Response Time

Introduction

With a **response time of 90 msec,** the Yokogawa EJA-E and EJX-A series of smart pressure transmitters are some of the fastest microprocessor based transmitters on the market today. This fast response time allows customers to track process changes more accurately than ever before, thus improving product quality and plant efficiency and safety.

Applicable Models

⇒ **EJA-E Series:** All models

⇒ **EJX-A Series:** All models except the EJX910A / EJX930A

Response Time

The industry definition for Response Time is the amount of time it takes for the output signal to reach 63.2% of the actual pressure change from the time the input change occurs. The 63.2% figure is derived from an equation used for modeling exponential decay rates and represents the output change for the first time constant.

Response time consist of two important components, ***Dead Time*** and the ***Time Constant.***

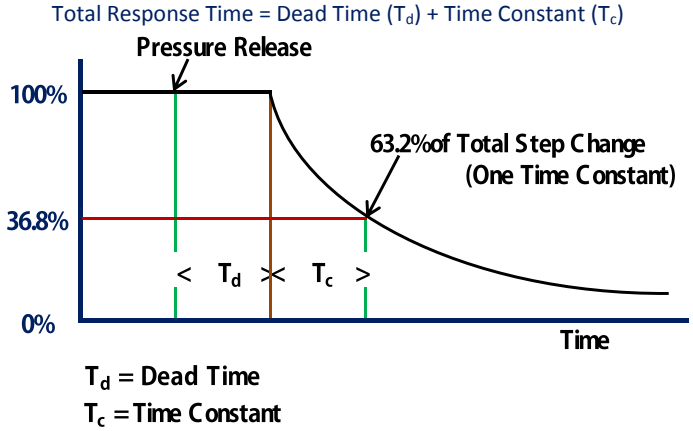


Figure 1: *Response Time Curve* FGP140-01.a

Dead Time (T_d)

Dead Time is the amount of time the transmitter takes to initially respond to the change in pressure.

Time Constant (T_c)

Time constant consists of the mechanical and electronic response time. Mechanical response time is the time it takes for the process pressure change to be transmitted by hydraulic force to the sensor. Electronic response is the time from the sensor detecting the pressure change to the transmitter electronics producing an output signal.

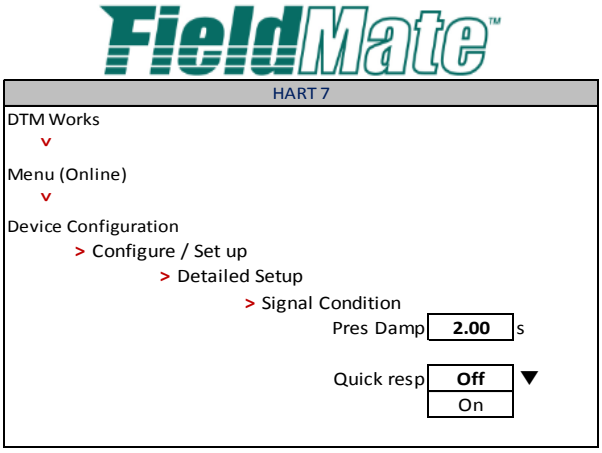
Damping

Damping is a setting that allow the customer to increase the dead time of the transmitter. This is done to keep the transmitter from "chattering". Chattering is when the output signal has small but rapid changes due to process variations. The damping removes this noise by extending the response time.

Setting when Shipped

Damping is set to 2.0 seconds.

The EJA-E and EJX-A transmitters are designed to not allow the damping to be set less than 0.5 sec unless the Quick Response feature is turned on. With the feature enabled, the damping can be set down to 0. To achieve the 90 msec response time, the damping must be set to 0. The damping may be set using DTM works in FieldMate.



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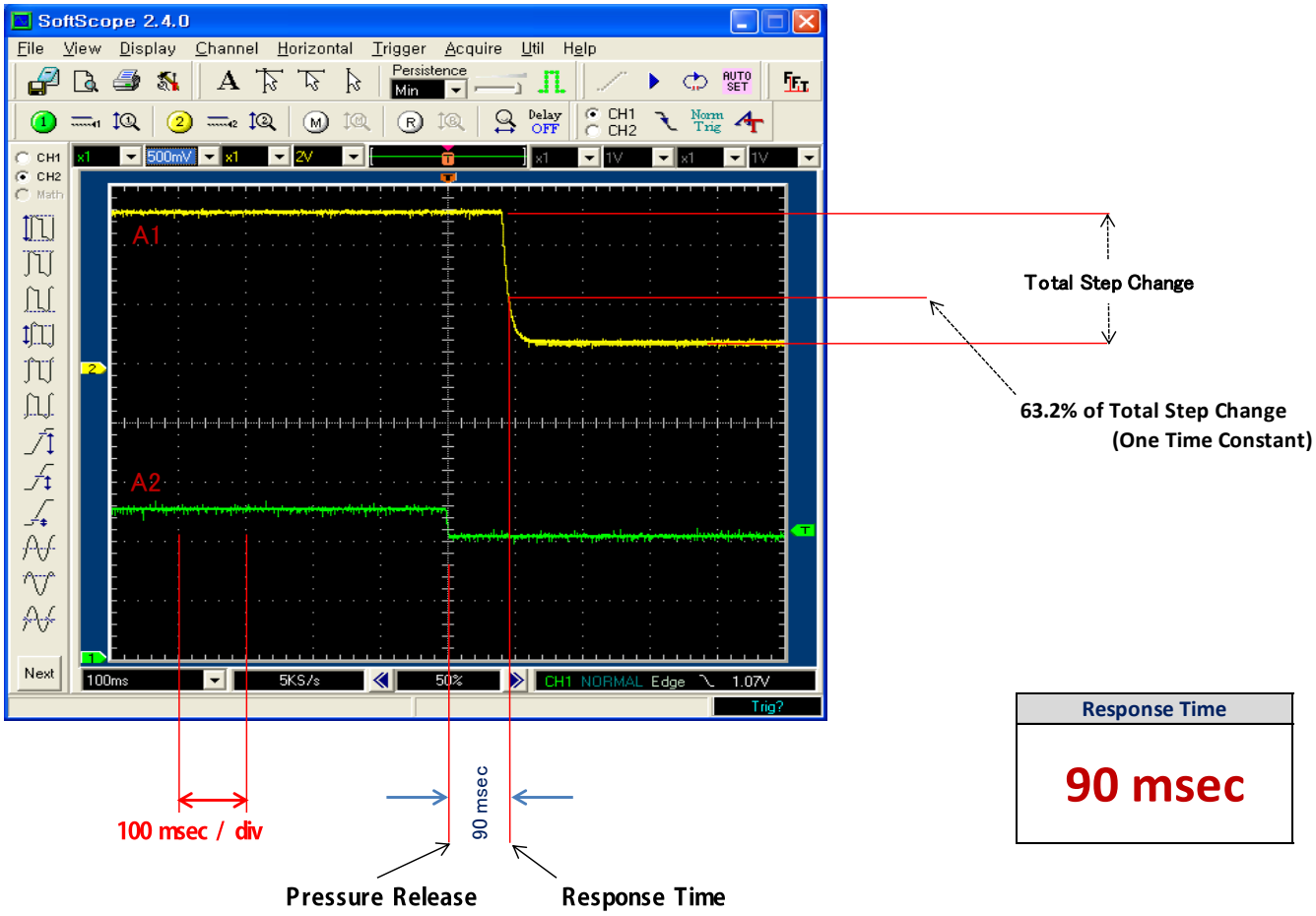
Although FieldMate is highlighted here, any Hart Communicator has access to these functions. Refer to the User's Manual for the HART programming tree.

This function is available in HART 5 or HART 7.

BRAIN PROTOCOL

The feature described in this FieldGuide are also available for EJA-E and EJX-A transmitters with BRAIN Protocol communication. Please refer to the User's Manual for details.

▪ Sample Test Results



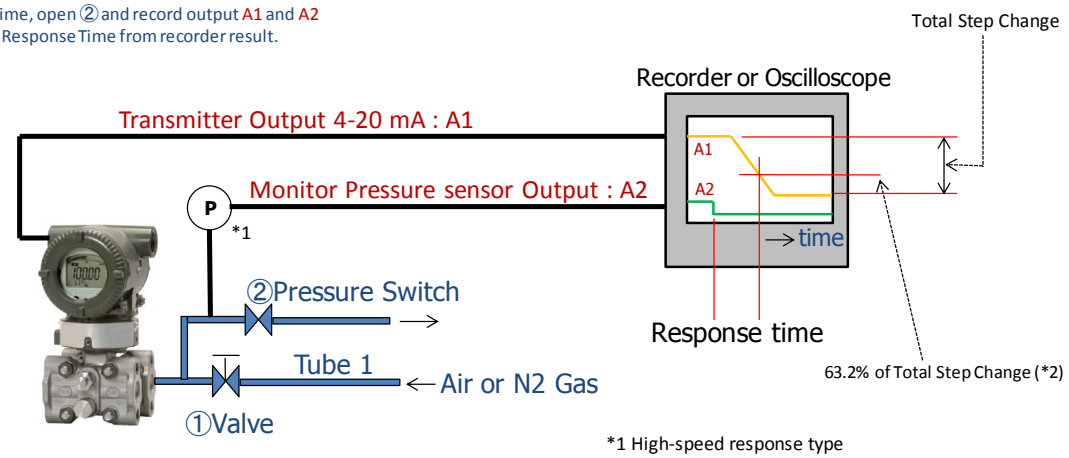
Response Time
90 msec

EJA110E tested June 4, 2013.

FGP140-03a

▪ Test Procedure

1. Connect A1 and A2 to Recorder or Oscilloscope.
2. Open ①, ② and input Air or N2 gas which pressure is span pressure through tube 1 to Transmitter (TX) high pressure process connection.
3. After 1 min, close ②, next, close ①.
4. At the same time, open ② and record output A1 and A2
5. Calculate the Response Time from recorder result.



FGP140-04a

*1 High-speed response type

*2 $(1-e^{-1}) \approx 0.632$ e = Napier's Constant