OM-SQ2020 / 2040 Full Technical Specification and Accessories

Inputs Channels

		Universal Analogue Inputs			Common Inputs				
Type	ADC	Differential	Single Ended	3 or 4 Wire	Pulse		Event	High Voltage	Internal Temperature Reference
OM-SQ2020 - 1F8	X 1	8 max	16max	0	2 x Fast	2 x Slow	8 x	2	1
OM-SQ2020 - 2F8	X 2	8 max	16max	4*	inputs	inputs at up to	digital	2	1
OM-SQ2040 - 2F16	X 2	16 max	32 max	0	at up to	to 100Hz with	or	2	2
OM-SQ2040 - 4F16	X4	16 max	32 max	8*	64Khz	debounce	1 x 8 bit	2	2

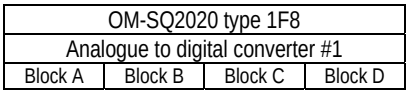
*Each 3 or 4 wire input reduces the total number of differential inputs by 2 and total single ended inputs by 4.

Input Channel Combination

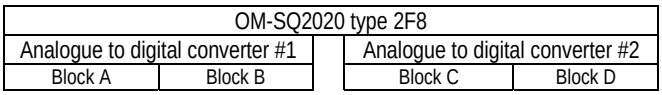
Input Channel Combinations

	Thermocouple		Thermistor		Voltage		Current		Resistance		RTD	
	2020	2040	2020	2040	2020	2040	2020	2040	2020	2040	2020	2040
Single ended	16	32	16	32	16	32			16	32	16	32
Differential	8	16			8	16	8	16				
3 or 4 wire									4 (2F8 only)	8 (4F16 only)	4 (2F8 only)	8 (4F16 only)

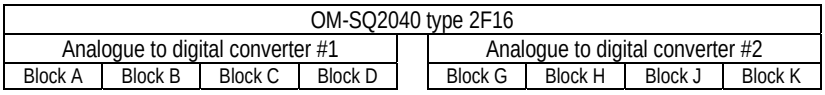
Note:- OM-SQ2020 / 2040 physical inputs are presented as a set of pins on a connector block. Each Connector block has 4 pins uniquely associated with inputs. An additional pin is the common for single ended use only. Each connector block can be configured as: (4 x Single ended) or (2 x Differential). On models 2F8 and 4F16 the block can also be used for 1 x 3 or 4 wire input. It is therefore possible to have a mix of single ended, differential and, if applicable, 3 or 4 wire inputs across different blocks as shown below:



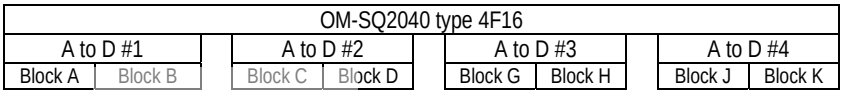
2 x Differential or 4 x Single ended inputs per block
(= 8 Differential inputs maximum)



1 x Four-wire, 2 x Differential or 4 x Single ended inputs per block (= 8 Differential inputs maximum)



2 x Differential or 4 x Single ended inputs per block
(= 16 Differential inputs max.)



1 x Four-wire, 2 x Differential or 4 x Single ended inputs per block (= 16 Differential

inputs maximum)

Reading Rate Combinations

The logger can read the inputs at one of four different reading rates. The number of different inputs that each analog to digital converter can read depends upon the reading rate and whether or not mains rejection is turned on. With mains rejection turned on each analog to digital converter can read 10 inputs per second. With mains rejection turned off each analog to digital converter can read 20 inputs per second but with reduced accuracy if there is any interference from the local mains electricity supply. These readings can be shared amongst several inputs as shown in the tables below. Alternatively, with mains rejection turned off, each analog to digital converter on a 2F8, 2F16 or 4F16 can operate at 100 readings per second but at this rate they can read one input only. Note that each analog to digital converter on a 2F8/4F16 is connected to up to 8 inputs and on a 1F8/2F16 is connected to up to 16 inputs.

Reading Rate	Maximum number of inputs which can be read at each rate with mains rejection turned on										
10	1										
5		2			1	1	1				
2			5		2	1		4	3	2	1*
1				8+/10*	1	3	5	2	4	6	8*

+2F8/4F16 only *1F8/2F16 only

Reading Rate	Maximum number of inputs which each 1F8/2F16 A to D can read at each rate with mains rejection turned off																														
100*	1																														
20		1																													
10			2				1	1	1	1	1	1	1	1	1																
5				4			2	1	1							3	3	2	2	2	2	2	2									
2					10			2		5	4	3	2	1		2		5	4	3	2	1		9	8	7	6	5	4	3	2	1
1						16		1	5		2	4	6	8	10	1	5		2	4	6	8	10	2	4	6	8	10	12	13	14	15

*100 readings per second is not available on 1F8 loggers or when reading thermocouple inputs

Reading Rate	Maximum number of inputs which each 2F8/4F16 A to D can read at each rate with mains rejection turned off																														
100*	1																														
20		1																													
10			2			1	1	1	1	1	1	1	1	1																	
5				4		2	1	1							3	3	2	2	2	2	2	2									
2					8		2		5	4	3	2	1		2		5	4	3	2	1		8	7	6	5	4	3	2	1	
1							1	5		2	4	5	6	7	1	5		2	3	4	5	6		1	2	3	4	5	6	7	

*100 readings per second is not available when reading thermocouple inputs

Standard Ranges for Temperature Channels

Each channel can be individually set to any of the ranges listed below.
Pt100/1000 sensors can be used on 4, 3 and 2 wire inputs with linearization to BS-EN-60751 or JIS1604

Input type	Range (°C)	Range (°F)	Default Resolution
Y and U: Thermistor	-50 to 150	-58 to 302	0.01
S: Thermistor	-30 to 150	-22 to 302	0.01
P: Pt100/Pt1000	-200 to 850	-328 to 1562	0.1(Pt100) /0.01(Pt1000)
K: Thermocouple	-200 to 1372	-328 to 2501	0.1
T: Thermocouple	-200 to 400	-328 to 752	0.1
J: Thermocouple	-200 to 1200	-328 to 2192	0.1
N: Thermocouple	-200 to 1300	-328 to 2372	0.1
R and S: Thermocouple	-50 to 1768	-58 to 3214	0.1

Note:- The resolution can be changed in OMEGALOG® but the logger only gives 6 significant figures.

Standard Ranges for DC Voltage / Current and Resistance Channels

Each voltage/current channel can be any of the voltage or current ranges below. Mixed differential and single ended configurations are permitted. Note that current ranges use differential input channels only to provide necessary isolation.

Voltage Range	Default Resolution	High Voltage Range (Single ended only)	Default Resolution	Resistance Range	Default Resolution
-0.075 to 0.075V	0.000001	4.0 to 20.0V	0.001	**2 wire**	
-0.15 to 0.15V	0.00001	4.0 to 40.0V	0.001	0.0 to 1250.0 Ω	0.01
-0.3 to 0.3V	0.00001	4.0 to 60.0V	0.001	0.0 to 5000.0 Ω	0.1
-0.6 to 0.6V	0.00001			0.0 to 20000.0 Ω	0.1
-0.6 to 1.2V	0.0001	**Current Range** (requires external 10 Ω shunt resistor)		0.0 to 300000.0 Ω	1.0
-0.6 to 2.4V	0.0001				
-3.0V to 3.0V	0.0001			**3 and 4 wire**	
-6.0V to 6.0V	0.0001	-30.0 to 30.0mA	0.001	0.0. to 500.0Ω	0.01
-6.0 to 12.0V	0.001	4.0 to 20.0mA	0.001	0.0 to 4000.0Ω	0.1
-6.0 to 25.0V	0.001				

Standard Ranges for Event and Pulse Count / Frequency Channels

Event 1 x 8 bit digital number (0 to 255) or 8 x individual bits indicating 8 x individual events.
Pulse Count (millions) 16.5, 33, 67, 134, 268, 536, 1073, 2147, 4295, 8590, 17180 or 34360.
Pulse Frequency 0-64KHz Fast mode (no signal conditioning)
0-100Hz, Slow mode (with signal conditioning / contact de-bounce)

Scaled Ranges

Scaled ranges can be created within OMEGALOG® using any of the standard ranges to display a sensor's output directly in the correct units. For example, a humidity sensor with a 0-1V output could have a scaled range created so that it displayed as 0-100%rh on the logger and when analysed in OMEGALOG®

Calculated Channels

Up to 16 calculated channels can be derived from physical input channels. Common arithmetic functions, that is **+**, **-**, **x**, **÷** and **=** are permitted together with brackets, **( )** and **numerical** values. For example, if channel 1 is measuring voltage and channel 3 is measuring current then a calculated channel could be produced to give power (= voltage x current). Calculated channels are calculated only once per second and only from channels being read at the same reading rate.

Technical Specification of the Data Loggers:

Analog Inputs

Common mode:
Range ±25V isolated
Rejection >100dB
Input Impedance:
approximately 10MΩ on ranges ≤ 2.5V
approximately 1MΩ for all other ranges
Linearity 0.0015%
Series mode line rejection: 50/60Hz 100dB

Digital Inputs

Zero input voltage = 0 to 0.5V (or shorted input)
One input voltage = 2.7 to 5V (or open circuit input)
Input protection will turn on below about -0.5V and above about 6V

Resolution

6 significant digits (that is the sixth digit is meaningful).

Analog-Digital Conversion

Type: Sigma-Delta
Resolution :24Bit

Sampling Rate:
Mains rejection on:
1F8 – up to 1 x 10 readings per second
2F8 – up to 2 x 10 readings per second
2F16 – up to 2 x 10 readings per second
4F16 – up to 4 x 10 readings per second
Mains rejection off:
1F8 – up to 1 x 20 readings per second
2F8 – up to 2 x 100 readings per second
2F16 – up to 2 x 100 readings per second
4F16 – up to 4 x 100 readings per second

Alarm outputs

4 x open drain FET (18V 0.1A)

Power output for external devices

5VDC at 50mA or Supply Voltage (from the external power supply or internal battery) at 100mA

Time and Date

In built clock – 3 formats
The clock will operate for up to 24 hours without batteries

Scaled Ranges

Displays the readings in the required Engineering Units

Memory Modes

Stop when full or Overwrite the oldest readings

Programming/Logger setup

OM-SQ-SOFT or OM-SQ-SOFT-PLUS

Communications

RS232 auto ranging to115200 bps
USB 1.0 and 2.0 compatible

Download Speed

Logger to External MMC – approximately 3Mb per minute
Logger to PC via RS232 – up to 115Kb (auto bauding)
Logger to PC via USB – approximately 1Mb per minute
External MMC to PC via MMC – function of card reader and PC.

Internal Batteries

6 x AA Alkaline batteries.
Preferred - Procell LR6 (2.7Ah)
Minimum: 5.4V is cut off
(Low battery warning at 6.0V)
Nominal high voltage 9.6V

External Supply

Nominal 12VDC (10V to 18V DC)
External supply voltage must be at least 0.5V greater than the internal batteries to prevent discharge of internal batteries
Note:- use of external supply without internal batteries is not recommended, a warning message is displayed if this is attempted to indicate that data loss may occur

Battery Endurance (days)

Estimated battery endurance assuming that the logger does not power any external sensors from the sensor power supplies.

Logging Interval	1F8	2F8 & 2F16	4F16
Continuous	1.75	1.25	0.75
5s	2.5	2	1.25
10s	5	3.75	2.5
15s	8	6	4
30s	16	12	8
1min	25	19	12
5min	75	58	37
15min	120	92	62

Current Consumption at 9VDC

Sleeping 600uA
Logging <55mA for 1F8, <85mA for 2F8 and 2F16 and <130mA for 4F16

Optional

External AC to 12VDC supply
97-263V 50/60Hz
Single fit UK/Euro/USA mains plug
Fused DC supply lead

Enclosure

Custom moulded plastic

Dimensions and Weight

Dimensions: OM-SQ2020 = W225xD170xH55mm
OM-SQ2040 = W225xD170xH92mm
Weight: OM-SQ2020 = approx. 1.2kg
OM-SQ2040 = approx. 1.5kg
Case material: ABS
Case flammability: UL 94 HB

Display and Keypad

4 Navigation keys
LCD with 2 lines of 20 characters
Battery state indication
External power applied indicator
Navigator prompt
Read and/or Change (see the TUI for more detail):
- Logging:- Arm/Disarm/Pause/Continue
- Meter any channel
- Select from setup options
- Date and time
- Status/diagnostics/faults/supply voltage/Text
- Alarms – assign outputs.
- View used and free memory
- View logger type

Key pad lock to prevent any change of set ups.

Environment

Highest accuracy over range +5 to +45°C
Reduced accuracy over range -20 to +60°C
(Refer to accuracy specifications for more information)
Relative Humidity 90% at 45°C, non-condensing

OM-SQ2020 / 2040 Accessories:

Item	Part number	Comment
GSM kit	OM-SQ-GSM-KIT	External GSM modem, harness and antenna.
Ethernet Kit	OM-SQ-NET-ADAP	External Ethernet Null modem adaptor kit.
Universal AC power supply	OM-SQ-UNIV-ADAP	AC97-263V 50/60 Hz to 12.5VDC at 1.25A regulated. Supplied boxed inclusive of 3 x single fit mains plug for UK, Euro and American power outlet sockets
Current Shunt	OM-SQ-CS	Precision resistance 10Ω 0.1% 15ppm 0.125W for -30 to +30mA and 4-20mA applications
Serial lead	OM-SQ-SER-CABLE	2020/2040 to PC serial port lead
Replacement USB lead	OM-SQ-USB-CABLE	USB lead is supplied with product
Calibration Certificate **Software**	OM-SQ2020-CAL OM-SQ2040-CAL	This certificate provides verification that your logger has been tested and is working accurately within its published specification. This authentication is now a standard requirement within most Quality Control departments
OM-SQ-SOFT		
OM-SQ-SOFT-PLUS		

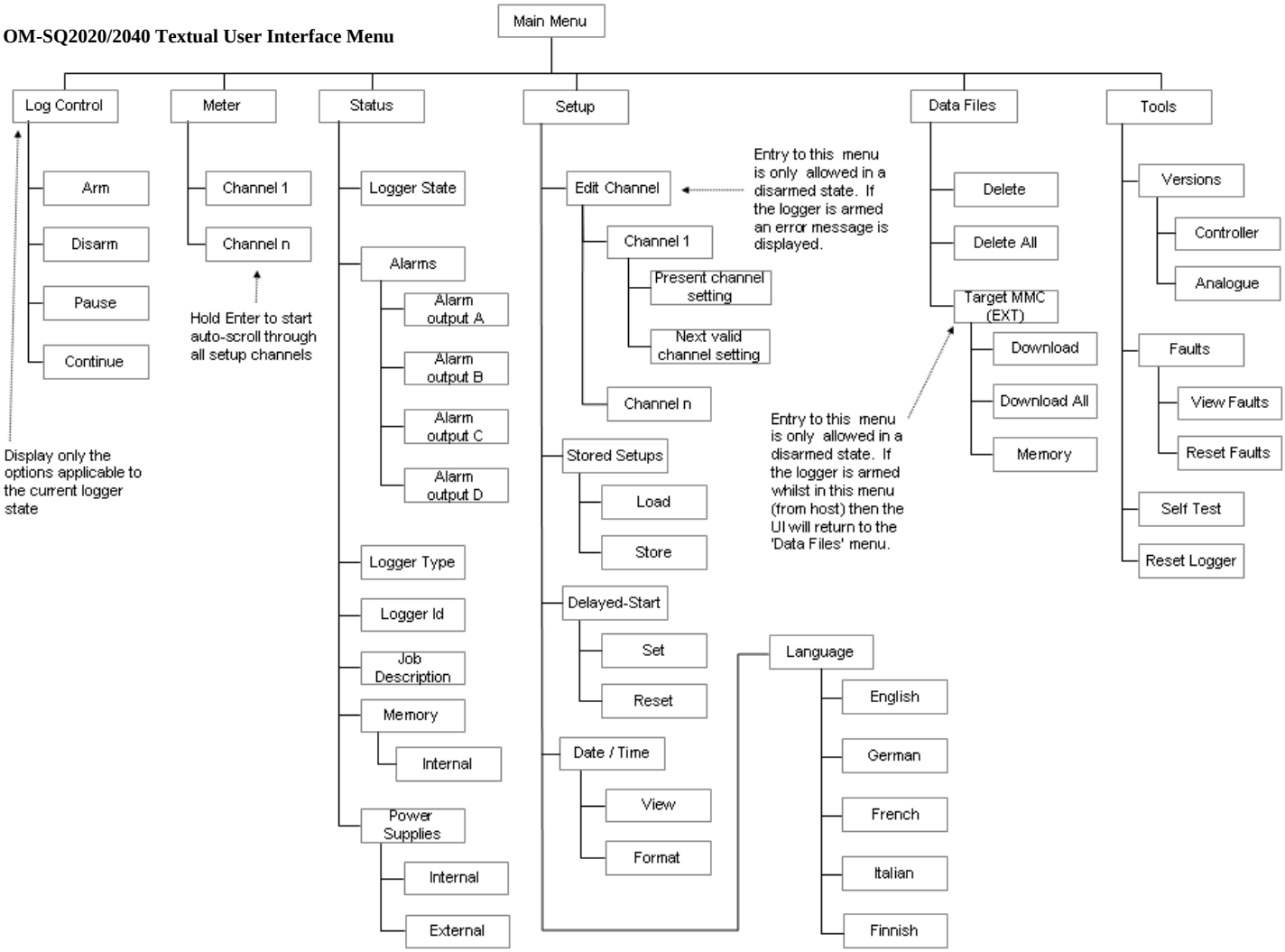
Policy note – if lost, the battery cover will be replaced free of charge to the customer

What do I get when I order an OM-SQ2020 / 2040 ?

- Customised* packaging designed for Airfreight containing;
- OM-SQ2020/2040 customer specific variation
- Set of 6 AA batteries
- Set of 4 precision 10R current sense resistors
- Desk/wall bracket
- USB lead
- OMEGALOG® Software on CD
- Connector kit with cable ties
- User Guide (A5 format)

*The packaging is designed to accept a OM-SQ2020 or OM-SQ2040, the power supply option and there is a spare compartment for non-specific accessories. The packaging should be retained for carriage returns or storage when product is not in use.

OM-SQ2020/2040 Textual User Interface Menu



Memory:

Internal

Type	MMC (Multi Media Card)
Size	16Mb
Readings	each reading is 8bytes or one data point
Time stamp	each time stamp is 8bytes or one data point – a time stamp occurs every second.
House keeping	including 4 set ups is approximately 1Mb (Note set up in use is also stored)

Number of readings – based on 15.0Mb available.

No Channels	Rate	Readings (approximately)	Note
1	1Hz	937,500	16 bytes for each readings (8+8)
10	1Hz	1.7×10^6	88 bytes for 10 readings (80+8)
1	10Hz	1.7×10^6	88 bytes for 10 readings (80+8)
1	100Hz	1.85×10^6	808bytes per 100 readings (800+8)

In order to estimate the number of readings, apply the following formula:

Readings = 15,000,000 / (8R + 8)

Where **R** = the number of readings per second, that is (No. of channels x Rate). This must be a whole number.

External

Type	MMC
Size	up to 256Mb
Implementation	Copy internal memory to an **accumulating** external memory (Internal memory from many loggers can be transferred to the external memory until the card is full) Up load to logger stored set ups from the external memory. Use to transport logger data to external device

Note:- Logging to external memory is not available

Fault Table:

The following are a list of faults that can be reported by the logger.

Code	Fault	Comments
	Controller / Common Faults	
102	TUI_FAILURE	The display is not detected / present
103	DATA_ACQ_COMMS_FAILURE	The acquisition has not replied to a command from the controller. A 103 is raised and the acquisition reset. If the acquisition does not respond to a reset, communications to it will be then be disabled the logger put into fatal fault. If the reset was *successful* but this resetting cycle occurs 3 times in one job then the logger is also put into a fatal fault state.
104	POWER_LOSS_DETECT	Detection that a un-controlled power down event occurred whilst Armed
105	REAL_TIME_CLOCK_FAILURE	
106	CPU_A2D_FAILURE	CPU internal A2D fault (was 121 pre v3)
107	FLASH_DISK_FAILURE (also WRITE_SETUP_FAILURE pre V2.1)	MMC failure on self-test. If reset of logger does not cure, try cycle of the power then, if needed, an internal format. (was also used for 121 cause pre v3)
118	STATE_CHANGE_DENIED	Development fault – unexpected behaviour
119	LOG_MGR_WRITE_FAIL	Failed to write to internal MMC. Could be that MMC has reached its wear limit and requires replacement
120	LOAD_SETUP_FAILURE	Failure during load of the current setup.
121	WRITE_SETUP_FAILURE	Failure during write of setup.
122	LOG_MGR_WRITE_TIMEOUT	Timeout when waiting for write semaphore
125	POWER_CRITICAL	The power has dropped to less than 5.4v whilst the logger was armed. The logger will attempt to disarm upon this event before raising this fault
126	POWER_LOSS	The power has dropped to less than 5.4v whilst the logger was armed and no batteries are detected. This fault should never be seen but is raised to ensure logger goes fatal (if it's seen, something has gone wrong!)
130	POST_COMPAT_MISMATCH	Incompatible firmware versions found at power up. Ensure that the Acquisition and Controller firmware are compatible with each other.
201	CPU_RAM_FAILURE	Unused at present
202	A2D_COMMS_FAILURE	Unused at present
203	SPARE1	Reserved for future use
204	SPARE2	Reserved for future use
205	SENSOR_POWER_FAILURE	Sensor power has failed, try removing the external load to reset the internal fuse. If the fault persists then contact support.
206	SENSOR_POWER_LOW	Power low may be due to an overload of the power supply.
207	POST_INVALID_CONFIG	Unused at present
208	POST_FAILURE	Logger Self Test problem. Run self test in SquirrelView diagnostics to view cause
209	POST_ERROR	Logger Self Test problem, will still operate in a degraded manner. Run self test in SquirrelView diagnostics to view cause

See technical support if fault is not listed above

Accuracy figures

The accuracy figures are quoted over a logger temperature range of +5 to +45°C and assume that the logger is at a constant temperature. If the logger's temperature is varying then the errors could be considerably worse, especially for thermocouple measurements. These are worst case figures and are given as ±(percentage of reading + percentage of range) or ±(percentage of reading + fixed value). The errors at 25°C are generally less than half of those quoted and over the ranges -30 to +5 and +45 to +65°C the errors are generally about twice those quoted.

Analog Ranges:

Analog Range	% of reading	% of range
4 to 60V	0.15	0.025
4 to 40V	0.15	0.03
4 to 20V	0.15	0.05
Reference temperature		0.1
Voltage Differential -0.6 to 2.4V	0.05	0.025
Voltage Differential -0.6 to 1.2V	0.05	0.025
Voltage Differential -0.6 to 0.6V	0.05	0.025
Voltage Differential -0.3 to 0.3V	0.05	0.025
Voltage Differential -0.15 to 0.15V	0.05	0.025
Voltage Differential -0.075 to 0.075V	0.05	0.05
Voltage Single ended -0.6 to 2.4V	0.05	0.025
Voltage Single ended -0.6 to 1.2V	0.05	0.025
Voltage Single ended -0.6 to 0.6V	0.05	0.025
Voltage Single ended -0.3 to 0.3V	0.05	0.05
Voltage Single ended -0.15 to 0.15V	0.05	0.1
Voltage Single ended -0.075 to 0.075V	0.05	0.2
Current Differential -30 to 30mA	0.05	0.03
Current Differential 4 to 20mA	0.05	0.03
Voltage Differential -6 to 25V	0.1	0.025
Voltage Differential -6 to 12V	0.1	0.025
Voltage Differential -6 to 6V	0.1	0.025
Voltage Differential -3 to 3V	0.1	0.025
Voltage Single ended -6 to 25V	0.1	0.025
Voltage Single ended -6 to 12V	0.1	0.025
Voltage Single ended -6 to 6V	0.1	0.025
Voltage Single ended -3 to 3V	0.1	0.025
Resistance 2-wire 0 to 300000R, sub-range 0 to 33000R	0.1	0.0005
Resistance 2-wire 0 to 300000R, sub-range 33000 to 300000R	0.4	0.0005
Resistance 2-wire 0 to 20000R	0.05	0.005
Resistance 2-wire 0 to 5000R	0.1	0.01
Resistance 2-wire 0 to 1250R	0.05	0.04
Resistance 3-wire 0 to 4000R	0.1	0.01
Resistance 3-wire 0 to 500R	0.05	0.05
Resistance 4-wire 0 to 4000R	0.075	0.005
Resistance 4-wire 0 to 500R	0.075	0.025
Thermistor U-type -50 to 150°C, sub-range -50 to 100°C	0.15	0.01
Thermistor U-type -50 to 150°C, sub-range 100 to 150°C	0.5	

Thermistor Y-type -50 to 150°C, sub-range -50 to 100°C	0.2	0.015
Analog Range	% of reading	% of range
Thermistor Y-type -50 to 150°C, sub-range 100 to 150°C	0.5	
Thermistor S-type -30 to 150°C, sub-range -30 to 15°C	0.1	0.03
Thermistor S-type -30 to 150°C, sub-range 15 to 150°C	0.05	0.01
Pt100 BS EN 60751 2-wire -200 to 850°C	0.1	0.1
Pt100 JIS 1604 2-wire -200 to 850°C	0.1	0.1
Pt1000 BS EN 60751 2-wire -200 to 850°C	0.1	0.02
Pt100 BS EN 60751 3-wire -200 to 850°C	0.1	0.1
Pt100 JIS 1604 3-wire -200 to 850°C	0.1	0.1
Pt1000 BS EN 60751 3-wire -200 to 850°C	0.1	0.02
Pt100 BS EN 60751 4-wire -200 to 850°C	0.075	0.05
Pt100 JIS 1604 4-wire -200 to 850°C	0.075	0.05
Pt1000 BS EN 60751 4-wire -200 to 850°C	0.075	0.02
Thermocouple J-type Differential -200 to 1200°C, sub-range -200 to -50°C	0.4	0.1
Thermocouple J-type Differential -200 to 1200°C, sub-range -50 to 1200°C		0.1
Thermocouple K-type Differential -200 to 1372°C, sub-range -200 to -50°C	0.7	0.1
Thermocouple K-type Differential -200 to 1372°C, sub-range -50 to 1372°C	0.05	0.1
Thermocouple N-type Differential -200 to 1300°C, sub-range -200 to -50°C	1.5	0.13
Thermocouple N-type Differential -200 to 1300°C, sub-range -50 to 1300°C		0.13
Thermocouple R-type Differential -50 to 1768°C, sub-range 0 to 350°C		0.4
Thermocouple R-type Differential -50 to 1768°C, sub-range 350 to 1768°C		0.23
Thermocouple S-type Differential -50 to 1768°C, sub-range 0 to 350°C		0.4
Thermocouple S-type Differential -50 to 1768°C, sub-range 350 to 1768°C		0.25
Thermocouple T-type Differential -200 to 400°C, sub-range -200 to 0°C	0.7	0.3
Thermocouple T-type Differential -200 to 400°C, sub-range 0 to 400°C		0.3
Thermocouple J-type Single ended -200 to 1200°C, sub-range -200 to -50°C	0.8	0.18
Thermocouple J-type Single ended -200 to 1200°C, sub-range -50 to 1200°C		0.18
Thermocouple K-type Single ended -200 to 1372°C, sub-range -200 to -50°C	1.5	0.18
Thermocouple K-type Single ended -200 to 1372°C, sub-range -50 to 1372°C	0.05	0.18
Thermocouple N-type Single ended -200 to 1300°C, sub-range -200 to -50°C	2.5	0.25
Thermocouple N-type Differential -200 to 1300°C, sub-range -50 to 1300°C		0.25
Thermocouple R-type Single ended -50 to 1768°C, sub-range 0 to 350°C		0.8
Thermocouple R-type Differential -50 to 1768°C, sub-range 350 to 1768°C		0.5
Thermocouple S-type Single ended -50 to 1768°C, sub-range 0 to 350°C		0.8

Analog Range	% of reading	% of range
Thermocouple S-type Differential -50 to 1768°C, sub-range 350 to 1768°C		0.5
Thermocouple T-type Single ended -200 to 400°C, sub-range -200 to 0°C	1.5	0.6
Thermocouple T-type Single ended -200 to 400°C, sub-range 0 to 400°C		0.6

Digital Ranges
The accuracy for all of the digital ranges is ±(0.0035% of reading + 1Hz/Count).

Time
The real-time clock accuracy is better than 3 seconds per day plus the initial 1 second setting accuracy.