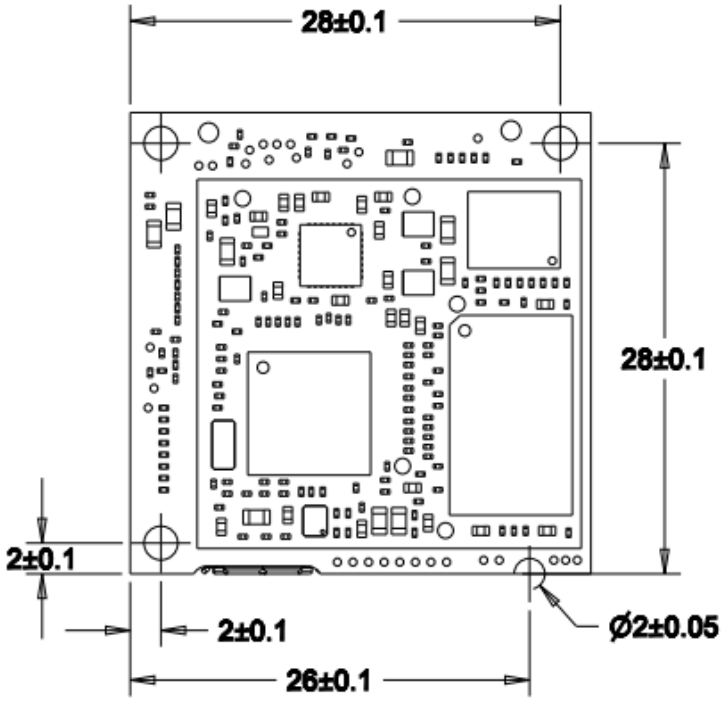
Figure 4 - Connector Position



Mounting Holes

There are three mounting holes and a notch to center and secure the OEM decoder to a host mounting system.

Figure 5 - Mounting Holes and Related Requirements



Chapter 3
Electrical Integration

Supply Voltages and I/O levels

Table 3 - Supply Voltages and I/O Levels

Item	Level	Description
VCC	3.2 V – 5.5 V	This is the core digital and analog power supply. The device full operation is guaranteed in this range of voltage (compatible with USB powering). Important note: This power can go as low as 3.0 V, but at power-up the minimum allowed voltage is 3.2 V, in order to guarantee the proper system startup.
VCC ILLUM	3.0 – 5.5 V	This is the illumination power source; can be connected to a power supply independent from VCC, if desired. 5V achieves best power efficiency.
I/O level	V_{IOH} min = 3.0 V V_{IOH} nom = 3.3 V V_{IOH} max = 3.6 V	The driving capability of the output pins is 4 mA max. The internal engine digital supply is 3.3 V. The I/O output voltage is 3.3 V nominal. If the main power VCC is not applied the input pins should not be driven.

Power Supply Noise

To preserve image quality (both for decoding and image capture applications), a low-noise power supply is required.

The requirement for the power supply peak-to-peak noise is ≤150mV on the power supply lines (or at least on the "VCC" supply), the lower the better.

Integration Notes

Grounding

The mounting holes of the decoder are at ground. Mounting screws can be used to implement connections to the host ground.

Based on the host characteristics, the additional ground connections can affect:

- the decoder performance (if noise is injected into the decoder)
- the radiated emission (depending on current loops)

It is suggested to investigate these topics at the beginning of the integration.

ESD

The decoder is protected from ESD up to ±2.0Kv@ connector.

During installation it is recommended to apply standard ESD handling procedures, such as operating in a properly grounded working area using wrist straps.

EMC considerations

OEM decoder is designed to have a reduced radiated emission. However, OEM decoder is a board to be integrated in a product and the compliance must be done on the end product. It is suggested to investigate the electromagnetic compatibility topic when designing the host and the product integrating OEM decoder. Please note that analysis of integration geometry, shielding and grounding are crucial for EMI performance of the integrating device.

Heat Dissipation

If the DB0431 is operated in a closed environment where the temperature can rise significantly, particular care must be taken to properly dissipate the heat generated by an intensive operative condition, like using ALWAYS ON mode continuously for an extended time.

In some cases, the DB0431 might detect an overheat condition of the connected scan engine and might apply power reduction strategies (like reducing FPS or turning off AIM laser).



In the specific case of DE2011 scan engine, when using "ALWAYS ON" mode the AIM will be disabled by default.

The grounded screw holes are the main thermal dissipator for the OEM decoder.

Electrical Interface

The DB0431 OEM decoder can be connected to an external digital platform via a 27-poles ZIF connector supporting:

- decoded information transmitted by means of TTL UART interface (referred to as decoded UART)

- decoded information transmitted by means of USB COM or HID Keyboard interface (referred to as decoded USB)

Signals on connector are mapped as follows:

Table 4 below describes the power lines and the signals mapped on the 27-pole ZIF connector:

1. **GND**: main power supply ground.
2. **USB DP**: USB main differential interface, positive pole.
3. **USB DN**: USB main differential interface, negative pole. 1MOhm pull-down.
4. **GND**: main power supply ground.
5. **UART_RX**: Input UART TTL main interface receiving, the decoder is receiving on this pin. When the OEM decoder is in low power state, a negative level on this pin wakes up the OEM decoder, that goes back to idle state.
6. **UART_TX**: Output UART TTL main interface transmitting, the decoder is transmitting on this pin.
7. **UART_CTS**: Input UART TTL main interface Clear To Send.
8. **UART_RTS**: Output UART TTL main interface Ready To Send.

Table 4 - Electrical interface of the host connector.

Pin	Signal	I/O type	Description
1	GND	power	Ground
2	USB DP	I/O	USB from HOST
3	USB DN	I/O	USB from HOST
4	GND	power	Ground
5	UART_RX	In	UART from HOST
6	UART_TX	Out	UART from HOST
7	UART_CTS	In	UART from HOST
8	UART_RTS	Out	UART from HOST
9	BEEPER_CTRL	Out	Beeper activator signal
10	EXT_ILLUM_EN	Out	EXTERNAL ILLUMINATION control
11	GOOD_READ_LED	Out	Good Read LED activator (GreenSpot)
12	TRIG_CTRL	In	Trigger scan session
13	AIM_CTRL	In	Activates Aiming Mode
14	VCC	power	Power for Digital and SCAN ENGINE Digital + Sensor + I/O
15	VCC	power	Power for Digital and SCAN ENGINE Digital + Sensor + I/O
16	PWR_ON_CTRL	In/Out	System Ready signal
17	VCC ILLUM	power	Power for SCAN ENGINE Illumination
18	VCC ILLUM	power	Power for SCAN ENGINE Illumination
19	GND	power	Ground
20	STAND_MODE	In	Stand Mode activate signal
21	GND	power	Ground
22	USER_LED	Out	Control for additional LED
23	GND	power	Ground
24	GND	power	Ground
25	OPERATING	Out	Operating Mode signal
26	GND	power	Ground
27	RESERVED		GPIO for future use

9. **BEEPER_CTRL**: Output digital control signal for the beeper. It is intended to be a digital signal not a beeper power driver. Square wave signal (2.5KHz), 4mA max driving capability.
10. **EXT_ILLUM_EN**: Output digital control signal for an external illuminator. Synchronized with the exposure time of the 2D camera. It is intended to be a digital signal, not a LED power driver. 4ma max driving capability.
11. **GOOD_READ_LED**: Output digital control signal for an external LED indicating a successful decode. It is intended to be a digital signal, not a LED power driver. 4ma max driving capability.
12. **TRIG_CTRL**: Input, scan session start, active high. A positive level triggers the reading session; a negative level edge ends it. Anti-bounce schmitt-trigger circuit is integrated.
13. **AIM_CTRL**: Input, aiming mode control and wake-up signal, active high. When the OEM decoder is idle state, a positive edge activates (if enabled) the aiming functionality of the scan engine that is connected to the decoder; a negative edge deactivates aiming mode and OEM decoder goes back to idle state.It is also used to wake up the decoder when OEM Decoder is in low power state: if it has a positive LEVEL, the OEM decoder wakes up and goes back to idle state. This signal is pulled up internally to 3.3V with a 100KOhm resistor. If not driven, a 10K or stronger pull-down is required for proper AIM and LOW POWER operation.



If it is kept low, it cannot be used as a wakeup source.

14. **VCC**: Digital power: main digital power supply, 3.2 to 5.5 V This VCC powers the Big-CPU digital part. At power up, it must be higher than 3.2 V in order to ensure a correct power up. After power up sequence, the VCC voltage can drop down to 3.0 V.
15. **VCC**: additional input for Digital power: it is in short circuit with pin 14.
16. **PWR_ON_CTRL**: Input/Output, system ready and RS232 UART forced selection signal. This signal is in open drain, with its main behavior being an Output: when this signal is high (released) it indicates that the decoder is operative. When is low (driven down) indicates that low power state is active. Only if the VCC_ILLUM power supply on 27-poles connector is supplied and only during system boot it also behaves as input: if driven low externally during startup sequence (see paragraph "Power-up Sequence" on page 11) can be used to force the OEM decoder to activate UART as default interface. Line is open-drain, with a weak 380KOhm internal pull-up (typical value). An additional 10K pull-up (or stronger) is recommended.
17. **VCC_ILLUM**: Illumination power supply 3.0 - 5.5 V. If this power is supplied, it is used as the power source for the illumination system of the connected scan engine.



If this power is not supplied, the PWR_ON_CTRL signal behaves only as an output (see pin 16).

18. **VCC_ILLUM**: additional pin for Illumination power supply 3.0 - 5.5 V.

19. **GND**: main power supply ground.
20. **STAND_MODE**: Input, stand mode control signal, active high. When high, activates the stand mode operation that is automatically triggering the decoder by analyzing the changes on the images coming from the 2D camera video stream.
21. **GND**: main power supply ground.
22. **USER_LED**: Output digital control, this configurable signal controls an auxiliary LED. It is intended to be a digital signal, not a LED power driver. 4ma max driving capability.
23. **GND**: main power supply ground.
24. **GND**: main power supply ground.
25. **OPERATING**: Output digital signal, is High when the OEM decoder is in OPERATING mode, acquiring images for decoding. 4ma max driving capability.
26. **GND**: main power supply ground.
27. **RESERVED**: GPIO reserved for future use. Keep floating.

Power Supply and I/O Voltage

OEM decoder can be powered either by micro-USB cable (via the 5V USB pin) or 27 poles ZIF (via 4 dedicated pins, split into two different power rails VCC and VCC ILLUM). The OEM decoder can detect which of the two is powering it. If it is powered using micro-USB connector or if only VCC power rail is supplied, the PWR_ON_CTRL signal behaves only as output and cannot be used for forcing interface selection at boot (see paragraph "Power-up Sequence" on page 11).

OEM decoder can be powered ranging from 3.3V to 5.5V both on VCC and VCC ILLUM. After power up both power supplies can drop down to 3V without issues, since PMIC wake up threshold is set to 3.0V + 200mV rising hysteresis by default when is powered off. After power up, brown-out voltage on the PMIC is set to 2.8V, giving additional voltage margin.

If a good 5 volt supply is available, it is suggested to use it to power at least VCC ILLUM (pins 17,18 on the 27 poles connector), provided that on the current availability of that supply rail is sufficient for proper operation (see Appendix A: Technical Specifications).

The I/O interface with the host is at 3.3V levels, with UART being at 3.3V TTL levels.

The I/O interface towards the scan engines is at 3.3V levels, with the exception of MIPI signals being at MIPI compliant levels (1.2V single-ended in LPmode and 200mV differential in HSmode). See MIPI D-PHY and CSI2 standard specification for additional details.

Power-up Sequence

At power up the OEM decoder starts boot sequence when the power supply level reaches 3.2 V. The OEM decoder boot sequence is composed by:

- a bootloader phase: loads the application in memory; can be interrupted for updating software.
- an application initialize phase: the operating system boots and the application is initialized for standard operation.

To complete the boot sequence about 1100 ms are required; after this time the decoder is ready for operation.

During the VCC stabilization and for T_s ms the interface signals should be at low level. If Pull-ups are used, the pull-up power rail can follow VCC (limited to max V_IO = 3.6V).
The engine boot time is then T_r ms, composed by a bootloader phase and an application initialize phase. After that time the decoder is ready to operate. During boot sequence, the POWER_ON_CTRL line signals the boot phases (see figure). When the system is ready, the POWER_ON_CTRL stays high, meaning that OEM decoder is in IDLE mode.
When the OEM decoder is powered using 27poles zif connector (on both VCC and VCC_ILLUM pins), a switch to UART interface can be forced by hardware instead of using software commands or configuration barcodes, if needed: PWR_ON_CTRL line can be driven LOW during boot phase, so to set UART as the new default communication interface, regardless of the previously configured interface. This can be done in a specific time frame: during BOOTLOADER phase, (see the short pulses at time Tc shown in figure 11).
PWR_ON_CTRL line is open drain, so it can be driven low indefinitely without electrical conflict. This procedure is equivalent to using the configuration barcodes or configuration software commands for switching to UART interface.

Figure 6. POWER_ON_CTRL Signal (cyan waveform) Timing during Boot

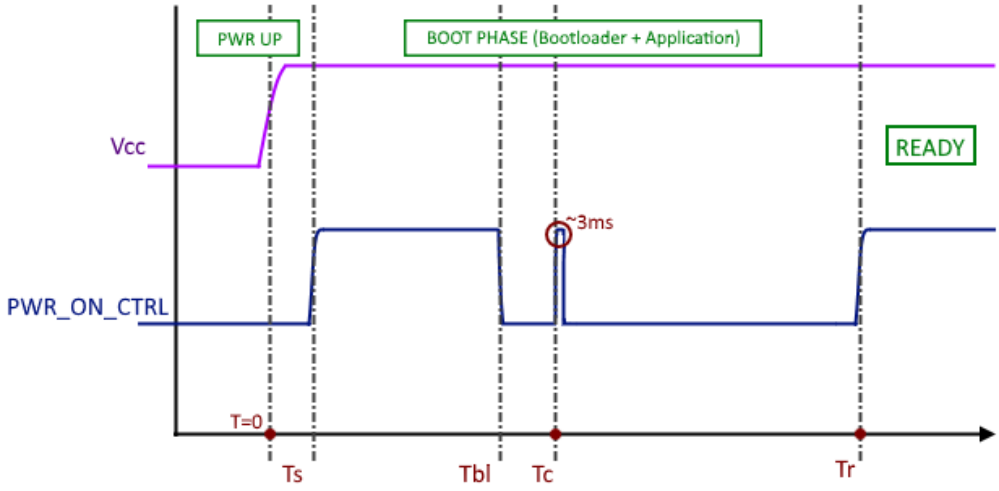
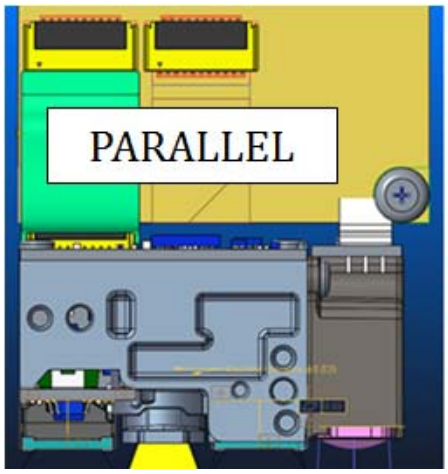


Table 5 - Start Up (@Vcc=5)

Item	Description	Value
T_s	T power startup: powering up, voltage should not be applied on all inputs	≃20 ms
T_{bl}	T I/O bootloader: I/O setup during bootloader	≃260 ms
T_{c1}	T check 1: pull low POWER_ON_CTRL here for forcing UART interface in bootloader and application.	≃351ms (width ≃3ms)
T_r	T ready: system is ready, OEM decoder is in IDLE mode, POWER_ON_CTRL is stable high	<1100 ms

With Vcc at 3.3V add about 33ms to all time values.

Scan Engine PARALLEL or MIPI Connection



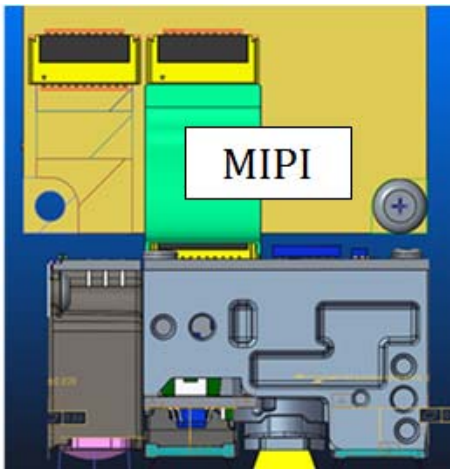


Table 6 - Electrical Interface of the MIPI Video Connector.

Pin	Signal	I/O type	Description
1	GND	power	Ground
2	I2C_DATA	I/O	I2C Data
3	I2C_CLK	In	I2C Clock
4	VCC_ILLUM_SYS	power	Illumination system power supply
5	VCC_ILLUM_SYS	power	Illumination system power supply
6	VCC	power	Digital and sensor power supply
7	Reserved	-	-
8	FLASH_OUT / HW TRIGGER	I/O	External illumination system trigger / Camera HW Trigger
9	VCC_IO	power	I/O reference and power supply
10	GND	power	Ground
11	MIPI CLKN	Out	MIPI-CSI2 differential clock lane (negative)
12	GND	power	Ground
13	MIPI CLKN	Out	MIPI-CSI2 differential clock lane (positive)
14	GND	power	Ground
15	GND	power	Ground
16	GND	power	Ground
17	MIPI DP	Out	MIPI-CSI2 differential data lane (positive)
18	GND	power	Ground
19	MIPI DN	Out	MIPI-CSI2 differential data lane (positive)
20	GND	power	Ground
21	GND	power	Ground

Table 7 - Electrical interface of the PARALLEL video connector

Pin	Signal	I/O type	Description
1	GND	power	Ground
2	PIXEL CLOCK	Out	I2C Data
3	GND	power	Ground
4	HSYNC	Out	LINE VALID SIGNAL
5	VCC_ILLUM_SYS	power	Illumination system power supply
6	VCC	power	Digital and sensor power supply
7	VCC_IO	power	I/O reference and power supply
8	FLASH_OUT / HW TRIGGER	I/O	External illumination system trigger / Camera HW Trigger
9	PIXEL0	Out	PIXEL BIT 0
10	PIXEL1	Out	PIXEL BIT 1
11	PIXEL2	Out	PIXEL BIT 2
12	PIXEL3	Out	PIXEL BIT 3
13	PIXEL4	Out	PIXEL BIT 4
14	PIXEL5	Out	PIXEL BIT 5
15	PIXEL6	Out	PIXEL BIT 6
16	PIXEL7	Out	PIXEL BIT 7
17	VSYNC	Out	FRAME VALID SIGNAL
18	I2C_DATA	I/O	I2C Data
19	I2C_CLK	In	I2C Clock
20	GND	power	Ground
21	GND	power	Ground

For a detailed description of the signals above please refer to the scan engine integration manual.

Connector and Flat Cable (Host Interface)

The DB0431 decoder is equipped with a 27-pole ZIF connector.

The host connector is 27-pole ZIF connector 0.5 mm pitch made for 0.2 mm thick flat cables.

KYOCERA 006299027010846+

HIROSE FH19C-27S-0.5SH (99)

Example part number for flex cable: Flexconn HCC27-35(3/5)6-T2TB

Scan Engine Connector and Flat cable

The connectors to the Scan Engines are Kyocera 21-pole ZIF connector having a pitch of 0.3mm - series 6283 - ordering code 04 6283 021 002 868.

In order to reduce radiated emission it is strongly recommended to adopt an EMI-shielded flat cable.

In order to improve MIPI signal quality keep the cable as short as possible.

An example 45mm cable is 100374600 PCB FLEX,21 POLES,SHIELDED, (see appendix for the drawings).

USB Powered Host and USB Interface Design Recommendations

The OEM decoder features some basic ESD protection and a controlled soft start during power up sequence, with a peak surge current below 130 mA (about 400us width) during input voltage ramp-up. Additional peaks are present during boot phase (see figure 11 for boot time), with a maximum peak below 250 mA (about 800us width). Carefully consider the OEM decoder consumption when integrating it on a USB powered system. If deemed necessary, the host may provide additional soft start circuitry in order to limit surge current. This might increase the power up time, of a value depending on the host circuitry design. OEM decoder is USB compliant, also when connected using its micro-USB connector.

Moreover, if USB communication interface is being used, additional standard USB protection for electrical immunity and adaptation might be applied to USB D+ and D- lanes on Host PCB, if needed. Carefully investigate such thematics when designing the host electronics.

Already on OEM decoder USB D+ and D- lines: 10 Ohm series resistor, common mode choke and TVS array; please consider this when designing USB transmission line on Host.

OEM Decoder Operation

The OEM decoder features three power states (working modes) that are reachable using the control interface by sending commands through it.

Table 8 - Power States (Working Modes)

Mode	Description
LOW POWER	Mode for energy saving: the decoder is in a state of sleep and most of the internal circuitry is disabled. T_w is required for wake up. Lowest on power consumption.
IDLE	The decoder is waiting for commands, all systems ready for operations. The connected scan engine is in low power mode. Moderate power consumption.
OPERATING	The connected scan engine is in Running mode with illumination and AIM turned on; the scan engine is continuously acquiring images to the decoder, that provides decoded data as soon as ready. All systems working, full power consumption.

Default Operation: The decoder in IDLE state starts the acquisition and decoding phase (entering OPERATING mode) when the level of the TRIG_CTRL signal goes from low to high (or issuing a DESP "Start" command through the communication interface). If an image is decoded, GOOD_READ_LED goes high and BEEPER_CTRL outputs a PWM and the decoder returns to IDLE state.

When UART interface is selected: The decoder can be put in LOW POWER mode by sending the DESP command "Suspend" through the UART interface. While in Low power, be sure to keep AIM_CTRL signal low and UART_RX signal High for correct low power operation.

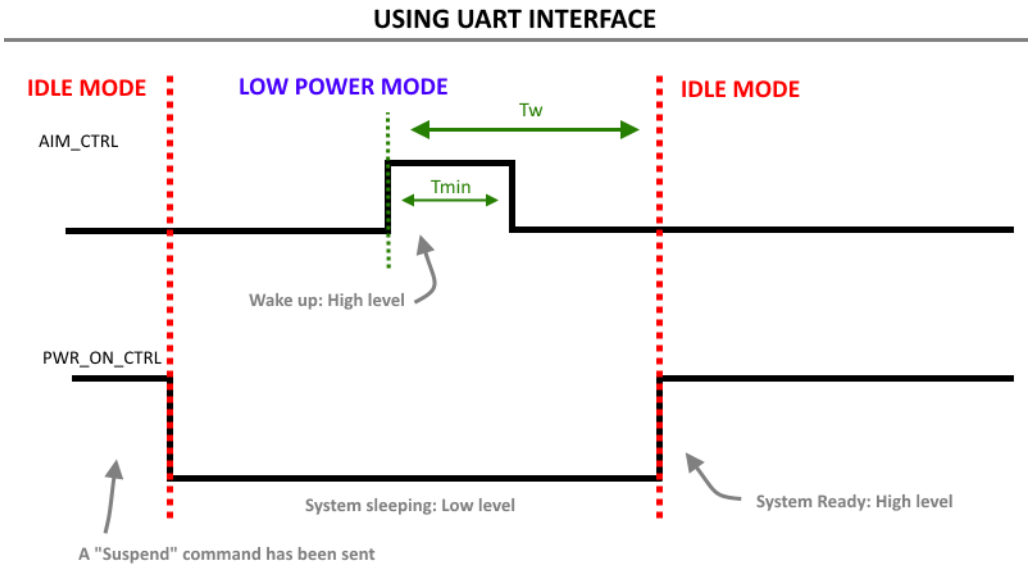
To wake up, use any of the following procedure:

- a high level on the AIM_CTRL signal. Minimum duration of high level on the line for wake-up is T_{min} (see figure).
- a low level on the UART_RX signal pin. For example, sending any command through the UART interface will wake up the decoder.

The LOW POWER state is signaled on the output interface by the low level of the PWR_ON_CTRL signal. If the signal PWR_ON_CTRL is high the decoder is either OPERATING or IDLE.

In the following figure a diagram of the wake up procedure using AIM_CTRL line: after the wake up time of T_w ms the OEM decoder is back to IDLE mode and can be triggered.

Figure 7 - Low Power and Wake Up with UART Interface





The same diagram counts also for UART_RX signal, but with polarity opposite to AIM_CTRL.

Table 9 - Wake-up Pulse Table

Item	Description	Value
T_w	Wake up time: from low power to idle	≃10 ms
T_{min}	Minimum pulse needed for a wake up event to be recognized	≃0.1us

When USB interface is selected: the decoder will go to LOW POWER mode when the Host puts the USB port in suspend. No command is needed.

When the Host resumes the USB port, the decoder will go back to IDLE mode. In this use case, the LOW POWER commands should not be sent to OEM decoder and AIM_CTRL line should be always kept low and UART_RX kept high while in USB suspend (and before any LOW POWER transition).

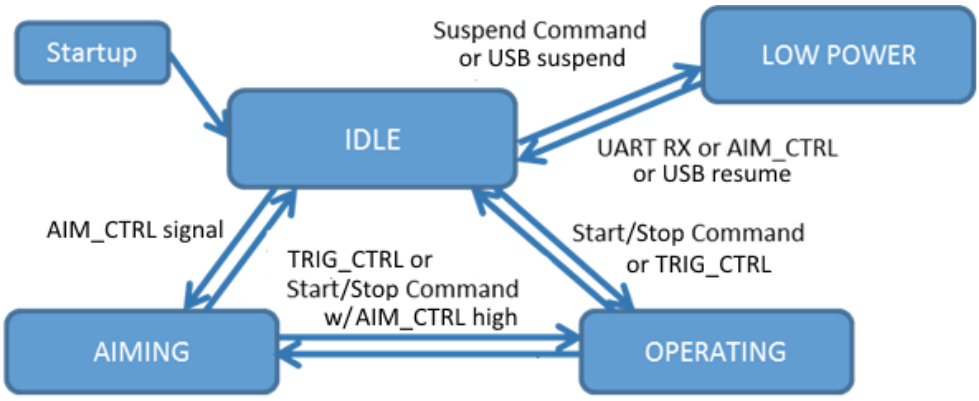
Alternative operating modes: the OPERATING mode can be modified selecting a number of different behaviours: TRIGGER SINGLE (default), TRIGGER HOLD MULTIPLE, TRIGGER SINGLE MULTIPLE, FLASHING, ALWAYS ON and STAND MODE. In particular, in Always ON and Stand Mode (or Object Sense) the decoder is constantly OPERATING and is consuming higher power than in IDLE mode. See DB0431 USER GUIDE for more details.

In **Always ON** the decoder is keeping the scan engine on with the illumination and aiming on and is decoding and transmitting everything presented in the scan engine field of view, without switching off the illumination and the aiming after a successful decode.

In **Stand Mode** (Object Sense), the decoder is keeping the scan engine illumination off and the aiming on. The illumination is switched on if an object is presented in the scan engine field of view – then the information, if present, is decoded and transmitted. After a period of "ON" time the decoder is switching off the scan engine illumination stepping back to sensing the field of view for an object to come in. See DB0431 USER GUIDE for more details.

Mode transition sequences and mode corresponding inputs are described in the following diagram:

Figure 8 - Working Modes Diagram



If in OPERATING mode the TRIG_CTRL is set at low level, the decoder will go first to IDLE mode then to LOW POWER mode. The timing for all transitions is described in Table 10:

Table 10 - Mode Transition Times

NEW STATES				
CURRENT STATE:	LOW POWER ⇧	IDLE ⇧	OPERATING ⇧	AIMING ⇧
LOW POWER	-	≃10ms	-	-
IDLE	≃0.04	-	≃8ms	≃7ms
OPERATING	-	max 80ms*	-	max 50ms*
AIMING	-	max 26ms*	max 26ms*	-

* dependent on the sync with scan engine sensor streaming

The decoder operation starts with asserting the signal TRIG_CTRL to high. This makes the engine exit the IDLE state and enter into the OPERATING mode, the transition time is about 8ms. The connected scan engine is put in RUNNING mode and starts image acquisition and streaming. For more details please refer to appropriate scan engine integration guide.

To enter the LOW POWER mode from IDLE the engine takes a time of about 0.04ms. If the decoder is in LOW POWER time, a LOW POWER to IDLE transition must be issued for resuming normal operation and before going to any other mode.

After entering IDLE mode the decoder can either parse UART/USB COM commands or respond to the interface signals TRIG_CTRL and AIM_CTRL (if aiming mode is enabled).

AIMING MODE: an optional working mode of the decoder is the AIMING mode: it is a special mode that turns on only the aiming system of the connected scan engine without decoding images, that can be used for aiming at target before decoding. When this mode is enabled (default is disabled), if AIM_CTRL signal goes high the connected scan engine goes into RUNNING mode activating only the aiming system. If the AIM_CTRL signal goes back low, the decoder gets back to IDLE state; if instead the TRIG_CTRL line goes high (or a “Start” command is sent via communication interface) the decoder goes form AIMING mode to OPERATING mode, acquiring and processing images normally.

Communication

The serial communication between the host and the decoder occurs using the selected interface (UART or any USB except USB keyboard) with the default setting of: baud rate 115.2k, 8 data bits, No parity, 1 stop bit.

The decoded data is sent through this interface (UART, USB-COM and USB-OEM configurations only).

For controlling the OEM decoder the protocol used is the Decoded Engine Serial Protocol (DESP). The DESP protocol can be used to start/stop operation and get the decoded result. It is also used to manage the configuration. Please refer to Decoded Engine Serial Protocol Specification for detailed information.

If USB Keyboard interface is used, the OEM decoder only sends decoding result as a normal keyboard output, so it cannot receive any data or commands from the host.

(**Default**) If USB Composite interface is used, the OEM decoder sends decoding result as a normal keyboard output, and it also opens a USB COM port for configuration or communication with the host using DESP protocol.

Appendix 4
Technical Specifications

This section lists the technical specification of the DB0431 OEM decoder. Refer to the appropriate Datalogic Scan Engine integration guide for informations related to scan engine performances.

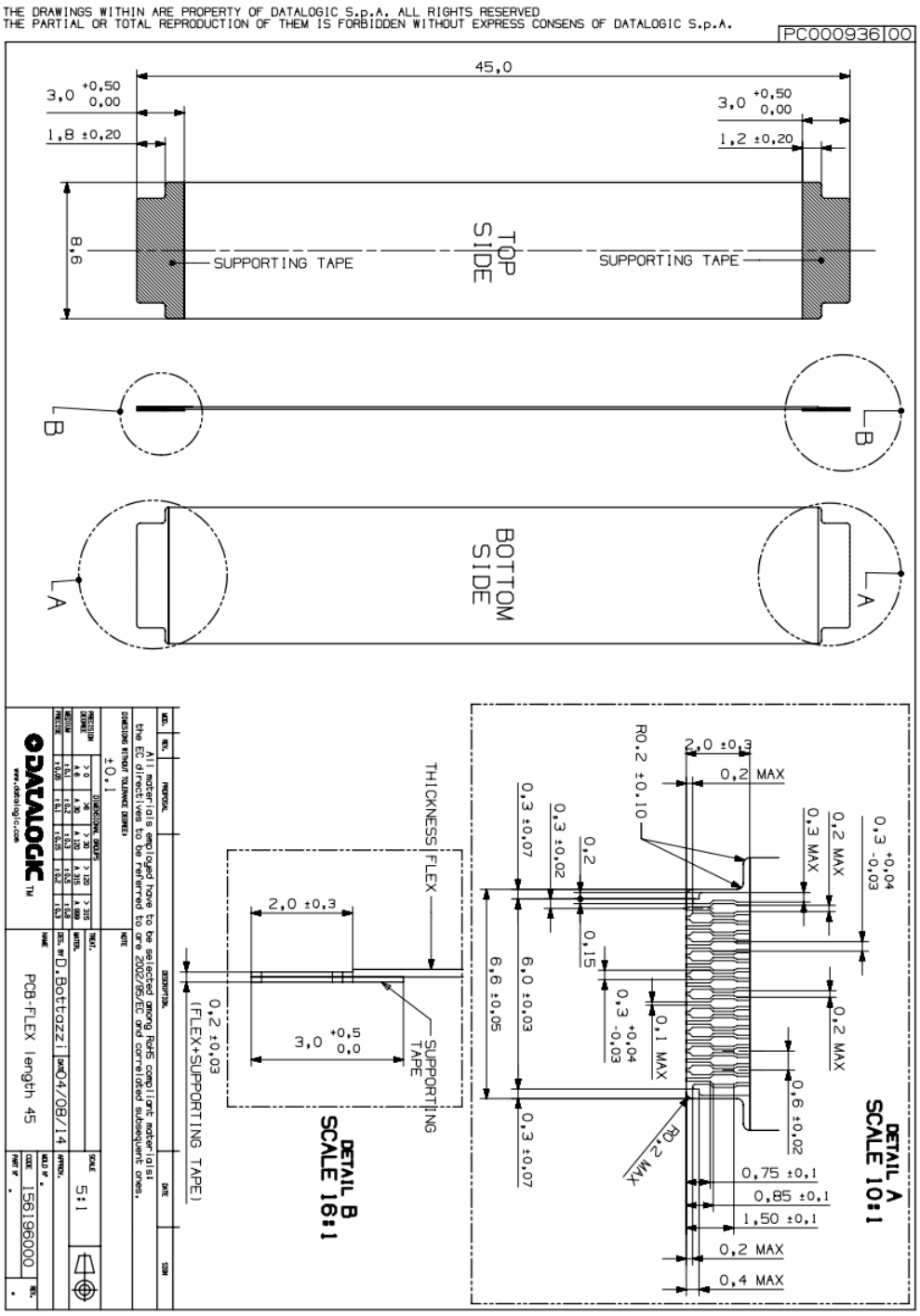
Item	Description
Physical Characteristics	
Dimensions	**Nominal size:** Width 30 mm Height 6.45 mm Depth 30 mm **Maximum size:** Width 30.1 mm Height 6.55 mm Depth 30.1 mm
Weight	6 g
Interface	Host – 27 pin ZIF Connector Parallel scan engine – 21 pin ZIF Connector MIPI CSI-2 scan engine – 21 pin ZIF Connector
Electrical Characteristics See Table 6 on page 13 for more information.	
Total Current Consumption (scan engine excluded)	RMS value @ 5V Power Supply OPERATING (Typical) ≃ 82 mA IDLE (Typical) ≃ 44 mA LOW POWER < 4 mA
Peak Total Current Consumption (including scan engine)	@ 5V Power Supply @ startup or exit LOW POWER <400 mA surge current peak about 900us width triangular peak of which about 500us are above 200ma
Input Voltage	Values @ 23°C: VCC: 3.2 – 5.5 VDC (compatible with USB powering) can drop down to 3.0V once power-up is completed

Item	Description
Performance Characteristics	
Image Sensor	Depending on the scan engine connected – refer to corresponding scan engine integration guide
Light Source	Depending on the scan engine connected – refer to corresponding scan engine integration guide
Field of View	Depending on the scan engine optics – refer to corresponding scan engine integration guide
User Environment	
Operating Temperature	Operating: -30 to 60ºC / -22 to 140ºF
Storage Temperature	Storage / Transport: -40 to 70ºC / -40 to 158ºF
Humidity (non-condensing)	95%
Mechanical Shock	2000 G ± 5% applied via any mounting surface at - 30° and 70° C for a period of 0.85 ± 0.05 msec 2500 G ± 5% applied via any mounting surface at 23° C for a period of 0.85 ± 0.05 msec
ESD Level	±2.0kV @ connector
Regulatory	
Illumination System (GREEN LED)	IEC 62471 Exempt risk group
Environmental	RoHS compliant

Table 11 - List of Datalogic Compatible Scan Engines

Scan Engine	Resolution	FOV	AIMING Types
DE2011-DL	752x480	40°H x 26°V	Laser cross + dots
DE2x12-DL	1280x96	42°H x 32°V	Laser cross + dots
DE2x12-SR	1280x960	42°H x 32°V	Laser cross + dots
DE2x12-WA-DL	1280x960	52°H x 40°V	Laser cross + dots
DE2101-DL	640x480	48°H x 34°V	LED spot
DE2102-DL	1280x800	42°H x 26°V	Laser cross + dots

Shielded Double Side FLEX 21 Example Drawing



Appendix 5
Ordering Information

OEM Decoder is available in a single model providing all possible output interfaces (DB0431). The default interface is USB composite, refer to the User's Guide for instructions about different interface configurations.

In order to test decoder and scan engine performance, 2 demo kits are available:

- DE201X DEMO: Halogen™ demo kit, including decoder board and one engine for each DE201X compatible model (4 engines total, all with parallel interface, see table below).
- DE210X DEMO: Halogen™ micro demo kit, including decoder board and one engine for each DE210X compatible model (2 engines total, all with MIPI interface, see table below).
- DB0431 DEMO: OEM decoder demo kit, including decoder only (engines to be bought separately).

Table 12 - List of Datalogic Compatible Scan Engines

Scan Engine	Resolution	FOV	AIMING Types
DE2011-DL	752x480	40°H x 26°V	Laser cross + dots
DE2x12-DL	1280x96	42°H x 32°V	Laser cross + dots
DE2x12-SR	1280x960	42°H x 32°V	Laser cross + dots
DE2x12-WA-DL	1280x960	52°H x 40°V	Laser cross + dots
DE2101-DL	640x480	48°H x 34°V	LED spot
DE2102-DL	1280x960	42°H x 26°V	Laser cross + dots

www.datalogic.com

©2020 Datalogic S.p.A. and/or its affiliates. All rights reserved. Datalogic and the Datalogic logo are registered trademarks of Datalogic S.p.A. in many countries, including the U.S. and the E.U.

Datalogic S.r.l.
Via S. Vitalino, 13 | Calderara di Reno
40012 BO | Italy | Telephone: (+39) 051-3147011
Fax: (+39) 051-3147205

820109091 (Rev. B) May 2020