Test&Measurement

YOKOGAWA

Simple high voltage and high current meter calibration

2560A
Precision DC Calibrator

Bulletin 2560A-01EN

Yokogawa has been supplying precision measuring instruments of the highest quality for 100 years. In order to check the performance of any meter, it needs to be calibrated and calibrators are used to compare a meter to its specifications both in the laboratory and on the production line.

The wide output ranges of up to 1224 V and up to 36.72 A mean that the 2560A is a simple, precise and cost effective solution for calibrating DC measuring instruments such as analog meters, thermometers, temperature transmitters and data loggers.

The 2560A provides:

Confidence – The attention that Yokogawa gives to quality ensures engineers can trust the performance of the 2560A.

Operability – Responsive rotary controls and a range of computer interfaces enable the 2560A to be intuitively operated through the front panel or controlled via an ATE system.

Versatility – By using techniques that have been developed over many years, the 2560A is able to deliver accurate DC voltages and currents for low and high ranges.

Features and benefits

High voltage and high current

The 2560A can generate DC voltage up to 1224 V and DC current up to 36.72 A. By connecting two 2560As in parallel, maximum 73.44 A can be generated. It calibrates various type of DC measurement instruments.

Intuitive operation

Dials and switches are provided for each digit and function, and traditional 7-segment LEDs provide clear visibility. In addition, a range of computer interfaces enable the 2560A to be controlled by an ATE (Automatic Test Equipment) system.

Sweep

With a flick of a switch, the output can be swept within the source range with sweep times of 8, 16, 32 or 64 seconds.

Output Divider

Linearity tests can be simply performed by dividing the output into steps. For example, a setting of 4 will generate steps of 25, 50, 75 and 100% of the set output value.

Direct readout of the deviation

When the deviation dials are adjusted to check the full scale value on the meter, the deviation from the main output setting is displayed as a % of full scale.

Digital display of output

The output value calculated from the main, divider and deviation settings is displayed. The user can directly read the output value. The emf (electro-motive force) equivalent to the thermocouple temperature and resistance equivalent to RTD temperature can be displayed as well.

High accuracy

DC voltage: ±50 ppm
DC current: ±70 ppm
At 1 V and 1 mA range, for 180 days, 10 ppm = 0.001%

High stability

DC voltage: ±10 ppm/h
DC current: ±20 ppm/h
At 1 V and 1 mA range

High resolution

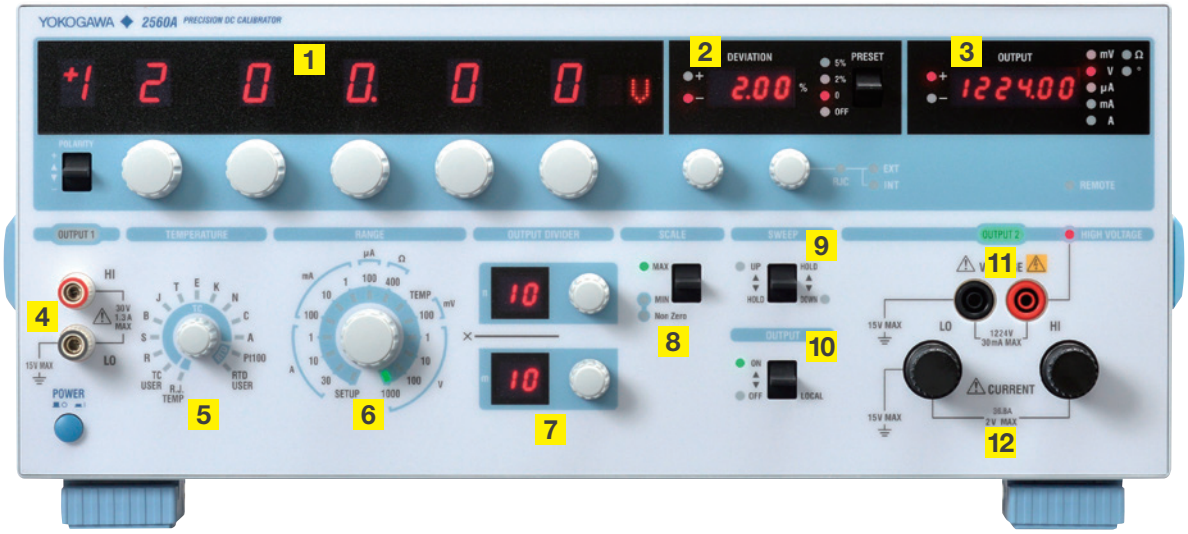
5.5 digits, ±120000 count display
6.5 digits, ±1200000 count display*
*In the high resolution mode

Wide output range

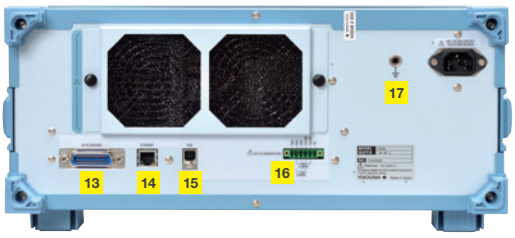
DC voltage: –1224.00 V to +1224.00 V
DC current: –12.2400 A to +36.720 A

5 voltage ranges (100 mV, 1 V, 10 V, 100 V, 1000 V)
7 current ranges (100 μA, 1 mA, 10 mA, 100 mA, 1 A, 10 A, 30 A)

The maximum output is ±122.4% of range. An instrument's 1200 V range can be calibrated.



1 Main set value
2 Deviation
3 Output value display
4 Output terminal 1
(For 10 V range or less, 1 A range or less, binding post)
5 Temperature type selection
6 Voltage/Current range selection
7 Output divider
8 Scale setting switch
9 Sweep execution switch
10 Output ON/OFF switch
11 Output terminal 2 (Voltage)
(For 100 V range or greater, safety terminal)
12 Output terminal 2 (Current)
(For 10 A range or greater, binding post)
13 GP-IB Interface
14 Ethernet



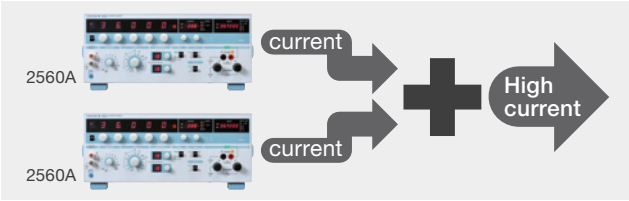
15 USB Interface
16 RJ sensor connector terminal
17 Functional earth terminal

Applications

Higher current output

To generate higher current than 36.72 A, two 2560As can be connected in parallel to double the output to 73.44 A.

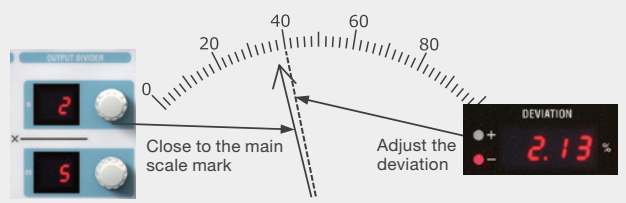
*The Accuracy, stability and temperature coefficient errors are twice those for one unit.



Calibrating and testing analog meters

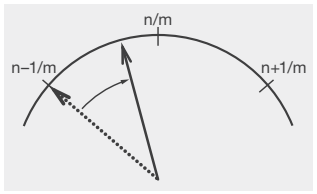
Using the output divider and deviation

Calibrating two or more points is quick and simple.
It is only necessary to preselect the number of required calibration points with the lower divider control and then use the upper control to step the output to the next calibration point. The deviation settings will then enable the output value and error of each calibration point to be displayed directly.

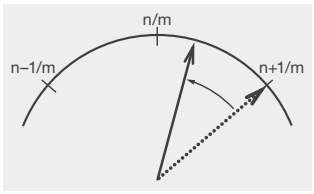


Using the output divider and deviation preset

The deviation preset control can be used to move the output value in small increments (2 or 5% of the step between calibration points).
This means that it is possible to finely approach the target calibration point, either from a lower value or a higher one, without exceeding it. This is particularly useful when the friction (hysteresis) of the moving part needs to be taken into consideration. In this case the point is calibrated twice, once from a lower value and once more from a higher value and the final calibration result is the average of the two.



From a lower value



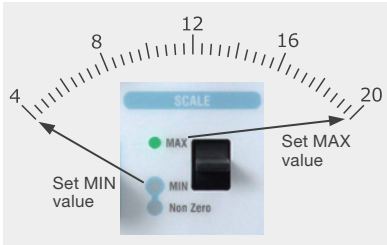
From a higher value

Using sweep

Needle sticking tests can be performed with high repeatability. It is possible to stop at any point and sweep around it in fine detail.

Using the scale setting

The scale setting is particularly useful when calibrating zero suppressed meters. The generated values are swept and divided within the range of the MAX and MIN values set by the user.



Calibration and testing multimeters

In the high resolution mode up to 6.5 digits, it is possible to test and calibrate digital multimeters and resistance standards.

*Sweep, divider, and deviation are not available in high resolution mode.

6.5 digits display example

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Calibrating and testing temperature controllers

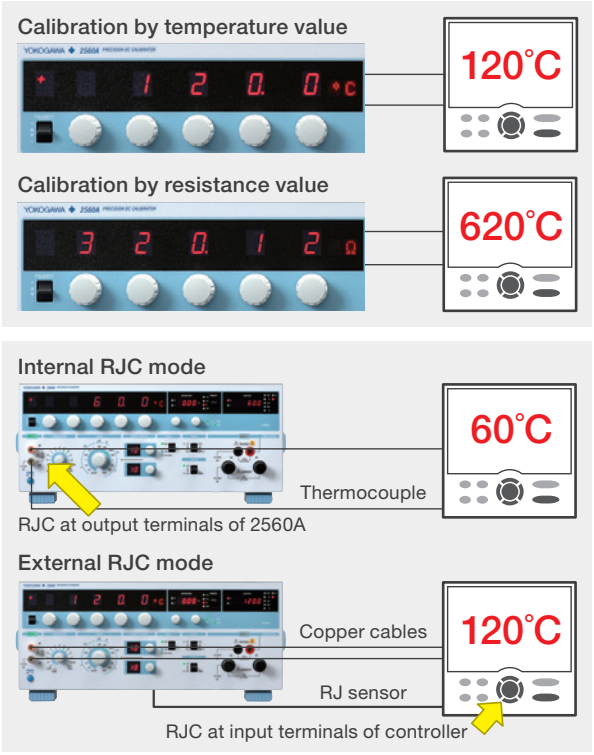
10 types of thermocouples and Pt100

The 2560A can calibrate and test temperature controllers and data loggers which use thermocouples and RTDs. 10 types of IEC thermocouple are supported. By setting a temperature value, the emf (electro-motive force) equivalent to the temperature is generated. A wide range of temperature controllers can be calibrated due the high accuracy.

When using a Pt100 RTD, a set temperature value generates the equivalent resistance value. Calibration using the resistance value can also be performed by setting resistance instead of temperature.

RJC at output terminals

The 2560A has 3 RJC (reference junction compensation) modes. The “internal RJC mode” uses the output terminals of the 2560A as the reference point. The “External RJC mode” enables the user to choose a suitable Pt100 as a versatile external sensor. The “Manual RJC mode” enables a reference value to be manually entered.



Comparison with previous models

		2560A	2560	2550/2552*1
DC Voltage	Range*2	100 mV, 1 V, 10 V, 100 V, 1000 V	10 mV, 100 mV, 1 V, 10 V, 100 V, 500 V, 1000 V	1 V, 10 V, 100 V, 1000 V
	Accuracy (1 V range)	**±50 ppm (180 days)**	±200 ppm (90 days)	±50 ppm or ±10 ppm (90 days)
	Output resistance (100 mV range)	**≤ 6 mΩ**	≤ 1.5 Ω	—
DC Current	Range*2	100 μA, 1 mA, 10 mA, 100 mA, 1 A, 10 A, 30 A	10 μA, 50 μA, 100 μA, 1 mA, 10 mA, 100 mA, 1 A, 10 A, 30 A	100 μA, 1 mA, 10 mA, 100 mA, 1 A, 10 A, 30 A
	Accuracy (1 mA range)	**±70 ppm (180 days)**	±2200 ppm (90 days)	±300 ppm or ±30 ppm (90 days)
Temperature	Thermocouple type	R, **S**, **B**, J, T, E, K, **N**, **C**, **A**, **User defined**	R, J, T, E, K	Unsupported
	RTD	**Pt100, User defined**	Unsupported	Unsupported
Resistance generation		**1 to 400 Ω**	Unsupported	Unsupported
Main setting digits		**5.5, (6.5)***3	4.5	6.5
Number of dials		**5, (6)***3	3	6
Weight		**Approx. 13 kg**	Approx. 34 kg	Approx. 53 kg
Communication Interface		**USB-TMC, Ethernet,** GP-IB	GP-IB (option)	Unsupported

Improved items are written in bold.
*1 Only voltage function on 2552 *2 10 mV and 100 μA of 2560 are supported by improvement of resolution *3 ( ) are for high resolution mode

Specifications

Voltage generation

Range	Source range[*1]	Resolution	Stability (1 h)[*2] ±(ppm of setting + V)	Accuracy (180 days)[*3, 4] ±(ppm of setting + V)	Accuracy (1 year)[*3, 4] ±(ppm of setting + V)
100 mV	±122.400 mV	1 μV	20 + 3 μV	40+ 4 μV	60+ 4 μV
1 V	±1.22400 V	10 μV	5 + 5 μV	40+ 10 μV	55+ 15 μV
10 V	±12.2400 V	100 μV	5 + 50 μV	40+ 100 μV	55+ 150 μV
100 V	±122.400 V	1 mV	5 + 500 μV	40+ 1 mV	55+ 1.5 mV
1000 V	±1224.00 V	10 mV	5 + 5 mV[*5]	40+ 10 mV[*5]	55+ 15 mV[*5]

Range	Temperature coefficient ±(ppm of setting + V)/°C	Max. Output	Output resistance[*6]	Output noise DC to 10 Hz	Output noise 10 Hz to 10 kHz	Max. C load
100 mV	5+ 0.3 μV	12 mA or more	6 mΩ or less	5 μVp-p	10 μVrms	10 μF
1 V	3+ 1 μV	Approx.120 mA	6 mΩ or less	15 μVp-p	20 μVrms	10 μF
10 V	3+ 10 μV	Approx.120 mA	6 mΩ or less	50 μVp-p	30 μVrms	10 μF
100 V	3+ 100 μV	Approx. 30 mA	30 mΩ or less	500 μVp-p	400 μVrms	1 μF
1000 V	3+ 1 mV	Approx. 10 mA	1 Ω or less	1 mVp-p	1 mVrms	0.01 μF

Current generation

Range	Source range[*1]	Resolution	Stability (1 h)[*2] ±(ppm of setting + A)	Accuracy (180 days)[*4] ±(ppm of setting + A)	Accuracy (1 year)[*4] ±(ppm of setting + A)
100 μA	±122.400 μA	1 nA	50 + 5 nA	100 + 12 nA	150 + 20 nA
1 mA	±1.22400 mA	10 nA	5 + 15 nA	50 + 20 nA	70 + 30 nA
10 mA	±12.2400 mA	100 nA	5 + 150 nA	50 + 200 nA	70 + 300 nA
100 mA[*7]	±122.400 mA	1 μA	10 + 1.5 μA	70 + 2 μA	90 + 3 μA
1 A	±1.22400 A	10 μA	25 + 25 μA	250 + 50 μA	350 + 70 μA
10 A	±12.2400 A	100 μA	50 + 500 μA	350 + 1 mA	380 + 1.2 mA
30 A	0 to +36.720 A	1 mA	70 + 1.2 mA	450 + 1.5 mA	540 + 1.8 mA

Range	Temperature coefficient ±(ppm of setting + A)/°C	Max. Output	Output resistance	Output noise DC to 10 Hz	Output noise 10 Hz to 10 kHz	Max. L load
100 μA	10 + 0.5 nA	Approx. 30 V	100 MΩ or more	0.1 μAp-p	0.2 μArms	1 mH
1 mA	3 + 1.5 nA	Approx. 30 V	100 MΩ or more	0.5 μAp-p	0.5 μArms	1 mH
10 mA	5 + 15 nA	Approx. 30 V	100 MΩ or more	1 μAp-p	1 μArms	1 mH
100 mA[*7]	10 + 150 nA	Approx. 30 V	10 MΩ or more	5 μAp-p	10 μArms	1 mH
1 A	15 + 6 μA	Approx. 10 V	1 MΩ or more	0.1 mAp-p	0.1 mArms	1 mH
10 A	30 + 60 μA	Approx. 2 V	10 kΩ or more	1 mAp-p	4 mArms	1 mH
30 A	30 + 300 μA	Approx. 1.5 V	5 kΩ or more	1 mAp-p	4 mArms	1 mH

*1 To generate 122.4% of range, set main value to 120% of range and set deviation to 2%
*2 1-hour stability values apply at 23°C±1°C. 1-hour starts from 1 hour after turning output on
*3 Excluding the voltage drop by the output resistance
*4 Accuracy values apply at 23±3°C, 20% to 80%RH. Add temperature coefficient at 5°C to 20°C and 26°C to 40°C. Add 500 ppm of range when the output value is 120% of range or greater.
*5 Add {12 ppm × (output value/1000)^2} of range when the output value is 100 V or greater
*6 When B8506ZK, 758933, or 758917 is in use; excluding aging and the effects of measurement leads
*7 Accuracy is specified when sinking the current up to 30 mA

Temperature generation for RTD

Type	Source Range	Resolution	Accuracy (180 days)[*8]	Accuracy (1 year)[*8]	Temperature Coefficient	Nominal Current
Pt100	–200.0 to 850.0°C	0.1°C	±0.1°C	±0.12°C	±0.006°C/°C	0.1 to 2 mA

Resistance generation

Range	Source Range	Resolution	Accuracy (180 days)[*8, 9] ±(ppm of setting + Ω)	Accuracy (1 year)[*8, 9] ±(ppm of setting + Ω)	Temperature Coefficient	Nominal Current
400 Ω	1.00 to 400.00 Ω	0.01 Ω	55 + 0.005	75 + 0.015	±0.002 Ω/°C	0.1 to 2 mA

*8 Accuracy values apply at 23±3°C, 20% to 80% RH. *9 Nominal current Is: In case of 0.1 mA to 1 mA, add{0.0025/Is(mA)}Ω

Temperature generation for Thermocouple

	R	S	B	J	T
Source Range [℃]	–50 to 1768	–50 to 1768	0 to 1820	–210 to 1200	–270 to 400
Setting temparature: Accuracy for 1 year (±℃)	–50℃: 1.10	–50℃: 1.03	400℃: 1.00	–210℃: 0.25	–250℃: 0.72
	0℃: 0.80	0℃: 0.75	600℃: 0.70	–100℃: 0.11	–200℃: 0.29
	100℃: 0.55	100℃: 0.56	1000℃: 0.50	0℃: 0.08	–100℃: 0.16
	600℃: 0.40	400℃: 0.47	1200℃: 0.44	1200℃: 0.15	100℃: 0.10
	1600℃: 0.40	1600℃: 0.44	1820℃: 0.44		400℃: 0.09
	1768℃: 0.45	1768℃: 0.51			

	E	K	N	C	A
Source Range [℃]	–270 to 1000	–270 to 1300	–270 to 1300	0 to 2315	0 to 2500
Setting temparature: Accuracy for 1 year (±℃)	–250℃: 0.50	–250℃: 0.94	–240℃: 1.00	0℃: 0.30	0℃: 0.34
	–200℃: 0.20	–200℃: 0.30	–200℃: 0.44	200℃: 0.26	100℃: 0.29
	–100℃: 0.10	–100℃: 0.15	–100℃: 0.21	600℃: 0.25	600℃: 0.28
	0℃: 0.07	0℃: 0.11	0℃: 0.16	1000℃: 0.30	1600℃: 0.47
	1000℃: 0.12	800℃: 0.15	800℃: 0.15	2000℃: 0.51	2500℃: 0.79
		1300℃: 0.21	1300℃: 0.20	2315℃: 0.70	

Resolution: 0.1℃
Output Resistance: Approx. 1 Ω
Temperature scale is ITS-90.
Accuracy apply at 23±3℃ and without reference junction compensation.
Accuracy doesn't include the thermocouple's error.
Accuracy for temperature between setting temperature is calculated by linear interpolation.
Accuracy not shown in left table is ±(60 ppm + 4 μV) for generated voltage.

3 RJC modes
INT*: Detect temperature of output terminal as compensation value. Temperature measurement accuracy is ±0.3℃.
EXT*: Detect compensation value by sensor connected to RJC terminal
MAN: Input compensation value

*When using RJC, add the reference junction compensation error in "2560A Temperature generation for Thermocouple (Detail)" on our web site.

Other generation specification

Sweep	Target	Voltage/Current/Temperature/ Resistance
	Speed	Approx. 8/16/32/64 sec. selectable during 0 to 100%, 100 to 0% of setting
Output divider	Target	Voltage/Current/Temperature/ Resistance
	Denominator	m 4 to 15
	Numerator	n 0 to 15 (n ≤ m)
Scale function	A function to set the maximum value (MAX) and minimum value (MIN) of sweep and divider range.	
Deviation	Target	Voltage/Current/Temperature/ Resistance
	Variable range	±20.00%
	Operation	Two dials Resolution of the first dial: 0.2% of (MAX – MIN) Resolution of the second dial: 0.01% of (MAX – MIN)
	Deviation preset	OFF/0/2%/5%
Transient response time	Voltage/Current generation: Approx. 500 ms (except for 1000 V range), approx. 3 s (1000 V range) (No load, Time to reach 0.02% of final value)	
	RTD/Resistance generation: Within 0.1 ms (Time constant at changing current)	
CMRR	Voltage	120 dB or greater (except for 1000 V range), 100 dB or greater (1000 V range) (DC, 50/60 Hz)
	Current	0.1 μA/V or less (1 A range or less), 10 μA/V or less (10 A range or more) (DC, 50/60 Hz)

General specification

Warm-up time	Approx. 30 minutes
Operating environment	Temperature: 5 to 40℃ Humidity: 20 to 80% RH* *20 to 70%RH for 30℃ and over
Storage environment	Temperature: –15 to 60℃ Humidity: 20 to 80% RH
Operating Height	2000 m or less
Operating Attitude	Horizon
Rated power supply voltage	100 to 120 VAC/200 to 240 VAC
Allowable power supply voltage fluctuation range	90 to 132 VAC/180 to 264 VAC
Rated power supply frequency	50/60 Hz
Allowable power supply frequency fluctuation range	48 to 63 Hz
Max. power consumption	200 VA
Withstand voltage	Between power and case: 1500 VAC 1 min.
Dimensions	426 (W) × 177 (H) × 400 (D) mm
Weight	Approx. 13 kg

Communication Interface

USB interface (PC connection)	
Connector	Type B connector (receptacle)
Electric and mechanical specifications	Complies with USB Rev. 2.0
supported transfer modes	High Speed, Full Speed
Ethernet interface	
Connector	RJ-45 connector
Electric and mechanical specifications	Confirms to the IEEE 802.3
Transfer methods	100 BASE-TX/10 BASE-T
Transfer speed	Max. 100 Mbps
GP-IB interface	
Electric and mechanical specifications	Complies with IEEE St'd 488-1978
Functional specifications	SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT1, C0
Address	0 to 30

Model and Suffix code

Model	Suffix code	Description
2560A		Precision DC Calibrator
	–VA	Version A
	–UC	Deg C
	–UF	Deg C and F
	–D	UL/CSA standard, PSE compliant
	–F	VDE standard
	–R	AS standard
	–Q	BS standard
	–H	GB standard
	–N	NBR standard

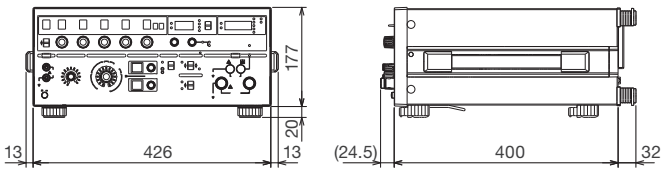
Standard accessories :
Power cord (1), B8506ZK, B8506WA (each 1), B8506ZL Alligator clip adapter set (1), 758921 Fork terminal adapter (1), Rubber feet (2 sets (4)), Terminal plug (1), User's manual (1)

Rack Mounting Kits

Model	Product	Description
751535-E4	Rack mounting kit	EIA standalone installation
751535-J4	Rack mounting kit	JIS standalone installation

External dimensions

Unit: mm



Related product

2553A Small and light Precision DC Calibrator

Accuracy Voltage: ±0.0075%, Current: ±0.0120%
Stability ±15 ppm/h
Noise 2 μVrms
Resolution 5.5 digits, ±120000 count display
Range Voltage: ±32 V, Current: ±120 mA
Thermocouple, RTD

2558A AC Voltage Current Standard

Accuracy Voltage: ±0.04%
Current: ±0.05%
Stability ±50 ppm/h
Frequency range 40 to 1000 Hz
Range Voltage: 1.00 mV to 1200.0 V
Current: 1.00 mA to 60.00 A

Accessories

Model	Name	Description	
257875	RJ sensor	For reference junction compensation sensor. Pt100, 1.95 m	
B8506ZK	Measurement lead set	2 voltage output cables (red and black). 1 m. Rating 1500 V	
B8506WA	Measurement lead set	2 current output cables. 1.5 m. Rating 80 A	
758933	Measurement lead set	2 safety terminal cables (red and black). 1 m. Rating 1000 V	
758917	Measurement lead set	2 safety terminal cables (red and black). 0.75 m. Rating 1000 V	
B8506ZL ⚠	Alligator clipadapter set	2 safety terminal—alligator clip adapters (red and black). Rating 1500 V	
758929 ⚠	Alligator clipadapter set	2 safety terminal—alligator clip adapters (red and black). Rating 1000 V	
758922 ⚠	Alligator clipadapter set	2 safety terminal—alligator clip adapters (red and black). Rating 300 V	
758921 ⚠	Fork terminal adapter	2 safety terminal—fork terminal adapters (red and black).	

⚠ Due to the nature of this product, it is possible to touch its metal parts. Therefore, there is a risk of electric shock, so the product must be used with caution.

NOTICE

- Before operating the product, read the user's manual thoroughly for proper and safe operation.

Yokogawa's Approach to Preserving the Global Environment

- Yokogawa's electrical products are developed and produced in facilities that have received ISO14001 approval.
- In order to protect the global environment, Yokogawa's electrical products are designed in accordance with Yokogawa's Environmentally Friendy Product Design Guidelines and Product Design Assessment Criteria.

This is a Class A instrument based on Emission standards EN61326-1 and EN55011, and is designed for an industrial environment.
Operation of this equipment in a residential area may cause radio interference, in which case users will be responsible for any interference which they cause.

YOKOGAWA

YMI-KS-MI-SE01

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