

# Section 1

## Introduction and Specifications

### 1-1. INTRODUCTION

1-2. The Fluke Model 732A is a highly stable, rugged, and transportable, solid state, dc voltage reference standard. The 732A has 10V, 1.018V and 1V outputs. These outputs are available on front panel binding posts. The calibration adjustments for the 10V, 1.018V and 1V outputs are accessible through the front panel. A non-conducting adjustment tool is supplied with the unit for this purpose.

1-3. All outputs of the 732A can be shorted indefinitely without damage. Recovery occurs in less than 2 minutes after the short is removed, with no loss of stability.

1-4. The stability and accuracy of the 732A allow direct substitution for saturated standard cells in many applications. The stability specification of 0.5 ppm for 30 days is achieved by enclosing the reference amplifier and output divider of the 732A in a high thermal gain oven. Full accuracy is attained over the specified ambient temperature range of  $23 \pm 5^{\circ}\text{C}$  (64.4 to 82.4°F). Variations in oven temperature may be monitored externally via the OVEN TEMP THERMISTOR terminals on the front panel.

1-5. The 732A may be powered from ac line power, an internal rechargeable battery, or an external low voltage ac or dc source. The 732A is designed to be powered continuously, including during storage or shipment. The back-up battery will continue to operate the 732A for up to 12 hours. Either line or battery power may be removed without affecting the output. The battery is kept charged by an internal battery charger when operating from ac line power, or from the external low voltage ac or dc source.

1-6. Various front panel LEDs (indicators) provide a continuous indication of the operating status of the 732A. The AC PWR indicator illuminates in the presence of ac line power. The BTRY CHG indicator is on steadily for normal charging activity, and is off when the battery is charged. The IN CAL indicator monitors the input voltage to the Reference and Oven. Should this voltage fall below that needed to keep the 732A operational, the IN CAL indicator is latched off, indicating a loss of power and standardization. Once power is restored and standardization has been verified, the IN CAL indicator can be reset.

1-7. The 732A may be used on the bench or rack mounted. The 732A is a half-rack width instrument and occupies 4 standard 1.75 inch rack spaces. Accessories for the 732A are listed in Table 1-1 and described in more detail in Section 6 of this manual. There are no options available for the 732A.

### 1-8. SPECIFICATIONS

1-9. Table 1-2 lists the specifications for the 732A.

**Table 1-1. Accessories**

MODEL NUMBER	DESCRIPTION
M00-800-523	Dual Mounting Fastener
M07-203-601	Half Width Rack Mount Kit
M07-200-601	Full Width Rack Mount Kit
5440A-7002	Low Thermal EMF Cable Assembly
732A-7001	Battery Pack
732A-7002	Transit Case
732A-7003	Battery Charger

Table 1-2. 732A Specifications

**OUTPUT VOLTAGE** ..... 10 volts, 1.018 volts, or 1 volt

**TRANSFER UNCERTAINTY** ..... @18°C to 28°C

Output Voltage	Time Interval			
	30 Days	90 Days	6 Months	1 Year
10V	0.5 ppm	1.5 ppm	3.0 ppm	6.0 ppm
1.018V	1.5 ppm	4.0 ppm	8.0 ppm	12.0 ppm
1V	1.5 ppm	4.0 ppm	8.0 ppm	12.0 ppm

These specifications assume the unit has been continuously powered up with either ac or battery or both. The specifications include effects due to line regulation.

#### TEMPERATURE COEFFICIENT OF OUTPUT

Range	Temperature Coefficient (ppm/°C)	
	0°C to 18°C	28°C to 40°C
10V	±0.05	±0.05
1.018V	±1.0	±1.0
1V	±1.0	±1.0

#### OUTPUT ADJUSTMENT AND RESOLUTION

Output	Adj. Range	Adj. Resolution
10V	±50 $\mu$ V	<0.05 ppm
1.018V	±50 $\mu$ V	<0.25 ppm
1.0V	±5 $\mu$ V	<0.10 ppm

#### OUTPUT IMPEDANCE

10V .....  $\leq$  5 milliohms  
 1.018V, 1V .....  $\approx$  1 kilohm

#### OUTPUT CURRENT

10V ..... 12 mA maximum  
 1.018V, 1V ..... Current limited by 1k  $\Omega$  source impedance

**OUTPUT PROTECTION** ..... The output may be shorted indefinitely without damage to the instrument. The instrument is protected against high voltage up to 1000V provided that the net current into the 732A does not exceed 30 mA.

**OUTPUT NOISE** .....  $\leq$  1  $\mu$ V RMS at 10V output, 0.1-10 Hz.

#### LOAD REGULATION AT

0.12 mA OUTPUT CURRENT .....  $\leq$  6.0 ppm

**LINE REGULATION** .....  $\leq$  0.05 ppm of output for full  $\pm$ 10% power line variation.

#### LINE POWER REQUIREMENTS

Nominal Setting	Voltage Limits	Fuse
100V	90-110V	0.375A/250V SLO-BLO
120V	108-132V	0.375A/250V SLO-BLO
220V	198-242V	0.250A/250V SLO-BLO
240V	216-264V	0.250A/250V SLO-BLO

**Table 1-2. 732A Specifications (cont)**

**AUXILIARY LOW VOLTAGE POWER REQUIREMENTS** ..... 24-40V dc or 24-30V ac 50-400 Hz

**INTERNAL BATTERIES** ..... 24V gelled-electrolyte lead-acid

**TYPICAL BATTERY LIFE** ..... 12 hours at 23°C

**PROTECTION CLASS** ..... Class 1 as defined in IEC 348.

**SIZE (HxWxD)** ..... 19.1 cm x 22.1 cm x 60.3 cm  
7.5 in. x 8.5 in. x 23.7 in. (see Figure 1-1)

**WEIGHT** ..... 12.3 kg (27 lbs.)

**COMPLIANCE WITH EXTERNAL STANDARDS** ..... ANSI C39.5 Draft #8  
IEC 348 2nd edition, 1978  
CSA bulletin 556B, 17 Sep 1973  
VDE 0411-1973  
UL 1244

**OPERATING TEMPERATURE** ..... 0°C to 40°C

**ALTITUDE**  
**Non-operating** ..... 0-12,200 meters, (40,000 feet)  
**Operating** ..... 0-3,050 meters, (10,000 feet)

**TEMPERATURE AND HUMIDITY**

Condition	Temperature (°C)	% Relative Humidity (Non-condensing)
Non-operating	-40 to +50 0 to 50	Not Controlled 95 ±5%
Operating	0 to 30 30 to 40	95 ±5% 7 ±5%

**VIBRATION**

Frequency	G Force Frequency	Double Amplitude
5-55 Hz	2 @ 55 Hz	0.013 inch