PHA & PHC

FUJI ELECTRIC

STRIP CHART RECORDERS WITH BRILLIANT SIX-COLOR PRINTING

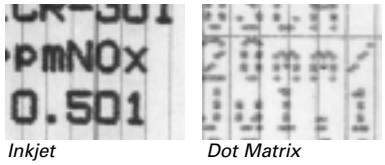
Why use dot-matrix or fiber-tip pen printing when Fuji Electric's patented, cutting-edge recording technology offers an affordable inkjet recorder? With an excellent rating for measuring range accuracy and analog trace accuracy, and a three-year warranty, these strip chart recorders represent the latest recording technology on the market today.

The PHC Series 100mm and the PHA Series 180mm recorders offer brilliant six color recording utilizing Fuji Electric's patented inkjet mechanism. Tiny piezo elements electronically dispense small dots of colored ink, 0.3mm in diameter, onto the chart paper. This non-contact printing advancement traces vibrant trend lines and prints sharp alphanumeric characters.

This technology, previously available on expensive printers only, now comes in a strip chart recorder at an affordable price — one that falls below the cost of most dot-matrix type printers. If you note the difference in print quality between the dot-matrix and the inkjet typefaces, you'll conclude there's simply no reason to use a dot-matrix type recorder anymore.

The inkjet cartridges can have a long life of up to 6 months of continuous operation. Each channel is assigned its own color, and reports generated in reference to that channel are printed in the corresponding color. As this method of printing requires only one mechanism, these recorders require fewer moving parts than conventional recorders — that means years of extremely reliable, trouble-free operation for you. With fewer moving parts comes a depth of less than 8", making it ideal for installation in shallow panels.

FEATURES



Inkjet *Dot Matrix*

- **Powerful Set of Printing and Recording Features**
  Prints 7 different types of reports
- **Front Panel Programming**
  Easy to program for more than 15 parameters
- **Advanced Math Functions**
  Provides subtraction, logarithm, and square root functions
- **Large Fluorescent, Multi-Language Display**
  Easy-to-read in either English, French, or German; 20-digit, 2-line display; 6-channel simultaneous display possible
- **Non-Contact, Inkjet Printing**
  Traces trend lines and prints digital characters which are vibrant and sharp. Selectable ink color for each channel
- **One Mechanical Assembly for Printing**
  Fewer moving parts for longer life and trouble-free operation
- **Side-by-Side Mounting**
  Convenient placement in crowded panel environments

- **Logging Mode**
  Print measured values at intervals ranging from 10 to 60 minutes
- **Daily Report**
  Provides measured values for every hour along with maximum, minimum, and average values
- **Totalization**
  Furnishes integrated values at intervals of one hour and the total value for one day
- **Zoom, Zone and Auto Range Trace**
  Provides special traces that match your unique programming
- **Additional Options**
  Chart illumination, alarm relays, remote control and RS485 Communications
- **Three-Year Warranty**
  Protects against manufacturing defects

CE

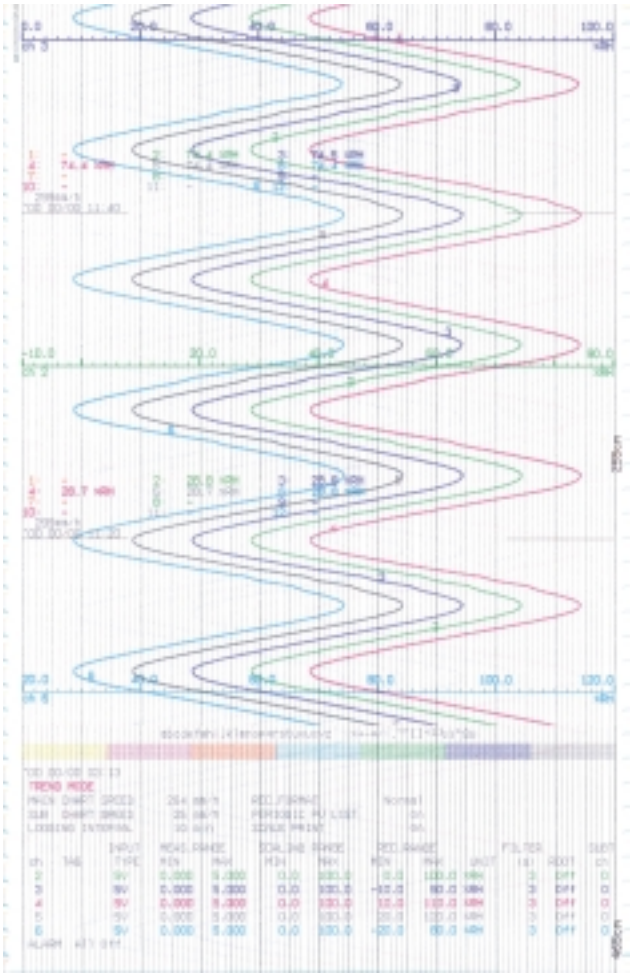
Fuji Electric is an ISO 9001 facility

Information subject to change without notice. Prices in USD.

General Capabilities

The PHC 100mm and PHA 180mm recorders offer recording in either continuous trace or intermittent (dot) printing. The PHC comes in three or six channels and the PHA comes in six or twelve channel versions. As each channel has its own 16-bit A/D converter, these instruments offer high speed sampling of the input signal. These inputs include most thermocouple and RTD types plus a wide range of DC currents/voltages; each input can be scaled for your particular application from the recorder's front panel. With advanced math functions, these recorders provide filtering, square root extraction, subtraction, and scaling for each channel.

Furthermore, these recorders are fully programmable from their easy-to-read, fluorescent front panels for a variety of parameters such as:



- **Pass Code**
- **Main and Sub Chart Speeds**
- **Record Mode — Trend/Logging**
- **Recording Range**
- **Input Signal**
- **Tag Number**
- **Communication Parameters**
- **Ink Monitor Status**
- **Language (English, French, or German)**
- **List Print Request**
- **Daily Report, Date and Time, and Alarm Settings**
- **Illumination Status**
- **And More...**

Report Capabilities

One of the most powerful features of the PHA and PHC recorders is their ability to create a full complement of status reports — scheduled or on demand. You may specify daily and summation reports for any period of time from one to 24 hours automatically or upon demand. These reports are printed in crisp digital type and provide you with important information such as:

- **Periodic Data for Each Channel**
- **Totalized Values for Each Channel**
- **Maximum and Minimum Recorded Value for Each Channel and Time of Occurrence**
- **Average Value for Each Channel**

Configurations

The 100mm PHC series recorders are available in three or six channel versions; the 180mm PHA series recorders come in six or twelve channel versions. Both the PHC and the PHA are available in either continuous trace or dotting print versions. The continuous trace and dotting models are nearly identical in features except that the dotting recorder has a slower sample time and has limited scale print or periodic printout capabilities. Therefore, the dotting recorder carries a lower price. Both recorders are capable of data logging in addition to trend recording and can transmit data via an RS-485 communications link.

SPECIFICATIONS

GENERAL SPECIFICATIONS

INDICATION	Fluorescent indication (blue-green). 20 characters x 2 lines
CHARACTER INDICATED (HxW)	PHA: 5 x 7 dots. 0.2 x 0.13 in. (5 x 3.3 mm) PHC: 5 x 7 dots. 0.16 x 0.09 in. (4.16 x 2.25 mm)
CONTENTS OF INDICATION	Measurement Value: Temperature – 1 decimal place. Voltage – 6 places (including sign and decimal point). PHA – Measurement value of channel 1 to channel 6 or channel 7 to channel 12 can be indicated simultaneously. PHC – Measurement value of channel 1 to channel 6 can be indicated simultaneously Channel Number: PHA – 1 or 2 digit. PHC – 1 digit Engineering Unit: Max. 7 characters (°C, °F, %, Pa, bar, ppm, m3/h, etc.) Tag Number: 8 alphanumeric characters Time: Year, month, day, hour, minute Status Indication: Record ON, chart end, alarm, battery low alarm, burnout, carriage failure, ink low alarm
CONFIGURATION	These configurations can be set via the keyboard as follows: Pass code, Main chart speed, Sub chart speed, Alarm setting, Record mode (trend/logging), Recording range, Input signal, List print request, Tag number, Daily report setting, Totalization function, Communication parameter, Date and time setting, Ink monitor clear, Illumination On/Off, Message definition, Message value shift
PRINTING	Writing System: Inkjet system, 6 colors Periodic Data Printing: Measured value, unit, date, time, time line, chart speed, channel number List Printing: Measured value list (date, time, channel number, measured value, units). Parameter list (date, time, channel number, recording range, scaling, units, alarm set value, chart speed, tag number). Test pattern (all characters and color patterns) Message Printing: 10 messages, 16-character, user-entered messages Alarm Printing: Channel number, alarm type (H, L, RH, RL), output relay number, On/Off time Burnout Printing: Burnout channel number and time Other: Ink low message, auto-range selection mark, recording start mark, chart speed change mark
TEXT PRINTING	PHA: text printing is not available for more than 301mm/hour (continuous recording), or more than 51mm/hour (dotting recording) PHC: text printing is not available for more than 401mm/hour (continuous recording), or more than 51mm/hour (dotting recording)
POWER REQUIREMENT	Line Supply: PHA – 85 to 300V AC. PHC – 85 to 150V AC or 150 to 300V AC Frequency: 50/60Hz Power Consumption: PHA – 22VA, 100V AC, without option, approx. 37VA, 100V AC, with option, approx. PHC – 20VA, 100V AC, without option, approx. 26VA, 100V AC, with option, approx.

INPUT AND ACCURACY

INPUT POINTS	PHA: 6 or 12 continuous recording and dotting recording PHC: 3 or 6 continuous recording and dotting recording; 3 (continuous only)
INPUT SIGNAL, THERMOCOUPLES & RTDS	Thermocouple: B, R, S, K, E, J, T, N, W, I, U, PN RTD: Pt100 (DIN IEC 751) Note: Factory default setting for input is K thermocouple, 32 to 2192°F (0 to 1200°C)
INPUT SIGNAL AND RESOLUTION, DC VOLTAGE	-50 to 50mV. Resolution: 10 µV -500 to 500mV. Resolution: 100 µV -5 to 5V. Resolution: 1 mV -50 to 50 V. Resolution: 10 mV Scaling is possible within the range of -32767 to 32767 (Decimal points may be placed as necessary)
INPUT RESOLUTION, THERMOCOUPLES & RTDs	0.1°C
INPUT ACCURACY	±(0.15% +1 digit) Without reference junction compensation error
MAX. INPUT VOLTAGE	Thermocouple, RTD and DC Voltage: ±10 VDC or less (50mV, 500mV Range) DC Voltage Input (5V, 50V Range): ±100 VDC or less
INPUT SIGNAL SETTING AND CHANGING	Setting and changing of input signal between thermocouple, RTD, and DC voltage (50mV, 500mV, 5V, 50V range) for each channel via jumper selection and keyboard selection
SETTING OF RECORDING RANGE	Setting is possible within the reference range by using the keyboard
BURNOUT FUNCTION	When the thermocouple or RTD input is disconnected, the recording is deflected to full scale
INPUT SIGNAL — DC CURRENT INPUT	4-20mA, 0-20mA, with shunt resistor
ACCURACY AND RESOLUTION	Performance under reference condition (23 ±2°C, 65 ±10%RH, power voltage and frequency variation ±1%,warm-up time 30 minutes or more, vertical mounting, free from the effects of external noise)
RECORDING ACCURACY	Indication accuracy, ±0.25% of recording span
RECORDING RESOLUTION	0.1mm minimum
CHART SPEED ACCURACY	±0.1% (expansion and contraction of paper is not included)
CLOCK ACCURACY	±50 ppm or less (monthly error: about 2 minutes)
REFERENCE JUNCTION COMPENSATION ACCURACY	K, E, J, T, N, L, U, PN: ±0.5°C R, S, B, W: ±1°C

RECORDING

WRITING SYSTEM	Inkjet system, 6 colors
CHART WIDTH	PHA: 180mm PHC: 100mm
CHART LENGTH	PHA: Z fold 65.6ft. (20m.) PHC: Z fold 49.5ft. (15.08m.)
CHART SPEEDS	Can be set in 1mm/hour steps. Continuous Recording: PHA – 5 to 300mm/hour. PHC – 5 to 400mm/hour Dotting Recording: PHA – 301 to 1500mm/hour. PHC – 401 to 1500mm/hour
RECORDING COLOR (PHA AND PHC)	Orange, green, purple, red, black, and blue. User selectable for each channel
RECORDING CYCLE	Dotting Recording: 30 seconds for all channels Continuous Recording: Depends on chart speed PHA: Recording cycle (seconds) = 450 ÷ chart speed (mm/hour) (not faster than 3 sec.) PHC: Recording cycle (seconds) = 400 ÷ chart speed (mm/hour) (not faster than 2 sec.)
MEASURING CYCLE	Up To 3 Inputs: 160ms More Than 3 Inputs: 320ms

SPECIFICATIONS, CONTINUED

SERVICE LIFE OF INK	Depends on operating conditions. About 6 months for 6 points of linear recording at 25mm/hour of chart speed
CHART HANDLING	Possible to draw the paper out during recording

ALARMS

SETTING METHOD	Setting from keyboard
NUMBER OF ALARMS	4 per channel, selectable as high, low, rate high, and rate low
ALARM INDICATION	Kind of alarm and output relay number are indicated on display for each channel at occurrence of alarm
PRINTING	Channel number, kind of alarm, output relay number and On/Off time are printed on chart paper
OUTPUT	See optional specifications
HYSTERESIS	Approximately 0.5% of recording span
ALARM TIMING	Recognition – 1 second (worst case)
ACTION	additional 1 second (worst case)
ALARM LATCH	Hold the alarm display and alarm output
OTHER	Ink end and chart end alarm output possible

ALARM OUTPUT PACK WITH 3-POINT EXTERNAL CONTROL

MOUNTING	This unit is mounted on the rear side of the recorder
ALARM OUTPUT (DO)	PHA: 6 or 12 points of relay contact N.O. (1a) output for individual channel operation or common operation. PHC: 6 points only. Maximum contact voltage 240V AC, 30V DC. Maximum contact current 3A
EXTERNAL CONTROL (DI)	The following control is possible with external contact signal: Recording start/stop – Effected by contact signal. Recording is started when contact is closed and stopped when contact is open Chart speed change – Selection between normal and remote chart speeds is effected by contact signal. Remote chart speeds are selected when contact is closed. Main chart speed is selected when contact is open Measured value printing – Measured value list printing (date, time, channel number, measured value, units) is effected by contact signal. Printing is started when contact is closed Message printing – (For external control, use a dry contact) Contact capacity – 12V DC, 0.05A, N.O. (1a) contact

FUNCTIONS

RANGE SETTING	Recording range can be set for each channel
INPUT SETTING	Any input can be set for each channel
SKIP FUNCTION	Used to skip recording, indication and alarm at any measuring point
MEASURED VALUE LIST	Date, time, measured value, and units can be printed
PARAMETER LIST	Date, time, recording range, scaling, units, kind of input, alarm set value, chart speed, and tag number can be printed
TEST PATTERN	All characters and color patterns can be printed
PERIODIC DATA PRINTING FUNCTION	Time, date, chart speed, measured value, and units can be printed at fixed intervals. Printing can be enabled/disabled from keyboard
MESSAGE PRINTING	Maximum 10 messages, 16-character, user-entered messages can be printed
ALARM PRINTING FUNCTION	Time, channel number, kind of alarm, and output relay number can be printed when alarm is on or off
UNITS INDICATION	Engineering units such as °C, °F, %, mV, mA, Pa, liters, etc., are indicated (setting from keyboard)
SCALING FUNCTION	Scaling with DC voltage input is possible. (Setting of decimal point is also possible within the range of -32767 to +32767)
SUBTRACT FUNCTION	Difference between any two channels is recorded (channel is set from keyboard)
AUTO-RANGE RECORDING	Recording range is automatically changed for recording in the event of over-range or under-range (setting with keyboard). This function is not available for combination of zone recording and enlarged/reduced recording
ZONE RECORDING	Recording area is divided into a maximum of 4 (PHA) or 3 (PHC) zones for recording. This function is not available for combination of automatic range selection and enlarged/reduced recording
ENLARGED/REDUCED	A part of recording area could be enlarged and the other reduced. This function cannot be used if auto-range recording or zone recording is used.
SQUARE-ROOT EXTRACTION FUNCTION	Square-root extraction of DC voltage input is possible
DAILY REPORT	A report can be printed for a 1 to 24 hour period for any channel. Information can be stored for up to 24 hours before printing the report. Maximum, minimum, and average values are also printed at the same time. On/Off operation, On/Off of each channel, and operation start/stop time can be set from keyboard
TOTALIZATION FUNCTION	A report of integrated values can be printed for a 1 to 24 hour period for any channel (integration in 1 second steps). Information can be stored for up to 24 hours before printing the report. Total value is also printed at the same time. On/Off operation, On/Off of each channel, and operation start/stop time can be set from keyboard.
MEMORY BACKUP	Set data and clock function are protected by built-in lithium battery (expected battery life, about 10 years under normal temperature)
INPUT FILTER	Response is delayed in case of sudden changes in input of each channel (1st order lag filter). Time constant setting range: 0 to 900 seconds (in 1 second steps) (setting from keyboard)
BURNOUT FUNCTION	When thermocouple or RTD input is disconnected, it is deflected to 100% full scale. Also, it is indicated and printed at the same time
PASSCODE	4-digit passcode security available
LANGUAGE	English, German, or French is selectable for display and printing
ALARM LATCH FUNCTION	The alarm display and alarm output are held even after the cause of alarm is removed. On-Off operation can be set from keyboard. Cancellation of the held alarm can be made from external control (DI)
PARAMETER COPY	Set parameters on any channel can be copied to any other channel

SPECIFICATIONS, CONTINUED

OPTIONS

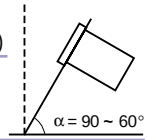
CHART ILLUMINATION	Cold cathode fluorescent lamp
TRANSMISSION FUNCTION	RS-485 interface for transmitting measured value and receiving the condition of setting Transmission Method: Half-duplex serial Synchronized Method: Start-stop synchronizing Code: Binary Data length – 8 bits. Parity – odd/even/none. Stop bit – 1 or 2 Transmission Speed: 2400, 4800, 9600, 19200 bps No. of Units Connected: Max. 31 units Transmission Distance: Max. 1km Remarks: When connecting through RS-232C, be sure to use an RS-485 to RS-232 converter. Model # RSFC24 recommended
ADDITIONAL OPTIONS	These Fuji inkjet recorders are available with a number of options in addition to its standard features: Chart illumination; Alarm module relays — six per module (the PHA has 1 or 2 modules; the PHC has 1 module); Remote control of recorder for On/Off, chart speed, PV print, and message print; RS-485 communications
DELIVERY	Recorder, panel mounting bracket, instruction manual, accessories — recording head (1), chart paper (1) Note: Recorder head is not mounted on the recorder at the time of delivery

OPERATING AND STORAGE CONDITIONS

TEMPERATURE LIMITS	32 to 122°F (0 to 50°C)
HUMIDITY LIMITS	20 to 80% RH, non-condensing (temperature x humidity <3200)
VIBRATION	10 to 60Hz, 0.2m/s2 (0.02g) or less
SIGNAL SOURCE RESISTANCE	Thermocouple input: 1kΩ or less Voltage input: Less than 0.1% of input resistance RTD input: Less than 10Ω per wire (resistance of each wire of 3-wire system should be balanced with others)
WARM-UP TIME	30 minutes or more
SHOCK	No external shock
PROTECTION	IEC IP5O (front door)
SAFETY	Conforms to EN55011;1991 class A for conducted and radiated emissions and EN500821-1;1992 for radiated immunity, ESD and FBT
POWER SUPPLY VARIATION INFLUENCE	Voltage Variation: 85 to 300V AC; 100V AC base. Change in indication – ± (0.1% of reference range + 1 digit)max. Change in recording – 0.2% of recording span, max. Frequency Variation: 47 to 63Hz, 50Hz base. Change in indication – ± (0.1% of reference range + 1 digit)max. Change in recording – ±0.2% of recording span, max.
INPUT SIGNAL SOURCE RESISTANCE OR WIRING RESISTANCE INFLUENCE	Thermocouple: 10μV per 100Ω Voltage Input: Variation of 0.1% change of resistance. Change in indication – ± (0.1% of reference range + 1 digit) max. Change in recording – ±0.2% of recording span, max. RTD: Variations of resistance with changes in 10Ω per wire. Change in indication – ± (0.1% of reference range + 1 digit)max. Change in recording – ±0.2% of recording span, max. (3 wires should be balanced)
TEMPERATURE INFLUENCE	Change in indication: ±0.2% of reference range/10°C, max. Change in recording: ±0.5% of recording span/10°C, max. Reference junction compensation: ±0.27°C/10°C, max.
MOUNTING POSITION INFLUENCE	Inclination within 30° Change in indication: ± (0.1% of reference range + 1 digit) max. Change in recording: ±0.2% of recording span, max.
VIBRATION INFLUENCE	Linear vibration with 10 to 60Hz of frequency and 0.2m/s2 (0.02g) of acceleration is applied to each of 3 directions for 2 hours Change in indication: ± (0.1% of reference range + 1 digit) max. Change in recording: ±0.2% of recording span, max.
CHART PAPER INFLUENCE	Standard Temperature/Humidity: 20°C, 65% RH Expansion at 85% RH: 0.4% max. Contraction at 35% RH: 0.5% max.
TRANSPORTATION/ STORAGE CONDITIONS	Temperature Limits: 14 to 140°F (-10 to +60°C) Humidity Limits: 5 to 90% RH, non-condensing is required Vibration: 10 to 60Hz, 2.45m/s2 (0.25g) Shock: 294m/s2 (30g) or less

STRUCTURE

MOUNTING	Panel (may be inclined up to 30° backwards from the vertical)
MOUNTING POSITION	Front inclination 0°, rear inclination 30°, left/right inclination 0°
MATERIAL	Case: Steel plate Front Door Frame: Polycarbonate with glass window (PHA) or plastic window (PHC)
WEIGHT	PHA: Approximately 13.2 lb. (6kg) (without option). Approximately 15.4 lb.(7kg) (with option) PHC: Approximately 6.2 lb.(2.8kg) (without option). Approximately 7.3 lb.(3.3kg) (with option)
CASE SIZE	PHA: Bezel – 11.34" x 11.34" (288 x 288mm). Depth – 7.84" (199mm). Cutout – 11.06" x 11.06" (281 x 281mm) PHC: Bezel – 5.67" x 5.67" (144 x 144mm). Depth – 7.84" (199mm). Cutout – 5.39 x 5.39" (137 x 137mm)
FINISH COLOR	Case and front door frame: black
EXTERNAL TERMINALS	Screw terminal (M4)



PHA & PHC SERIES ORDERING INFORMATION

P	H	A	A	A	0	0	4	–	E	B	C	D	V

To create an ordering code fill in the boxes above with the appropriate number and/or letter from the corresponding box below.

Box A: Recording Points

66= 6 continuous	$ 2,899
76= 6 dotting	2,499
88= 12 dotting	2,899
98= 12 continuous	3,450

Box B: Chart Paper Illumination

A = Without	N/C
B = With	265

Box C: Alarm Output/Ext. Control

0 = Without	N/C
1 = 6-point alarm output/3-point external control	$ 320
2 = 12-point alarm output/3-point external control	580

Box D: Transmission Function

Y = Without	N/C
R = With RS-485	425

P	H	C	A	A	0	0	3	–	B	C	D	E	V

To create an ordering code fill in the boxes above with the appropriate number and/or letter from the corresponding box below.

Box A: Recording Points

33 = 3 continuous recording	$ 2,050
66 = 6 continuous recording	2,250
76 = 6 dotting recording	1,999

Box B: Power Supply

A = 85-150V AC 50/60Hz	N/C
E = 150-300V AC 50/60Hz	N/C

Box C: Chart Paper Illumination

A = Without	N/C
B = With	$ 265

Box D: Alarm Output/Ext. Control

0 = Without	N/C
1 = 6-point alarm output/3-point external control	320

Box E: Transmission Function

Y = Without	N/C
R = With RS-485	425

ACCESSORIES & SPARE PARTS

PHZK8601	Alarm output/external control unit for the PHA series with 6-point alarm output/ 3-point external control	$ 320
PHZK8701	Alarm output/external control unit for the PHA series with 12-point alarm output/ 3-point external control	580
PHZK1601	Alarm output/external control unit for the PHC series	320
PHZH1001	Recording head	135
PHZL8001	Chart illumination lamp for the PHA	125
PHZL1001	Chart illumination lamp for the PHC	125
PEX00BL1-1000B	Chart paper for the PHA (1 set = 6 pkgs. of paper)	100
PEX00DL1-5000B	Chart paper for the PHC (1 set = 6 pkgs. of paper)	100
SHUNT RESISTOR	10Ω or 250Ω shunt resistor	4.25