

riFuse 2.0



Powerful | Informative | Durable | Cost-effective



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riFuse

is a versatile power distribution module for vehicles and industrial machines that is used together with a CAN based supervisory system. It eliminates the need of relays and fuses in favor of a non-maintenance module that can be individually configured and mounted anywhere in the vehicle, constantly reporting the status of all its outputs to the supervisory system enabling clear and concise fault-finding support. No more need for accessible fuse cabinets and spare parts!

CAN

For connecting to the supervisory system, the riFuse use a J1939 compatible proprietary protocol at 250 kbps. It also has an internal termination resistor that can be enabled via the protocol when needed.

I/O

The riFuse can support up to 14 outputs and 6 inputs (see the table on next page for configurations). Outputs are controlled from the supervisory system through the J1939 protocol with ON/OFF and 0-100% duty-cycle parameters.

The H-bridge enable the control of a bi-directional DC motor, i.e., a fan , wiper motor or similar.

All outputs can be limited in current through a “fuse” setting that replicates the behavior of standard vehicle fuse types. When the set current threshold is exceeded, the output is disconnected, its status can be read through the J1939 protocol and viewed by the operator with a clear message.

The outputs have current and voltage measurement, enabling fast and accurate control.

- Precision measurement with a resolution down to < 10 mA and < 10mV over the full range.

The inputs can be used with analog sensors, supplied by the sensor supply output, or configured as digital inputs referencing system GND.

General

Operating temperature -30 to 60°C
Storage temperature -40 to 85°C
Voltage supply 9 to 36 V

To meet the environment found in mobile machines the riFuse uses the Deutsch DT high reliability connector system, which is made for harsh environment and high vibration applications.

The enclosure is rated IP65 + IP67 and is a rugged mechanical design, sealed for outdoor use.

Ordering PN

1100-00622

Description

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Capabilities	Number
Outputs total	14
Digital/PWM outputs (HS) 25 A. (Output A, B, C, E, F):	5
Digital/PWM outputs (HS) 20 A. (G, H):	2
Digital/PWM outputs (HS) 15 A. (D.1, D.2, D.3):	3
Digital/PWM outputs (HS) 45 A. (D. Consist of pins D.1, D.2 and D.3 combined):	1
Digital output (LS) 15 A. (K, L):	2
H-Bridge -40 to 0 to +40 A in 1% increments:	1
Sensor supply 5V, 150 mA:	1
Inputs total	6
Voltage inputs 12-bit, 0 – 36 V:	4
Counter inputs:	6
Digital inputs	6
Network	
CAN bus J1939:	1 (and 1 pass-through connection)

HS = High-side, driving current through the attached load.

LS = Low-side, sinking current from the attached load.

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Power supply X1, +BAT160A

This feed is connected in most cases after the main battery switch.
Choose supplying cable, including fuse, after the total power output of the unit.
Maximum tightening torque of X1 is 9 Nm.

Connection outputs X2

Pin	Function
1	OUT-A
2	OUT-A
12	OUT-A
3	OUT-B
10	OUT-B
11	OUT-B
4	OUT-C
8	OUT-C
9	OUT-C
5	OUT-D.1
6	OUT-D.2
7	OUT-D.3

Connection outputs X3

Pin	Function
5	OUT-E
7	OUT-E
8	OUT-E
3	OUT-F
9	OUT-F
10	OUT-F
1	OUT-G
2	OUT-G
11	OUT-H
12	OUT-H
6	OUT-LOW-K
4	OUT-LOW-L

Connections for CAN, inputs and address X4

Pin	Function
1	+BAT10A
2	DIN-A
3	DIN-B
4	GND
5	CAN-H
6	CAN-L
7	AIN-A
8	AIN-B
9	ADR-A0
10	ADR-A1
11	ADR-A2
12	DOUT-1A

UART for program loading X5

Pin	Function
1	TX
2	RX
3	GND

Power supply X6, -BAT

In the event that riFuse minus is connected to the chassis (recommended), connection shall be as close as possible to riFuse.


In the event that minus is connected centrally in the installation, the area of the negative line shall not be less than on the +Bat cable. The total voltage drop at full installed load must not exceed 1 V. The symptoms that usually occur in case of excessive voltage drop on the negative line are primarily problems with CAN bus communication.

Auxiliary connector X7

Pin	Function
1	HBRIDGE-A
2	HBRIDGE-A
12	HBRIDGE-A
3	HBRIDGE-B
10	HBRIDGE-B
11	HBRIDGE-B
4	GND
5	CAN-H (pass-through connection)
6	CAN-L (pass-through connection)
8	AIN-C
7	AIN-D
9	DOUT-5V

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Connectors on incoming cables

Connector	Connector parts
X1A, X1B	M8 ring cable shoe. If total output current exceeds 100A both connections should be used.
X6	M5 ring cable shoe. If low-side outputs and H-Bridge are used with a combined total current that exceeds 30A both connection should be used.
X2 (Black)	DT06-12SB-CE05 DEUTSCH 12 PIN CODE B
	W12S-P012 WEDGE
	1062-16-0988 Deutsch sleeve 16-18AWG gold banded shape
	240114-017 CAVITY PLUG
X3 (Green)	DT06-12SC-CE05 DEUTSCH 12 PIN CODE C
	W12S-P012 WEDGE
	1062-16-0988 Deutsch sleeve 16-18AWG gold banded shape
	240114-017 CAVITY PLUG
X4 (Gray)	DT06-12SA-CE11 DEUTSCH 12 PIN CODE A
	W12S-P012 WEDGE
	1062-16-0988 Deutsch sleeve 16-18AWG gold banded shape
	240114-017 CAVITY PLUG
X7 (Brown)	DT06-12SD-CE05 DEUTSCH 12 PIN CODE D
	W12S-P012 WEDGE
	1062-16-0988 Deutsch sleeve 16-18AWG gold banded shape
	240114-017 CAVITY PLUG

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Nominal voltage 12 and 24 V DC
Temperature range -30°C...+60°C

Standards EMC Directive (2014/30/EU)
 EN ISO 13766-1:2018 Earth moving machinery

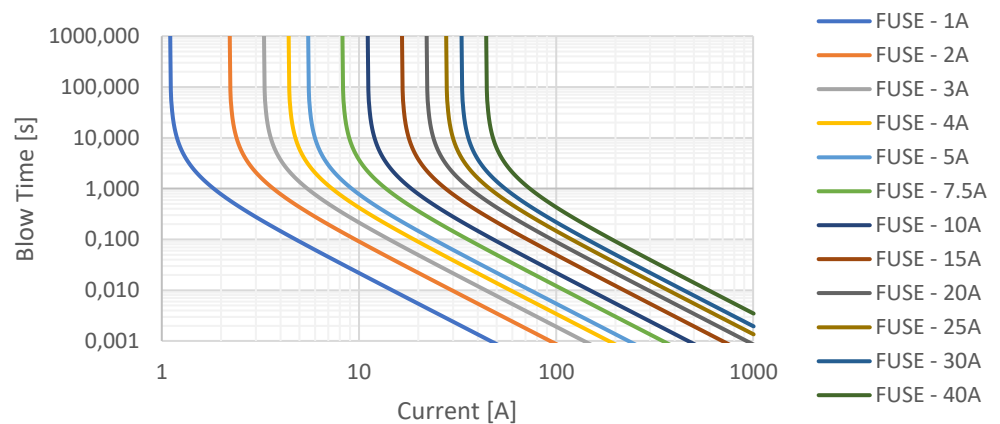
Material housing

Material	Aluminium	EN 6082
Color	Black powder coating	RAL9005
Halogen-free	Yes	
UV resistant	Yes	
IP rating	IP65 + IP67	

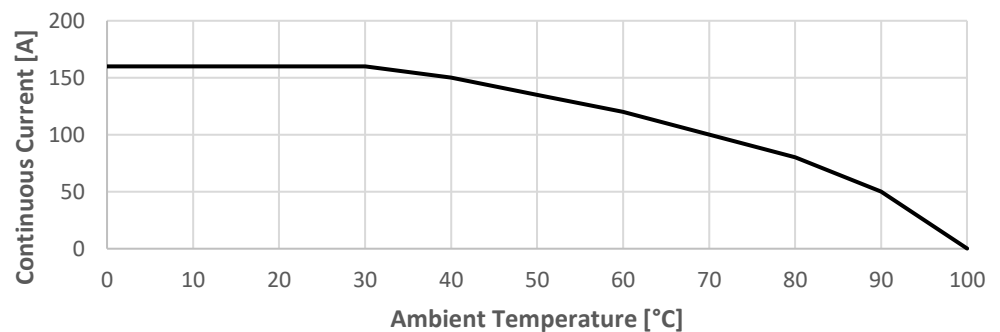
Material contacts Deutsch sleeve 16-18AWG gold banded shape.

Performance

Fuse Time-Current Chart



Max. Continuous Current Derating Curve (In Free Air)



Derating will be positively affected by enclosure cooling. Diagram shows worst-case continuous power.

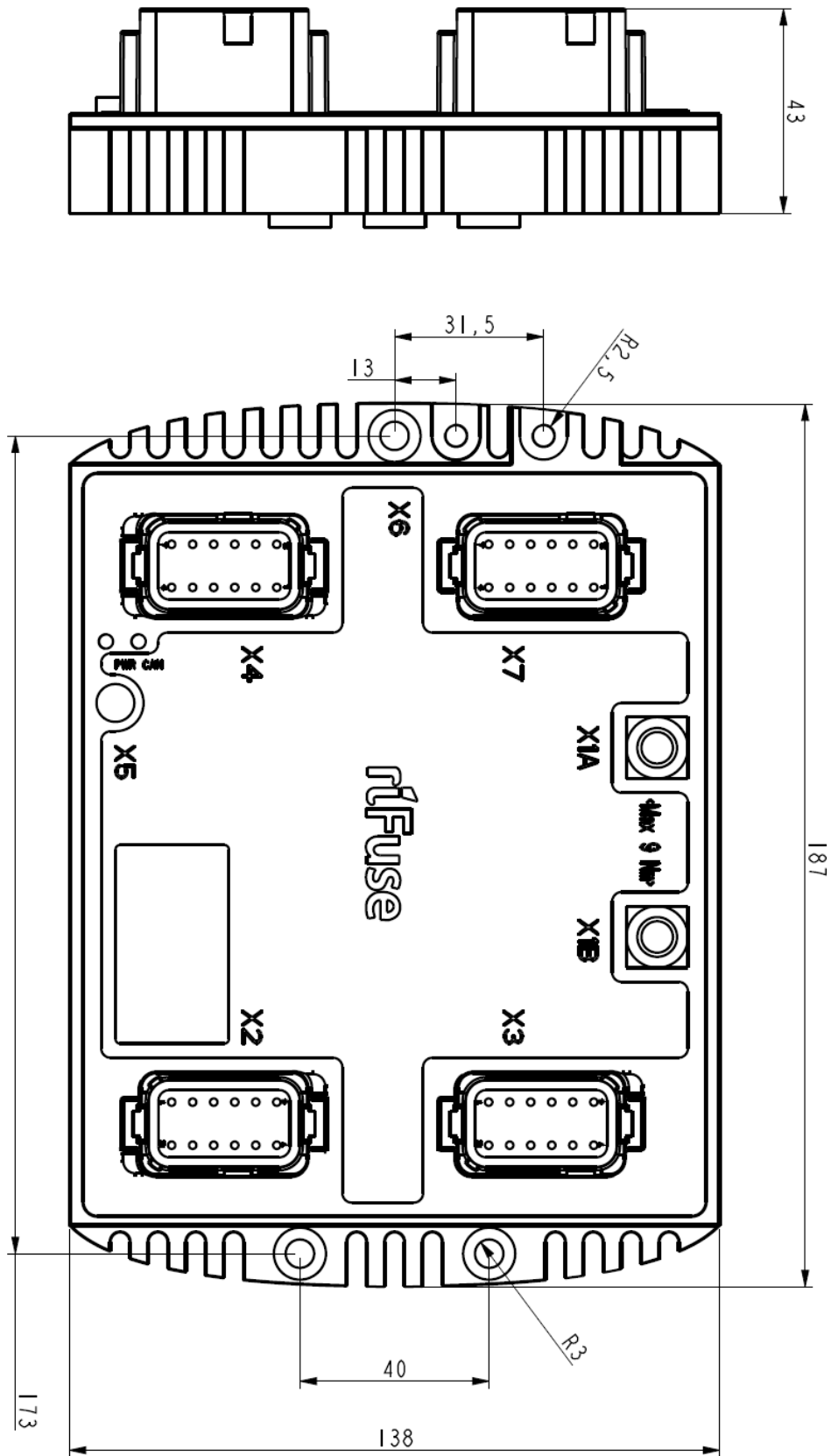


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Dimensions



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Electrical Specifications						
Absolute Maximum Ratings						
	Symbol	Parameter	Conditions	Min	Max	Unit
Power Inputs						
+BAT160A, +BAT10A	VIN	Input Voltage Range		-0.3	80	V
+BAT160A	IIN	Continuous Supply Current			160	A
	IIN_PEAK	Surge Peak Current	Single Pulse, $\Delta t=1\text{ms}$		450	A
+BAT10A	IIN	Continuous Supply Current			10	A
	IIN_PEAK	Surge Peak Current	Single Pulse, $\Delta t=8.3\text{ms}$		150	A
Power Outputs						
OUT-A, OUT-B, OUT-C, OUT-E, OUT-F, OUT-G, OUT-H, OUT-D.1, OUT-D.2, OUT-D.3	OUT	Output Voltage Range		-0.3	40	V
OUT-A, OUT-B, OUT-C, OUT-E, OUT-F	IOUT	Continuous Output Current			25	A
	IOUT_PEAK	Surge Peak Output Current			Internally Limited	A
	ICUT-OFF	Short-Circuit Cut-off Current		35		A
OUT-G, OUT-H	IOUT	Continuous Output Current			20	A
	IOUT_PEAK	Surge Peak Output Current			Internally Limited	A
	ICUT-OFF	Short-Circuit Cut-off Current		24		A
OUT-D.1, OUTD.2, OUTD.3	IOUT	Continuous Output Current			15	A
	IOUT_PEAK	Surge Peak Output Current			Internally Limited	A
	ICUT-OFF	Short-Circuit Cut-off Current		24		A
External Supply Outputs						
DOUT-1A	VOUT	Output Voltage	VIN: Supply Voltage	-0.3	40	V
	IOUT	Continuous Output Current			1.5	A
DOUT-5V	VOUT	Output Voltage		-0.3	8	V
	IOUT	Continuous Output Current	Supply Voltage 24V		150	mA
	IOUT	Continuous Output Current	Supply Voltage 12V		300	mA
Motor Outputs						
HBRIDGE-A, HBRIDGE-B	VOUT	Output Voltage Range		-0.3	40	V
HBRIDGE-A, HBRIDGE-B	IOUT	Continuous Output Current			40	A
	IOUT_PEAK	Surge Peak Output Current			Internally Limited	A
Sinking Outputs						
OUT-LOW-K, OUT-LOW-L	VOUT	Output Voltage Range		-0.3	40	V
OUT-LOW-K, OUT-LOW-L	IOUT	Continuous Output Current			15	A
	IOUT_PEAK	Surge Peak Output Current			Internally Limited	A
Digital Inputs						
DIN-A, DIN-B	VIN	Input Voltage Range		-80	80	V
Analog Inputs						
AIN-A, AIN-B, AIN-C, AIN-D	VIN	Input Voltage Range		-66	66	V
CAN						
CAN-H, CAN-L	VIN	Input Voltage Range		-36	36	V
			Transient Pulse, Through 100 Ω	-60	60	V
CAN Address Inputs						
ADDR-A0, ADDR-A1, ADDR-A2	VIN	Input Voltage Range		-0.3	80	V
RS232						
RS232-RX, RS232-TX	VIN	Input Voltage Range		-0.3	7	V
Storage Temperature						
Operating Ambient Temperature				-40	105	$^{\circ}\text{C}$
				-30	60	$^{\circ}\text{C}$

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Recommended Operating Conditions

	Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Power Inputs							
+BAT160A, +BAT10A	VIN	Input Voltage Range		9		36	V
Power Outputs							
OUT-A, OUT-B, OUT-C, OUT-D.1, OUT-D.2, OUT-D.3, OUT-E, OUT-F, OUT-G, OUT-H	VOUT	Output Voltage Range				36	V
Motor Outputs							
HBRIDGE-A, HBRIDGE-B	VOUT	Output Voltage Range				36	V
Sinking Outputs							
OUT-LOW-K, OUT-LOW-L	VOUT	Output Voltage Range				36	V
External Supply Outputs							
DOUT-1A	VOUT	Output Voltage	VIN: Supply Voltage	VIN-2.2V	VIN-1.6V	VIN-1.0V	V
	IOUT	Continuous Output Current				1	A
	ILIM	Limiting Current		1,5	2,2	3,4	A
	ILOAD_MIN	Minimum load current			3,5	10	mA
DOUT-5V	VOUT	Output Voltage		4.9	5	5.1	V
	IOUT	Continuous Output Current	Supply Voltage 24V			100	mA
	IOUT	Continuous Output Current	Supply Voltage 12V			200	mA
Digital Inputs							
DIN-A, DIN-B	VIN	Input Voltage Range		0		40	V
	VT+	Positive-Going Threshold Voltage		1.49	1.95	2.53	V
	VT-	Negative-Going Threshold Voltage		0.77	1.3	1.82	V
	VHYS	Hysteresis Voltage		0.44	0.74	1.32	V
	fCUT-OFF	Input Cut-off Frequency	Sine Wave		7.9		kHz
Analog Inputs							
AIN-A, AIN-B, AIN-C, AIN-D	VIN	Input Voltage Range		0		40	V
	VOS	Input Offset Voltage			±30	±170	mV
		Accuracy	Of Reading (+ Input Offset)			±0.35	%
	VFS	Full-Scale Measurement Range		0		36.3	V
	fCUT-OFF	Input Cut-off Frequency	Sine Wave		9.5		kHz
CAN							
CAN-H, CAN-L	VIN	Input Voltage Range	Separately or Common-Mode	-7		12	V
			Differential	-6		6	V
	IOH	High-Level Output Current	Driver	-50			mA
			Receiver	-10			mA
IOL	Low-Level Output Current	Driver			50	mA	
		Receiver			10	mA	
Driver (CAN-H, CAN-L)	VO(D)	Bus Output Voltage (Dominant)	CAN-H	2.45		3.3	V
			CAN-L	0.5		1.25	V
	VO	Bus Output Voltage (Recessive)	CAN-H		2.3		V
			CAN-L		2.3		V
	VOD(D)	Differential Output Voltage	Dominant	1.2	2	3	V
			Recessive	-0.5		0.05	V
	VOC(pp)	Peak-to-Peak Common-Mode Output Voltage			1		V
	IOS	Short-Circuit Output Current	VCAN-H = -7V, CAN-L Open	-250			mA
			VCAN-H = 12V, CAN-L Open			1	mA
			VCAN-L = -7V, CAN-H Open	-1			mA
VCAN-L = 12V, CAN-H Open					250	mA	
CO	Output Capacitance	CAN-H or CAN-L, Pin-to-Ground		40		pF	
COD	Differential Output Capacitance	Pin-to-Pin		20		pF	

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Recommended Operating Conditions (Continued)

	Symbol	Parameter	Conditions	Min	Typ	Max	Unit
CAN							
	VIT+	Positive-Going Input Threshold Voltage			750	900	mV
	VIT-	Negative-Going Input Threshold Voltage		500	650		mV
	VHYS	Hysteresis Voltage			100		mV
Receiver (CAN-H, CAN-L)	II	Bus Input Current	CAN-H or CAN-L at 12V	150		500	µA
			CAN-H or CAN-L at 12V, VCC at 0V	200		600	µA
			CAN-H or CAN-L at -7V	-610		-150	µA
			CAN-H or CAN-L at -7V, VCC at 0V	-450		-130	µA
	CI	Input Capacitance	CAN-H or CAN-L, Pin-to-Ground		40		pF
	CID	Differential Input Capacitance	Pin-to-Pin		20		pF
RS232							
RS232-RX, RS232-TX	VIN	Input Voltage Range		-0.3		5.5	V
Voltage Measurement							
+BAT160A, +BAT10A	VMEAS	Voltage Measurement Range		0		80.3	V
		Resolution			200		mV
		Accuracy	Of Reading (+ Resolution)		±1.0	±1.5	%
OUT-A, OUT-B, OUT-C, OUT-E, OUT-F, OUT-G, OUT-H, OUT-D.1, OUT-D.2, OUT-D.3, HBRIDGE-A, HBRIDGE-B, DOUT-1A, DOUT-5V, AIN-A, AIN-B, AIN-C, AIN-D	VMEAS	Voltage Measurement Range		0		36.3	V
		Resolution			30		mV
		Accuracy	Of Reading (+ Resolution)		±1.0	±1.5	%
Temperature Measurement							
NTC1, NTC2, NTC3, NTC4, NTC5	TMEAS	Temperature Measurement Range		-40		215	°C
		Resolution			1		°C
	Accuracy	-50°C				±7.42	°C
		-25°C				±2.44	°C
		0°C				±1.28	°C
		+25°C				±1.03	°C
		+50°C				±1.03	°C
+75°C				±1.11	°C		
+100°C				±1.25	°C		
Current Measurement							
OUT-A, OUT-B	IMEAS	Current Measurement Range		0		100	A
		Resolution			10		mA
		Accuracy	Of Reading (+ 50mA)		±1.5	±2.5	%
OUT-C, OUT-E, OUT-F	IMEAS	Current Measurement Range		0		66	A
		Resolution			10		mA
		Accuracy	Of Reading (+ 30mA)		±1.5	±2.5	%
OUT-D.1	IMEAS	Current Measurement Range		0		33	A
		Resolution			10		mA
		Accuracy	Of Reading (+ 20mA)		±1.5	±2.5	%
OUT-D.2, OUT-D.3, OUT-G, OUT-H	IMEAS	Current Measurement Range		0		25	A
		Resolution			100		mA
		Accuracy	Of Reading (+ Resolution)		±1.5	±2.5	%
OUT-D (OUT-D.1 + OUT-D.2 + OUT-D.3)	IMEAS	Current Measurement Range		0		83	A
		Resolution			10		mA
		Accuracy	Of Reading (+ 50mA)		±1.5	±2.5	%
HBRIDGE	IMEAS	Current Measurement Range		0		100	A
		Resolution			10		mA
		Accuracy	Of Reading (+ 50mA)		±2.5	±3.5	%
OUT_LOW-K, OUT_LOW-L	IMEAS	Current Measurement Range		0		25	A
		Resolution			100		mA
		Accuracy	Of Reading (+ Resolution)		±2.5	±3.5	%
TOTAL OUTPUT CURRENT	IMEAS	Current Measurement Range		0		255	A
		Resolution			1		A
		Accuracy	Of Reading (+ Resolution)		±2.5	±3.5	%

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