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**TURCK**

# EZ-track<sup>®</sup> Q21 D Series Digital Output

Manual

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**Warning:**

Disconnect power before servicing. The Q21D Digital Output contains no serviceable components. Consult Factory for repair or replacement.

# Chapter 1: Hardware Overview

## Description of Q21D Digital Output

The **Q21D with Digital Output** is an accurate, auto-tuning, non-contact, linear displacement transducer in an economical, low profile package. The transducer utilizes our field proven magnetostrictive technology to give absolute position, repeatable to .006% of the active sensing distance. The streamlined anodized aluminum extrusion houses the sensing element and electronics. The magnet moves over the sensing element which determines the position and converts it to a Digital output.

The **Q21D LDT** has auto-tuning capability, which is the ability to sense a magnet other than the standard slide magnet and adjust its signal strength accordingly.

There is a diagnostic LED that is located at the connector end of the probe and provides visual status information regarding the operation of the LDT. Green indicates proper or normal operation. Red indicates the loss of the magnetic signal or an LDT failure. When the LDT is in the normal mode of operation, the LED will remain illuminated continuously.

**Green:** Magnet is present and within the active range.

**Red:** Fault, the LDT has lost its signal from the magnet or the magnet has moved into the Null or Dead zone.

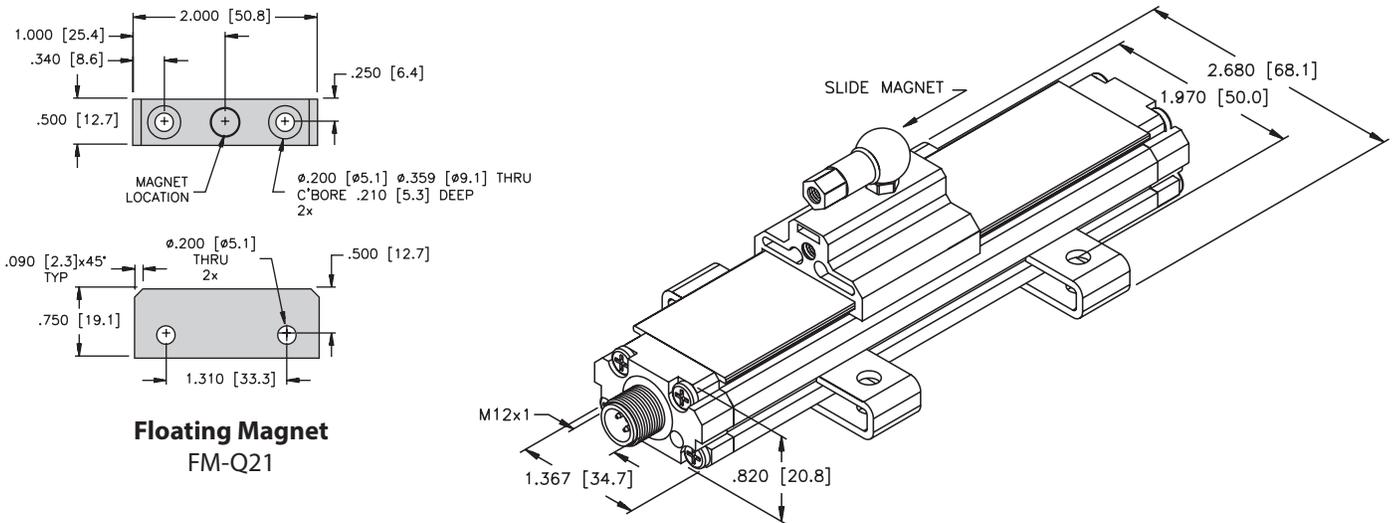
**Yellow:** No external interrogation pulse detected.

The Q21D with Digital Output is a Linear Displacement Transducer. It provides a Control Pulse, Start/Stop or Variable Pulse output signal that is proportional to the position of the slide magnet assembly along the length of the probe.

**Note:**

The part number on your LDT is a description of all the specific characteristics that make up your unit. This includes what interface type it is, its output signal and range, the type of connector the unit uses, and stroke length (see page 9 for part number key).

## Dimension Drawing for the Q21D Digital Output



The Q21D with Digital Output

## Chapter 2: Installing the Q21D

### Mounting Instructions

The **Q21D Digital** can be mounted vertically or horizontally using **MB-Q21** mounting brackets. The mounting brackets slide in the grooves on the lower part of the extrusion and clamp down when tightened. It is recommended to use one mounting bracket on each end and every three feet in between.

### Mounting the Magnet Assembly

Before mounting the magnet assembly, you should consider the following:

- Ferromagnetic material should not be placed closer than 1/4" from the LDT's sensing surface. Failure to do so could cause erratic operation. Non-ferrous materials, such as brass, copper, aluminum, non-magnetic stainless steel or plastics, can be in direct contact with the magnet assembly and sensing surface without producing any adverse results.
- Make sure that the magnet is located within the LDT's active stroke area. Captive magnet assemblies should be positioned so that they can move freely over the entire area of the active stroke without binding or pushing on the extrusion. Non-captive magnet assemblies should be situated so that the magnet is no further than 3/8" from the sensing surface at any point in the floating magnet assembly's movement.
- When using the Floating Magnet assembly (**FM-Q21**), the magnet should be installed within 3/8" of the sensing surface. The magnet assembly should also be installed in such a manner that it remains an even distance from the aluminum extrusion throughout the entire stroke. Improperly installed magnets can result in output signal non-linearity.

## Chapter 3: Q21D Overview

### CP (Control Pulse)

The Control Pulse signal interface of the Q21D digital output series is a differential RS-422 output. The maximum cable length for the differential digital EZ-track is 1500 feet. To initiate a start pulse, an external device is used. This start pulse should be a minimum of 1.0 microsecond in duration. After the start pulse is received, the Q21D will generate a stop pulse of 2.0 microseconds in duration. The time between the leading edge of the start pulse to the leading edge of the stop pulse is proportional to the distance from the Null Zone to the Magnet. The order of these two pulses is illustrated in the Figure 3-1. To wire the Q21D see Figure 3-7. For proper grounding information, see page 6, **Q21D Wiring Connections**.

### Variable Pulse (VP)

The Variable Pulse signal interface of the Q21D digital output series is a pulse width modulated signal (RS-422). The maximum cable length for the differential LDT's is 1500 feet. This LDT can also be configured for external or internal interrogation. External interrogation is when an external device connected to the LDT generates a start pulse. This start pulse should be a minimum of 1.0 microsecond in duration. Within 50 nanoseconds after the leading edge of the start pulse has been received, the LDT will generate an output pulse. The duration of the output pulse is proportional to the distance from the Null Zone to the Magnet. The order of these two pulses is illustrated in Figure 3-2.

The Q21D Variable Pulse can also generate internal interrogations. This LDT will continually output pulse width modulated signals. As with a Q21D Variable Pulse, using an external interrogation, the duration of this output pulse is proportional to the distance from the Null Zone to the Magnet. This is illustrated in Figure 3-3. To wire the Q21D Variable Pulse, see Figure 3-7.

### Recirculations

The method used to improve the resolution of a system using a digital LDT. The "on" time of a pulse width output is multiplied by a specific factor (from 1-127). This multiplication provides more counting time for the counter in the customer's electronics, thus improving the resolution. The only disadvantage to the higher recirculating numbers is the time needed to process the signal.

### RS (Start/Stop)

The Start/Stop signal interface of the Q21D digital output series is differential RS-422 output. The maximum cable length for differential LDT's is 1500 feet. To initiate a start pulse, an external device is used. This start pulse should be a minimum of 1.0 microsecond in duration. Within 50 nanoseconds after the leading edge of the start pulse, the LDT will generate a start pulse of 1.0 microsecond in duration. A stop pulse of 1.0 microsecond in duration will follow. The time it takes from the leading edge of the start pulse to the leading edge of the stop pulse is proportional to the distance from the Null Zone to the Magnet. The order of these two pulses is illustrated in Figure 3-4. To wire the Q21D Start/Stop signal, see Figure 3-7.

# Chapter 3: Q21D Overview (continued)

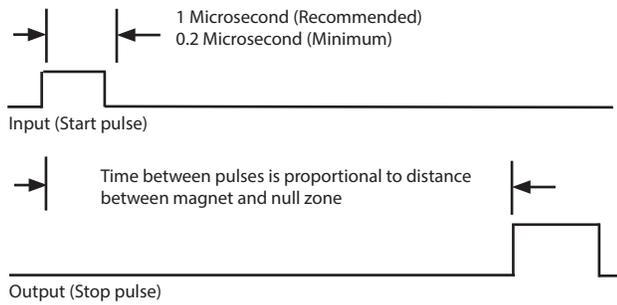


Figure 3-1 Q21D CP

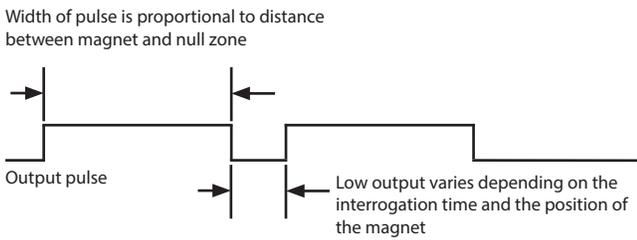


Figure 3-3 Q21D VPI with Internal Interrogation

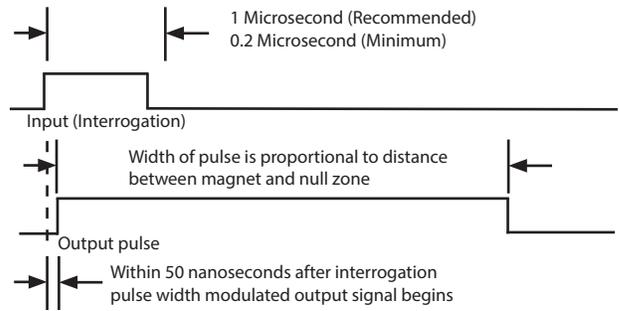


Figure 3-2 Q21D VPE with External Interrogation

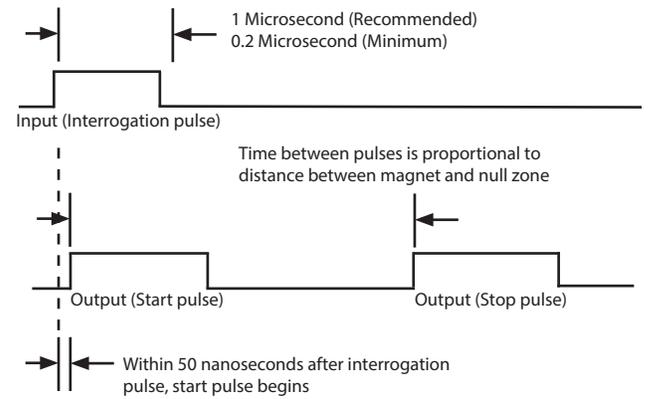


Figure 3-4 Q21D RS

# Q21D Wiring Connections

Once the LDT has been installed, wiring connections can be made. There are two groups of connections you will need to make. They are as follows:

- Power Supply Connections (including ground and shield)
- LDT's Input/Output Connections

## Power Supply/Ground Connections

The Q21D standard cable is a 6-pin, 12 mm **euromast**® style Cordset (see Figure 3-6 thru 3-8). It has 6 conductors of 24 AWG, with an aluminum/polyester/aluminum foil with drain wire plus an overall braid of tinned copper shield. Outside cable diameter is 0.20 inches. To reduce electrical noise, the shield must be properly used. Connect the cable's shield to the controller system GND.

Always observe proper grounding techniques such as single point grounding and isolating high voltage (i.e. 120/240 VAC) from low voltage (13.5-30 VDC cables). Whenever possible, this cable should be run in conduit by itself. The power supply common, the cable shield and a good earth ground should be connected together at the location of the power supply common.

**WARNING:**

Do not route the LDT's output cable near high voltage sources.

In order for the Q21D to operate properly, the LDT's external power supply must provide a voltage between +13.5 to +30 VDC. The power supply must be rated at 150 mA minimum. The power supply should provide less than 1% ripple and 10% regulations (the power supply should be dedicated to the LDT to prevent noise from external loads from affecting the position readings.)

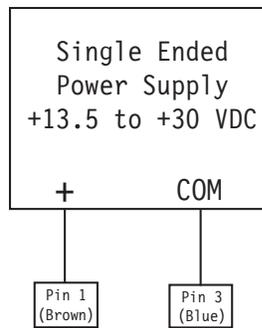


Figure 3-5: Power Supply Wiring

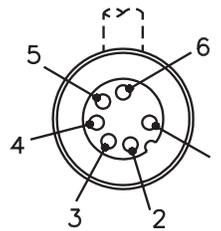


Figure 3-6: Pin-out

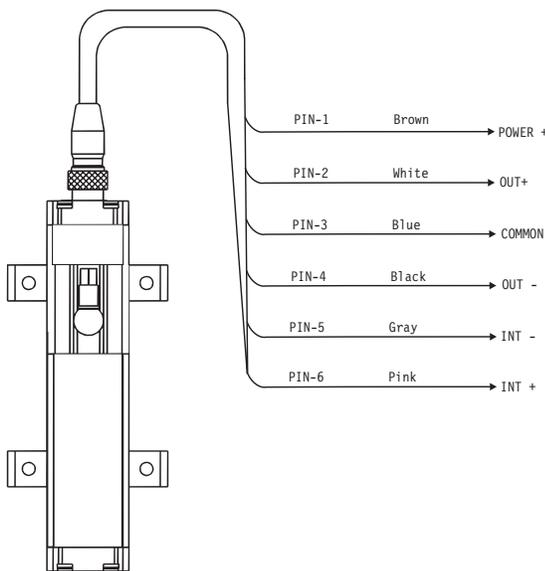


Figure 3-7: Wiring Diagram (Cable Assembly)

Wire Color	RKC6T-*/S618	Pin-out
Brown	1	PWR+
White	2	OUT+
Blue	3	COMMON
Black	4	OUT
Gray	5	INT
Pink	6	INT+

Figure 3-8: Wiring Colors

## Troubleshooting for Q21D Digital Output

Troubleshooting describes common problems that may occur when installing the LDT and offers possible solutions to these problems. If, after troubleshooting the LDT, you are unable to resolve a problem, contact our application support department at (800) 544-7769.

### General Checks

Make sure that the magnet is located within the LDT's active stroke area. Captive magnet assemblies should be positioned so that they can move freely over the entire area of the active stroke without binding or pushing on the extrusion. Non-captive magnet assemblies should be situated so that the magnet is no further than 3/8" from the sensing surface at any point in the floating magnet assembly's movement

#### Note:

Ferromagnetic material (material readily magnetized) should be located no closer than 0.25" from the sensing surface of the LDT. This includes mounting brackets, magnet spacers, magnet brackets, and mounting screws. Ferromagnetic material can distort the magnetic field, causing adverse operation or failure of the LDT.

Check all LDT wires for continuity and/or shorts. It is preferable that the cable between the LDT and the interface device be one continuous run. If you are using a junction box, it is highly recommended that the splice junction box be free of AC and/or DC transient-producing lines. The shield should be carried through the splice and terminated at the interface device end.

### Power Supply Check

This section will help you to determine if your power supply is adequate for the LDT to operate properly, or if the LDT cable has a short or open.

In order for the Q21D to operate properly, the external power supply must provide a level between 13.5 to 30 VDC. A power supply providing voltage above this specified range may damage the LDT. A power supply providing power below this specified range will not be sufficient to power the LDT. When powering more than one LDT on a single power supply, remember that each LDT requires 2.5 watts of power maximum. The amount of current draw will vary based on the input voltage used.

To calculate the current draw for a particular LDT, divide the LDT wattage by the input voltage. For example, 2.5 watts divided by 24 VDC equals 105 mA.

If your LDT is not operating properly, the LDT cable may have an open or short, or the power supply is not supplying sufficient power. To verify this, perform the following steps:

1. Turn the power supply OFF.
2. Remove the mating connector from the LDT.
3. Turn the power supply ON.
4. Using a digital voltmeter, check pins 3 (GND) and 1 (+) from the mating end of the cable for a level between +13.5 and +30 VDC.

If reading is between 13.5 and 30 VDC, turn power supply OFF and go to Step 7. If reading is below 13.5 VDC, either your power supply is not providing enough power or the LDT's cable possibly has a short/open. Readings of no voltage or minimal voltage (less than 5 volts) may be due to short/open in the cable. If reading is NOT between 13.5 and 30 VDC, go to Step 5. If reading is above 30 VDC, adjust power supply or replace.

5. Turn the power supply OFF.
6. Check the continuity of the individual wires of the cable between the power supply and the LDTs. Check for continuity from one end of the cable to the other. Also verify that no shorts exist between pins.
7. Reconnect the mating connector to the LDT.
8. Turn power supply ON.
9. Using a digital voltmeter, check the power supply's "+" and "-" terminals for a voltage between 13.5 and 30 VDC.

Low voltage readings may indicate a power supply with a wattage (current) rating that is too low. (Each LDTs requires 2.5 watts.) If the cabling checks out in Step 6, and your voltage is below 13.5 VDC, check your power supply current rating. If voltage is between 13.5 to 30 VDC and the LDT is still inoperative, contact factory.

## Specifications for Q21D Digital Output

General Specifications	
<b>Null Zone</b>	3.00"
<b>Dead Zone</b>	2.00"
<b>Extrusion Assembly</b>	Anodized Aluminum with gasket seals, IP 67, IP 68 Optional
<b>Connector</b>	6 Pin, M12 <b>euromast</b> ®
<b>Sensor Length</b>	5" to 180"
<b>Agency Approval</b>	CE
<b>Shock &amp; Vibration</b>	
Random Vibration	MIL-STD 810E, 10Grms random, 20Hz - 2K Hz
Shock	Tested to 40G

Electrical Specifications	
<b>Input Voltage</b>	Unipolar 13.5 to 30 VDC
<b>Current Draw</b>	2.5 watts maximum
<b>Nonlinearity</b>	+/- 0.05% of full stroke
<b>Repeatability</b>	+/- 0.006% of full stroke
<b>Hysteresis</b>	+/- 0.02% of full stroke
<b>Operating Temperature</b>	-20° to 70° C
<b>Storage Temperature</b>	-40° to 85° C
<b>Update Time</b>	Controller Dependent
Specifications are subject to change and are based on a typical 36" LDT.	

# Digital Profile Series Part Number Key

## Part Number Key: Digital Profile Series

A	B	C		D		E		F		G		H		I
LT	40	E	-	Q21D	-	VPI	-	001	-	X3	-	H1161	/	S1661

A	Type
LT	Linear Transducer

B	Measuring Span
*	Length of Measuring Span

C	Units of Measurement
E	Inches

D	Housing Height
Q21D	21 mm
Q35D	35 mm

E	Output Mode
CP	RS422, Control Pulse
RS	RS422, Start/Stop Pulse
VPE	Variable Pulse External Interrogations
VPI	Variable Pulse Internal Interrogations

F	Number of Recirculations <sup>1)</sup>
*	001 (Standard) to 127

<sup>1)</sup> Only Available with Output Mode 'VPI' or 'VPE'. Otherwise (Blank)

G	Number of LEDs
X3	3 Diagnostic LED's

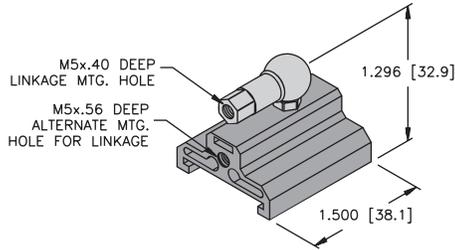
H	Type of Connection
H1161	6-pin M12 <b>eurofast</b> ® Connector

I	Specials
(Blank)	IP67
S1661	IP68

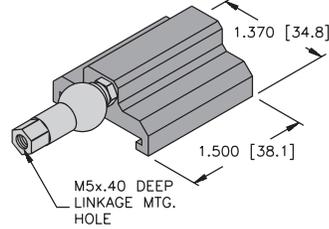
**Note:** In addition to the LDT, a typical system includes a magnet, mounting feet and cable (all sold separately).

# Accessories

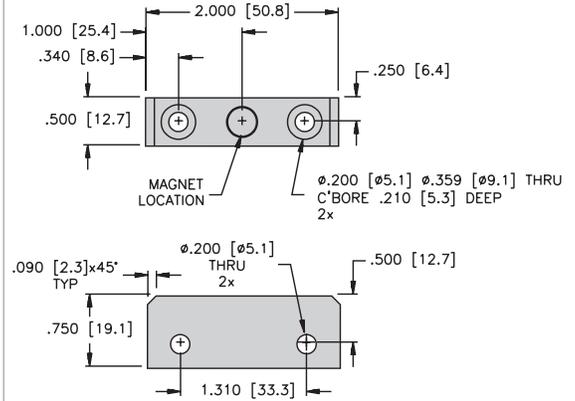
**Slide Magnet**  
SM-Q21 [A5600]



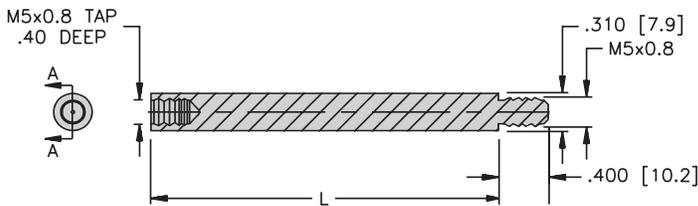
**Slide Magnet with Slide Adapter**  
SA-Q21 [A0864]



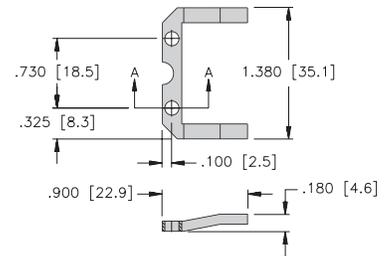
**Floating Magnet**  
FM-Q21 [A5500]



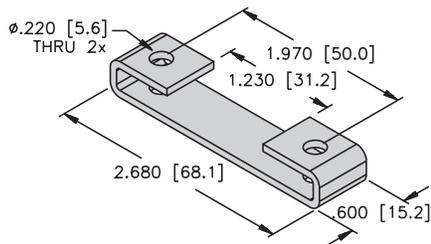
**Control Arms**  
CA\*E-Q21



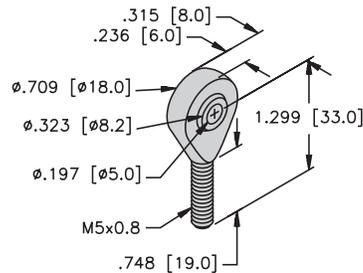
**Q21 Upside Down Brackets**  
UB-Q21 (2/bag) [A5500]



**Q21 Mounting Brackets**  
MB-Q21 [A5700]



**Rod Ends**  
RE-Q21 [A0865]



**RBVA-M5**

Angle Joint for M5 Thread,  
Stainless Steel



**ABVA-M5**

Angle Joint for M5 Thread,  
Stainless Steel





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B1404 B 10/15

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