

# CAN BUS KEYPAD PLUS

## Engineered for the Toughest Environments

- Modern flush styling
- No-tool snap-in front mounting
- LEDs on ridges for greater viewing angle
- Designed for ISO 13849 safety rated vehicles
- Self-diagnostics include:
  - Supply voltage monitoring
  - Indicator “LED ON” verification
  - Button short detection
- Low current sleep mode (<1.5 mA) with wake on:
  - CAN message
  - button press
  - input pin signal
- CAN FD tolerant
- 2 configurable I/O pins
- Dimmable LED indicators and legends
- Same field-tested reliability as 3KG1 Keypads, with over 1 million in operation
- Backward compatible firmware with 3KG1 Keypads



## 3KG2 CUSTOM OPTIONS

Custom configurations are available.  
Contact Grayhill to build your custom part number.

- Custom button top legends
- Up to 3 LED indicators per button

### Indicator Colors:

- Amber (Standard)
- Blue
- Green
- Red
- White
- Yellow

### Backlight Colors:

- Green (Standard)
- White (Standard)
- Amber
- Blue
- Pure Green
- Red
- Yellow

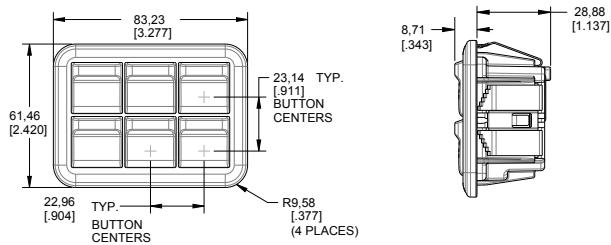
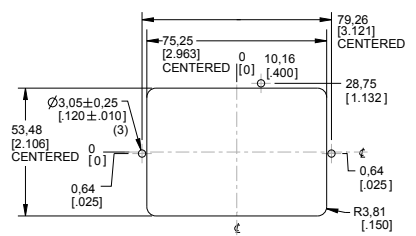
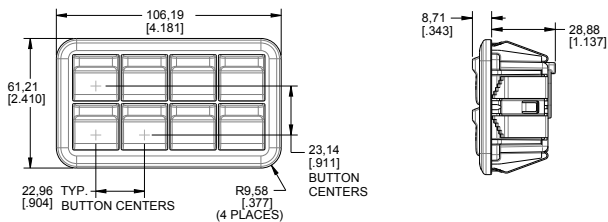
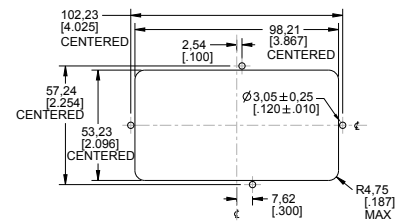
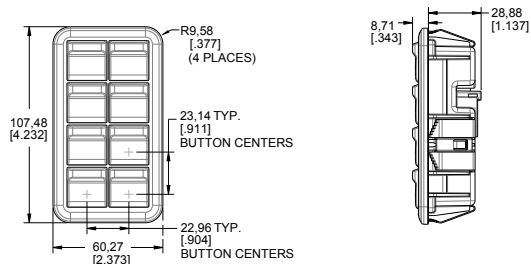
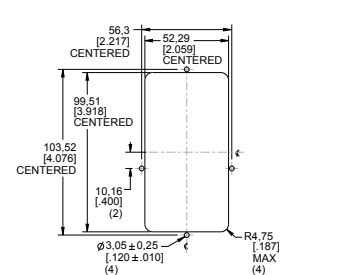
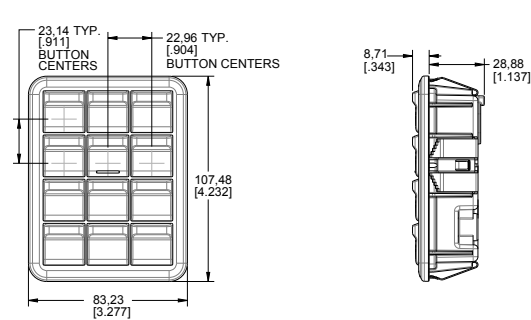
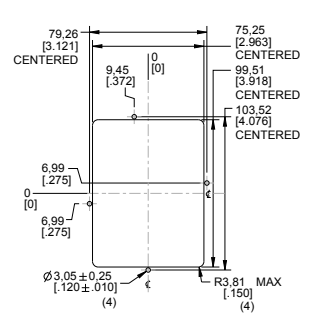
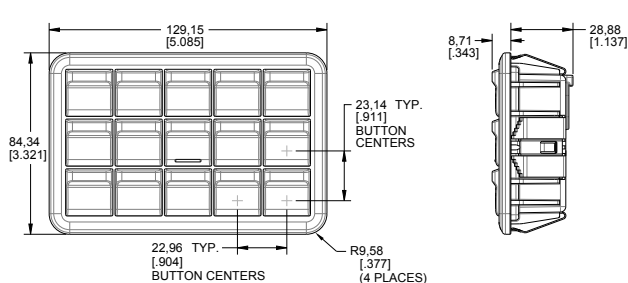
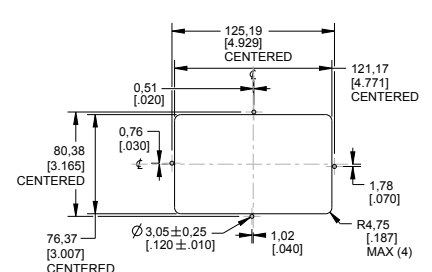
## YOUR EXPERTS IN CAB CONTROLS

Grayhill specializes in the design, development, and production of human interface controls, including:

- Cab user interface design
- Customized control panels
- CAN bus interface devices

**DIMENSIONS in millimeters [and inches]**

 All dimensions are  $\pm 0.50$  mm (Panel thickness to be  $2.5 \pm 1.0$  mm)

**3KX06-G2-2RX3AX 6-Position Keypad**

**Panel Cutout and Mounting Information**

**3KX08-G2-2RX3AX 8-Position Keypad (Horizontal)**

**Panel Cutout and Mounting Information**

**3KX08-G2-4RX3AX 8-Position Keypad (Vertical)**

**Panel Cutout and Mounting Information**

**3KX12-G2-4RX3AX 12-Position Keypad**

**Panel Cutout and Mounting Information**

**3KX15-G2-3RX3AX 15-Position Keypad**

**Panel Cutout and Mounting Information**


Specifications are subject to change.

## SPECIFICATIONS

### Electrical Specifications

<b>Maximum Load</b>	ISO 16750-4 5.1	Low temp = -40 °C High temp = +85 °C Duration: 4 hrs at low temp, 11 hrs at high temp Maximum load applied
<b>Over-Voltage</b>	ISO 16750-2 4.3.2	High voltage: 36 V, Duration: 60 min Tmax - 20 °C
<b>Superimposed Alternating Voltage</b>	ISO 16750-2 4.4	Severity 2 and 3; Ri = 50 mΩ Frequency range: 50 Hz to 25 kHz Sweep duration: 120 s Number of sweeps: 5 (continuously)
<b>Slow Decrease and Increase of Supply Voltage</b>	ISO 16750-2 4.5	
<b>Momentary Drop in Supply Voltage</b>	ISO 16750-2 4.6.1	Class B no reset
<b>Reset Behavior at Voltage Drop</b>	ISO 16750-2 4.6.2	Class C
<b>Starting Profile</b>	ISO 16750-2 Sec. 4.6.3 <i>Formerly known as Pulse 4</i>	12 V, Level II Class B and Level IV Class A 24 V, Level II Class A and Level III Class A
<b>Load Dump</b>	ISO16750-2 sec 4.6.4.2.2 Test A <i>Formerly known as ISO7637-2 Pulse 5</i>	12 V: Us = 101 V, 12 V case Ri = 4 ohm, td = 400 ms 24 V: Us = 202 V, 24 V case Ri = 8 ohm, td = 350 ms
<b>Reverse Polarity</b>	ISO 16750-2 4.7.2.3	Voltage: -28 V, Duration: 60 s
<b>Open Circuit Tests</b>	ISO 16750-2 4.9.1.2	Relay and signal outputs to be connected to load
<b>Short-Circuit Protection</b>	ISO 16750-2 4.10.2 Signal Circuits	Connect all signal inputs and outputs to Vmax and GND for 60 s. One circuit tested at a time.
<b>Short-Circuit Protection</b>	ISO 16750-2 4.10.3 for Load Circuits	ISO 8820 operating time rating +10% Minimum Class C
<b>Parallel Inductive Load</b>	ISO7637-2 Pulse 1	Us = -600 V
<b>Wire Harness Inductance</b>	ISO 7637-2 Pulse 2a	Wire harness inductance
<b>Switching Spikes</b>	ISO 7637-2 Pulse 3a	Pulse 3a: Us = -300 V Pulse 3b: Us = +300 V
<b>Fast Transients Mutual Coupling</b>	ISO 7637-2 Pulse 3b	Pulse a: 24 V Class IV Us = -80 Pulse b: 24 V Class IV Us = +80
<b>Slow Transients Mutual Coupling</b>	ISO7637-3 4.3.2	DCC slow + = +30; DCC slow - = -30 ICC slow + = +6; ICC slow - = -6

### Physical Specifications

<b>Vibration, Random</b>	ISO 16750-3 4.1.2.7	Commercial vehicle, sprung masses
<b>Vibration, Sinusoidal</b>	MIL-STD-202G, Method 204D, Test Condition C	Logarithmic Sweep from 10 Hz – 2000 Hz – 10 Hz over a period of 20 min Duration: 4 hrs (12 cycles) in each of 3 orthogonal axes Maximum displacement for 10 Hz – 55 Hz: 0.06" Peak acceleration for 55 Hz – 2000 Hz: 5G
<b>Shock/Crash Safety</b>	ISO 16750-3 4.2.2	Pulse shape: half-sinusoidal Acceleration: 500 m/s <sup>2</sup> Duration: 6 ms Number of shocks: 10 per test direction
<b>Drop</b>	ISO 16750-3 4.3	Height: 400 mm Repeat for all practical edges and faces
<b>Chemical Resistance</b>	ISO 16750-5	All agents on Table 1 except battery fluid

### Environmental Specifications

<b>Operating Temperature</b>	ISO 16750-4 5.1.1.2 ISO 16750-4 5.1.2.2	Low temperature: -40 °C for 24 hrs High temperature: +85 °C for 96 hrs
<b>Storage Temperature</b>	ISO 16750-4 5.1.1.1 ISO 16750-4 5.1.2.1	Low temperature: -55 °C High temperature: +105 °C
<b>Thermal Shock</b>	ISO 16750-4 5.4.3	High temperature: +85 °C Water temperature: 2±2 °C
<b>Altitude (Barometric Pressure)</b>	IEC60068-2-13	Sea level to 15240 m (101.3 kPa to 11.6 kPa), Exposure Time: 2 hrs
<b>Shipping Integrity</b>	ISTA Procedure 3A	
<b>Solar Radiation</b>	ISO 4892-2 Method B 1000 hours SAE J2527 1000 hours	No change in color or appearance of protective hardcoat layer
<b>Ingress Protection (IP6K7/9K)</b>	IEEC 60529 – IP6KX/IPX9K ISO 20653 8.3.3 – IPX7	
<b>Humidity</b>	ISO 16750-4 5.7 (Damp Heat) ISO 16750-4 5.6.2.2 (Humidity Cycling)	Damp heat: Duration: 21 days Temperature: 40° C Humidity: 85% Humidity cycling: Test Db, Variant 1 Thigh = 55° C Number of cycles: 6 Duration of cycle: 24 hrs
<b>Salt Fog</b>	ISO 16750-4 5.5.1	5% aqueous solution of NaCl @ 35 °C and a pH between 6.5 and 7.2
<b>Extended Duration Temperature and Humidity Cycling</b>	Custom Temperature/ Humidity Profile	Temperature cycle: Dwell at -40°C for 15 min; Ramp to 85°C over 45 min; Dwell at 85 °C for 15 min; Ramp to -40 °C over 45 min Humidity cycle: 70% when temperature is 85 °C Humidity uncontrolled while temperature < 0 °C during ramp-up and during ramp-down. Voltage cycle: 12 VDC from the beginning of the temperature ramp-up to the beginning of the temperature ramp-down; 0 VDC everywhere else Total number of cycles: 343 (620 hrs / 29 days total)

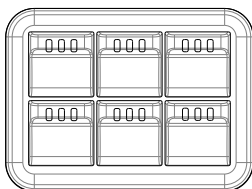
### Electromagnetic Compatibility Specifications

<b>Radiated Immunity</b>	ISO 11452-2 ALSE	80 MHz – 1000 MHz, 200 V/m
	ISO 11452-2 ALSE	1000 – 2500 MHz, 200 V/m, 3-axis
	ISO 11452-3 TEM cell	0.01 – 200 MHz, 300 V/m
	ISO 11452-4 Bulk current injection	0.5 MHz – 400 MHz, 300 mA
<b>Electrostatic Discharge</b>	ISO 11452-5 150 mm Stripline	0.01 MHz – 400 MHz, 300 V/m
		ESD Capacitor Network 330 pF, 330 Ω Conductive Surfaces Contact Discharge +/-15 kV Non-Conductive Surfaces Air Discharge +/-25 kV Indirect Discharge +/-20 kV
<b>Electrostatic Discharge</b>	ISO 10605 8 powered-up test	
<b>Electrostatic Discharge</b>	ISO 10605 9 unpowered test	ESD Capacitor Network 150 pF / 2 kΩ Conductive Surfaces Contact Discharge +/-15 kV Non-Conductive Surfaces Air Discharge +/-25 kV Indirect Discharge +/-20 kV
<b>Radiated Emissions Broadband</b>	ISO14982  CISPR 25 where frequency bands are specified	CISPR 25 Class 5 where specified CLASS 3: Average, Peak and Quasi Peak (where specified), on remaining CISPR 25 defined bands
<b>Radiated Emissions Narrowband</b>	ISO14982  CISPR 25 where frequency bands are specified	CISPR 25 Class 5 where specified CLASS 3: Average, Peak and Quasi Peak (where specified), on remaining CISPR 25 defined bands
<b>Conducted Emissions</b>	CISPR 25 6.2	Class 5

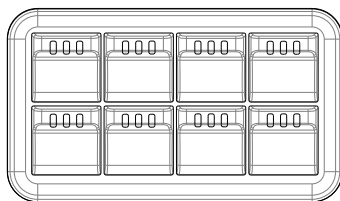
Specifications are subject to change.

**MIX & MATCH** with any keypad and symbol form factors number of keys

**Blank Versions Shown**

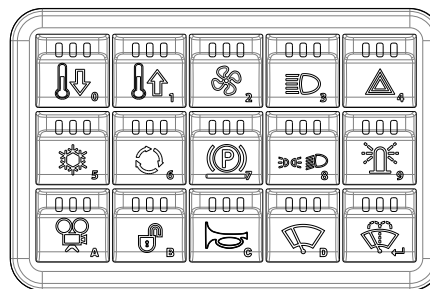


6 Position Keypad



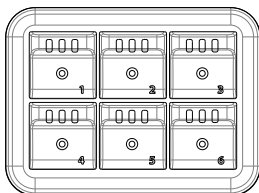
8 Position Keypad (Horizontal)

**ISO Symbols**

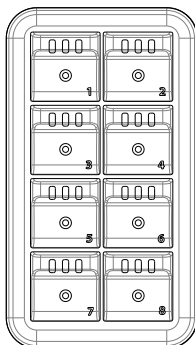


15 Position Keypad

**Target Legends Shown**



6 Position Keypad



8 Position Keypad (Vertical)

**CONNECTOR PINOUT**

Flexible I/O pins can be configured as

- Relay Driver
- 10 mA constant current push-pull

MATES WITH DEUTSCH #DT06-6S WITH W6S WEDGE LOCK.		
PIN	SIGNAL	
1	POWER	
2	GROUND	
3	I/O 1	
4	I/O 2	
5	CAN_H	
6	CAN_L	

MATES WITH DEUTSCH #DT06-4S WITH W6S WEDGE LOCK.		
PIN	SIGNAL	
1	POWER	
2	GROUND	
3	CAN_H	
4	CAN_L	

**ORDERING INFORMATION**

**3 K X X X - G 2 - X R X 3 A X**

**Series**

**Keypad Symbols**

- 0 = Blank
- 1 = ISO Symbols
- 2 = Targets (8 position only)

**Number of Keys**

- 06 = 6 keys
- 08 = 8 keys
- 12 = 12 keys
- 15 = 15 keys

**Generation Code**

- G2 = Generation 2

**Back Light Color**

- G = Green
- W = White

**Indicator Number/Color**

- 3A = 3 amber indicators per key (default)

**Protocol**

- C = J1939
- N = CANopen

**Number of Rows of Keys**

- 2R = 2 rows (6, 8 keys)
- 3R = 3 rows (15 keys)
- 4R = 4 rows (8, 12 keys)