

PERFORMANCE
MADE
SMARTER

Configuration Manual **4179 / 4511**

Modbus RTU configuration of 4179 Universal AC/DC transmitter



TEMPERATURE | I.S. INTERFACES | COMMUNICATION INTERFACES | MULTIFUNCTIONAL | ISOLATION | DISPLAY

No. 4179MCM100-UK
For 4511 devices from ser. no. 141590001

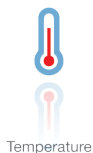
PR
electronics

6 Product Pillars

to meet your every need

Individually outstanding, unrivalled in combination

With our innovative, patented technologies, we make signal conditioning smarter and simpler. Our portfolio is composed of six product areas, where we offer a wide range of analog and digital devices covering over a thousand applications in industrial and factory automation. All our products comply with or surpass the highest industry standards, ensuring reliability in even the harshest of environments and have a 5-year warranty for greater peace of mind.



Temperature

Our range of temperature transmitters and sensors provides the highest level of signal integrity from the measurement point to your control system. You can convert industrial process temperature signals to analog, bus or digital communications using a highly reliable point-to-point solution with a fast response time, automatic self-calibration, sensor error detection, low drift, and top EMC performance in any environment.



I.S. Interface

We deliver the safest signals by validating our products against the toughest safety standards. Through our commitment to innovation, we have made pioneering achievements in developing I.S. interfaces with SIL 2 Full Assessment that are both efficient and cost-effective. Our comprehensive range of analog and digital intrinsically safe isolation barriers offers multifunctional inputs and outputs, making PR an easy-to-implement site standard. Our backplanes further simplify large installations and provide seamless integration to standard DCS systems.



Communication

We provide inexpensive, easy-to-use, future-ready communication interfaces that can access your PR installed base of products. The detachable 4501 Local Operator Interface (LOI) allows for local monitoring of process values, device configuration, error detection and signal simulation. The next generation, our 4511 Remote Operator Interface (ROI) does all that and more, adding remote digital communications via Modbus/RTU, while the analog output signals are still available for redundancy.

With the 4511 you can further expand connectivity with a PR gateway, which connects via industrial Ethernet, wirelessly through a Wi-Fi router or directly with the devices using our Portable Plant Supervisor (PPS) application. The PPS app is available for iOS, Android and Windows.



Multifunction

Our unique range of single devices covering multiple applications is easily deployable as your site standard. Having one variant that applies to a broad range of applications can reduce your installation time and training, and greatly simplify spare parts management at your facilities. Our devices are designed for long-term signal accuracy, low power consumption, immunity to electrical noise and simple programming.



Isolation

Our compact, fast, high-quality 6 mm isolators are based on microprocessor technology to provide exceptional performance and EMC-immunity for dedicated applications at a very low total cost of ownership. They can be stacked both vertically and horizontally with no air gap separation between units required.



Display

Our display range is characterized by its flexibility and stability. The devices meet nearly every demand for display readout of process signals, and have universal input and power supply capabilities. They provide a real-time measurement of your process value no matter the industry, and are engineered to provide a user-friendly and reliable relay of information, even in demanding environments.

Contents

Introduction	2
Modbus RTU	2
4511 Supported Modbus Function Codes	2
4511 Modbus parameter settings	2
Modbus RTU segment line termination	2
4179 Configuration Parameter List	3
General	3
Input	3
Display	3
Output	3
Table 1: Display units	5
4179 Input Types and Ranges	5
4179 Process Parameter List	6
4179 Simulation Parameter List	6
4511 Modbus Configuration Parameter List	7
4511 Additional Parameter List	7
4511 Modbus Status Parameter List	7
4511 Modbus Front Programming Parameter Menu	8

Introduction

This configuration manual

contains the necessary information for configuring a PR 4179 device which is connected to a PR 4511 Modbus RTU enabler.

Modbus is a “master-slave” system,

where the “master” communicates with one or multiple “slaves”.

The master typically is a PLC (Programmable Logic Controller), DCS (Distributed Control System), HMI (Human Machine Interface), RTU (Remote Terminal Unit) or PC.

The three most common Modbus versions used are: MODBUS ASCII, MODBUS RTU and MODBUS/TCP.

In Modbus RTU, data is coded in binary, and requires only one communication byte per data byte. This is ideal for use over multi-drop RS485 networks, at speeds up to 115,200 bps.

The most common speeds are 9,600 bps and 19,200 bps.

Modbus RTU is the most widely used industrial protocol and is supported by the 4511.

Modbus RTU

To communicate with a slave device, the master sends a message containing:

Device Address - Function Code - Data - Error Check

The **Device Address** is a number from 0 to 247.

Messages sent to address 0 (broadcast messages) will be accepted by all slaves, but numbers 1-247 are addresses of specific devices. With the exception of broadcast messages, a slave device always responds to a Modbus message so the master knows the message was received.

4511 Supported Modbus Function Codes

Command	Function code
Read Holding Registers	03
Read Input Registers	04
Write Single Register	06
Diagnostics	08
Write Multiple Registers	16

The **Function Code** defines the command that the slave device is to execute, such as read data, accept data, report status. Some function codes have sub-function codes.

The **Data** defines addresses in the device’s memory map for read functions, contains data values to be written into the device’s memory, or contains other information needed to carry out the function requested.

The **Error Check** is a 16-bit numeric value representing the Cyclic Redundancy Check (CRC).

Maximum number of registers which can be read or written at once

For a read command, the limit is 8 registers at a baud rate up to 38,400 bps, 16 registers @ 57,800 bps and 32 registers @ 115,200 bps.

For a write command, the limit is 123 registers at baud rates up to 115,200 bps.

4511 Modbus parameter settings

Automatic Baudrate Detection:	Can be configured YES or NO
Supported baudrates:	2400, 4800, 9600, 19.2k , 38.4k, 57.6k, 115.2k bps
Parity Mode:	Even , Odd or None parity
Stop Bits:	1 or 2 stop bits
Response delay:	0...1000 ms (0 ms = default)
Modbus slave addressing range:	1 - 247 (247 = default address)
Modbus Parameter Storage:	Saved in non-volatile memory in the 4511 device

(Factory Default Values are marked in **bold**)

Modbus RTU segment line termination

A 120 Ohm resistor should be installed on both ends of a RS485 Modbus RTU segment loop to prevent signal echoes from corrupting data on the line.

4179 Configuration Parameter List

Category	Parameter Name	No.	Modbus Address	Register Size	Read/Write	Type	Description	Values
GENERAL	DEVICE NUMBER	0	0	1	RO	UNSIGNED INTEGER	Defines the actual device type	4179 = 16761 (0x4179)
GENERAL	DEVICE VERSION	1	1	1	RO	UNSIGNED INTEGER	Product version	0
GENERAL	VARIANT	2	2	1	RO	UNSIGNED INTEGER	Device variant	0
GENERAL	SERIAL NUMBER	3	3	2	RO	UNSIGNED INTEGER	Device serial number	Range: 0..999999999
GENERAL	PASSWORD	4	5	1	R/W	UNSIGNED INTEGER	Password for entering configuration menu	Range: 0..9999
INPUT	INPUT TYPE	5	6	1	R/W	UNSIGNED INTEGER	Selected input type.	Current = 0 Voltage = 1
INPUT	INPUT VOLTAGE RANGE	6	7	1	R/W	UNSIGNED INTEGER	Fixed input range for voltage measurements	Custom input range = 0 0...0.5 V RMS = 1 0...1 V RMS = 2 0...2.83 V RMS = 3 0...5 V RMS = 4 0...120 RMS = 5 0...230 V RMS = 6 0...300 V RMS = 7
INPUT	INPUT CURRENT RANGE	7	8	1	R/W	UNSIGNED INTEGER	Fixed input range for current measurements	Custom input range = 0 0...0.5 A RMS = 1 0...1 A RMS = 2 0...2.5 A RMS = 3 0...5 A RMS = 4
INPUT	INPUT CUST. VOLTAGE RANGE LOW	8	9	2	R/W	INTEGER	Low range for CUSTOM VOLTAGE INPUT RANGE in μ V	Range: 0..300000000
INPUT	INPUT CUST. VOLTAGE RANGE HIGH	9	11	2	R/W	INTEGER	High range for CUSTOM VOLTAGE INPUT RANGE in μ V	Range: 0..300000000
INPUT	INPUT CUST. CURRENT RANGE LOW	10	13	2	R/W	INTEGER	Low range for CUSTOM CURRENT INPUT RANGE in μ A	Range: 0..5000000
INPUT	INPUT CUST. CURRENT RANGE HIGH	11	15	2	R/W	INTEGER	High range for CUSTOM CURRENT INPUT RANGE in μ A	Range: 0..5000000
INPUT	ENABLE INPUT LIMIT LOW	12	17	1	R/W	UNSIGNED INTEGER	Enable low limit detection on input	NO = 0 YES = 1
INPUT	ENABLE INPUT LIMIT HIGH	13	18	1	R/W	UNSIGNED INTEGER	Enable high limit detection on input	NO = 0 YES = 1
INPUT	INPUT LIMIT LOW	14	19	2	R/W	INTEGER	Low limit for input	Range for voltage input: 0...<input range low> Range for current input: 0...<input range low> (upper limit for this value is equal to input range low)
INPUT	INPUT LIMIT HIGH	15	21	2	R/W	UNSIGNED INTEGER	High limit for input	Range for voltage input: <input range high>...300000000 Range for current input: <input range high>...5000000 (lower limit for this value is equal to input range high)
DISPLAY	DISPLAY UNIT	16	23	1	R/W	UNSIGNED INTEGER	Units shown as display units for input	Acc. to table 1
DISPLAY	DECIMAL POINT	17	24	1	R/W	UNSIGNED INTEGER	Decimal point place for display reading	XXXX = 0 X.XXX = 1 XX.XX = 2 XXX.X = 3
DISPLAY	DISPLAY LOW	18	25	1	R/W	INTEGER	Low display range for display reading of input	Range: -1999...9999
DISPLAY	DISPLAY HIGH	19	26	1	R/W	INTEGER	High display range for display reading of input	Range: -1999...9999
OUTPUT	OUTPUT FUNCTION	20	27	1	R/W	UNSIGNED INTEGER	Analog function for output	Direct output = 0 Inverted output = 1 V-function output = 2 Note: V-function is only applicable for output ranges starting at 0 mA / 0 V
OUTPUT	OUTPUT TYPE	21	28	1	R/W	UNSIGNED INTEGER	Analog output type	CURR = 0 VOLT = 1
OUTPUT	OUTPUT CURRENT MODE	22	29	1	R/W	UNSIGNED INTEGER	Mode for analog output current	Active = 0 Passive* = 1 * Passive output not valid for bipolar output

Category	Parameter Name	No.	Modbus Address	Register Size	Read/Write	Type	Description	Values
OUTPUT	CURRENT OUTPUT RANGE	23	30	1	R/W	UNSIGNED INTEGER	Fixed output range for current output	0...20 mA = 0 4...20 mA = 1 4...20 mA (SIL) = 2 -10...10 mA* = 3 -20...20 mA* = 4 *non-zero starting ranges not valid if V-function is selected as output function
OUTPUT	VOLTAGE OUTPUT RANGE	24	31	1	R/W	UNSIGNED INTEGER	Fixed output range for voltage output	0...1 V = 0 0.2...1 V = 1 0...5 V = 2 1...5 V* = 3 0...10 V = 4 2...10 V* = 5 -1...1 V* = 6 -5...5 V* = 7 -10...10 V* = 8 *non-zero starting ranges not valid if V-function is selected as output function
OUTPUT	OUTPUT AT LOW INPUT ERROR	25	32	1	R/W	UNSIGNED INTEGER	Analog output level at input below configured input limit low	DOWN = 0 ZERO = 1 UP = 2 NONE = 3
OUTPUT	OUTPUT AT HIGH INPUT ERROR	26	33	1	R/W	UNSIGNED INTEGER	Analog output level at input beyond configured input limit high	DOWN = 0 ZERO = 1 UP = 2 NONE = 3
OUTPUT	OUTPUT RESPONSE	27	34	1	R/W	UNSIGNED INTEGER	Analog output damping (in 1/10 s)	Range: 0..600 (0...60.0 s)
INPUT	CALIB RANGE LOW	28	35	2	R/W	FLOAT	Actual process value for low calibration point in input values	Range for voltage input: 0..300000000 (0...300 V) Range for current input: 0..5000000 (0...5 mA)
INPUT	CALIB RANGE HIGH	29	37	2	R/W	FLOAT	Actual process value for high calibration point in input values	As CALIB RANGE LOW
INPUT	CALIB POINT LOW	30	39	2	R/W	FLOAT	Measured process value for low calibration point in input values (can be read from PRIMARY RAW VALUE)	As CALIB RANGE LOW
INPUT	CALIB POINT HIGH	31	41	2	R/W	FLOAT	Measured process value for high calibration point in input values (can be read from PRIMARY RAW VALUE)	As CALIB RANGE LOW
INPUT	USE CALIB	32	43	1	R/W	UNSIGNED INTEGER	Use the applied calibration values	NO = 0 YES = 1
DISPLAY	DISPLAY CONTRAST	33	44	1	R/W	UNSIGNED INTEGER	Contrast in the LCD display	Range: 0...9
DISPLAY	DISPLAY BACKLIGHT	34	45	1	R/W	UNSIGNED INTEGER	Backlight intensity on LCD	Range: 0...9
DISPLAY	TAG TEXT	35	46	3	R/W	ASCII CHAR	Tag of the device (6 characters)	Range: ASCII values from 32 to 90 (' ' to 'Z').
DISPLAY	LINE 3 FUNCTION	36	49	1	R/W	UNSIGNED INTEGER	Information shown in line 3 of display in monitor mode (normal mode). Choose between the analog output value or the configured tag.	Output value TAG = 0 = 1
GENERAL	ENABLE PASSWORD	37	50	1	R/W	UNSIGNED INTEGER	Password protect entry to configuration menu via display	NO = 0 YES = 1
GENERAL	HELPTXT LANGUAGE	38	51	1	R/W	UNSIGNED INTEGER	Language for the help texts shown in display	UK = 0 DK = 1 DE = 2 FR = 3 SE = 4 IT = 5 ES = 6
GENERAL	CHECKSUM	100	100	1	RO	UNSIGNED INTEGER	CRC16 checksum of the configuration	Range 0..65535
GENERAL	Configuration counter	101	101	1	RO	UNSIGNED INTEGER	This counter will count the number of times the configuration has been changed. The counter is reset on power-up	Range 0..65535

Table 1: Display units

0	°C	10	mils	20	in/s	30	t	40	kJ	50	kA	60	m ³ /h	70	A RMS
1	°F	11	yd	21	ips	31	kg	41	Wh	51	mA	61	l/s	71	[blank]
2	K	12	m ³	22	ft/s	32	g	42	MWh	52	μA	62	l/min		
3	%	13	l	23	in/min	33	N	43	kWh	53	V	63	l/h		
4	m	14	s	24	ft/min	34	Pa	44	W	54	kV	64	gal/min		
5	cm	15	min	25	in/h	35	MPa	45	GW	55	mV	65	gal/h		
6	mm	16	m/s	26	ft/h	36	kPa	46	MW	56	Ω	66	t/h		
7	μm	17	mm/s	27	m/s ²	37	hPa	47	kW	57	S	67	mol		
8	ft	18	m/min	28	rpm	38	bar	48	hp	58	μS	68	pH		
9	in	19	m/h	29	Hz	39	mbar	49	A	59	m ³ /min	69	V RMS		

4179 Input Types and Ranges

Input type	Min. value	Max. value
mA	0 AAC RMS	5 AAC RMS
V	0 VAC RMS	300 VAC RMS

4179 Process Parameter List

Parameter Name	No.	Register Address	Register Size	Read/Write	Type	Description	Values
INPUT VALUE	1	1000	2	RO	FLOAT	The measured, scaled and process calibrated input value (in μA or μV).	Range for voltage input: 0..360000000 Range for current input: 0..6000000
MEASURE STATUS	2	1002	1	RO	UNSIGNED INTEGER	The actual measurement status	INPUT UNDERRANGE: bit 0 = 1 INPUT OVERRANGE: bit 1 = 1 OUTPUT UNDERRANGE: bit 2 = 1 OUTPUT OVERRANGE: bit 3 = 1 LOW INPUT LIMIT ERROR DETECTED: bit 4 = 1 HIGH INPUT LIMIT ERROR DETECTED: bit 5 = 1 NOT USED: bit 6..7
RELATIVE INPUT	3	1003	2	RO	FLOAT	The relative input calculated from INPUT VALUE. 0.0..1.0 corresponds to the selected range (e.g. 0..230 VAC).	Range: 0.0..1.0 (e.g. 0.7898 = 78.98% = 181.654 VAC)
OUTPUT VALUE	4	1005	2	RO	FLOAT	The calculated output value (in μA or μV).	Range for voltage input: 0..115000000 Range for current input: 0..230000000
PRIMARY RAW VALUE	5	1007	2	RO	FLOAT	The measured input value (in μA or μV). NOT PROCESS CALIBRATED/SIMULATED.	Range for voltage input: 0..360000000 Range for current input: 0..6000000
ERROR STATUS	6	1009	1	RO	UNSIGNED INTEGER	The actual error status (Device errors).	ADC ERROR bit 0 = 1 RAM ERROR bit 1 = 1 CONFIG ERROR bit 2 = 1 INT. FLASH ERROR bit 3 = 1 EXT. FLASH ERROR bit 4 = 1 OUTPUT ERROR bit 5 = 1 SUPPLY ERROR bit 6 = 1 ADC COMM. ERROR bit 7 = 1

4179 Simulation Parameter List

Parameter Name	No.	Register Address	Register Size	Read/Write	Type	Description	Values
SIMULATION CONTROL	1	2000	1	R/W	UNSIGNED INTEGER	Control register for simulation	Clear errors and reload config. bit 0 = 1 Simulate input bit 1 = 1 Simulate output bit 2 = 1 Reserved MUST BE SET TO "0" bit 3..7
INPUT VALUE	2	2001	2	R/W	FLOAT	Simulated input value (in μA or μV)	Range for voltage input: 0..360000000 Range for current input: 0..6000000
OUTPUT VALUE	3	2003	2	R/W	FLOAT	Simulated output value (in μA or μV)	Range for voltage output: 0..115000000 Range for current output: 0..230000000
SIMULATION TIMEOUT	4	2005	1	R/W	UNSIGNED INTEGER	If this value is greater than zero the counter decrements once every 5 ms. Upon reaching 0 SIMULATION CONTROL is cleared.	0..4000

4511 Modbus Configuration Parameter List

Parameter Name	No.	Register Address	Register Size	Read/Write	Type	Description	Values
ENABLE MODBUS	1	3000	1	R/W	INTEGER	Enable Modbus communication. If disabled, 4511 ignores all frames sent from the Modbus master and the only way to re-enable Modbus communication is by using the 4511 menu.	NO = 0 YES = 1
BAUDRATE	2	3001	1	R/W	INTEGER	The baud value used for Modbus communication	2400 BAUD = 0 4800 BAUD = 1 9600 BAUD = 2 19200 BAUD = 3 38400 BAUD = 4 57600 BAUD = 5 115200 BAUD = 6
ENABLE AUTOBAUD	3	3002	1	R/W	INTEGER	Enable automatic baudrate detection. If enabled, 4511 determines the baudrate automatically by listening to frames sent on the Modbus line.	NO = 0 YES = 1
PARITY	4	3003	1	R/W	INTEGER	Configures parity check on Modbus frames	NONE = 0 EVEN PARITY = 1 ODD PARITY = 2
STOP BITS	5	3004	1	R/W	INTEGER	Configures the number of stop bits in Modbus frames	ONE STOP BIT = 1 TWO STOP BITS = 2
ADDRESS	6	3005	1	R/W	INTEGER	Configures the Modbus address of the 4511 (Address 0 is broadcast address)	Range: 1...247
RESPONSE DELAY	7	3006	1	R/W	INTEGER	Configures minimum delay for Modbus response in ms	Range: 0...1000

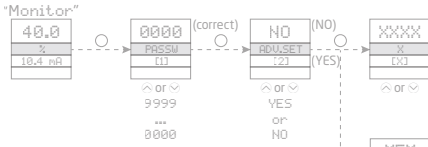
4511 Additional Parameter List

Parameter Name	No.	Register Address	Register Size	Read/Write	Type	Description	Values
ROTATE DEVICE	1	3100	1	R/W	INTEGER	Enables the display and key buttons to be used normally when the host device is mounted upside down	NO = 0 YES = 1

4511 Modbus Status Parameter List

Parameter Name	No.	Register Address	Register Size	Read/Write	Type	Description	Values
AUTOBAUD STATUS	1	4000	1	RO	INTEGER	Actual state of automatic baudrate detection	2400 BAUD = 0 4800 BAUD = 1 9600 BAUD = 2 19200 BAUD = 3 38400 BAUD = 4 57600 BAUD = 5 115200 BAUD = 6 SEARCHING = 7 ERROR = 8
IDENTIFY DEVICE	2	4001	1	R/W	INTEGER	Enables the device to flash the LCD background with approx. 4 Hz. Value will automatically return to NO if not written within 10 seconds!	NO = 0 YES = 1
MAXIMUM READ REGISTERS	3	4002	1	RO	INTEGER	Maximum allowed number of registers that can be read in one command, with the given/detected baudrate	Range: 8...32

4511 Modbus Front Programming Parameter Menu



Scrolling HELP TEXTS:

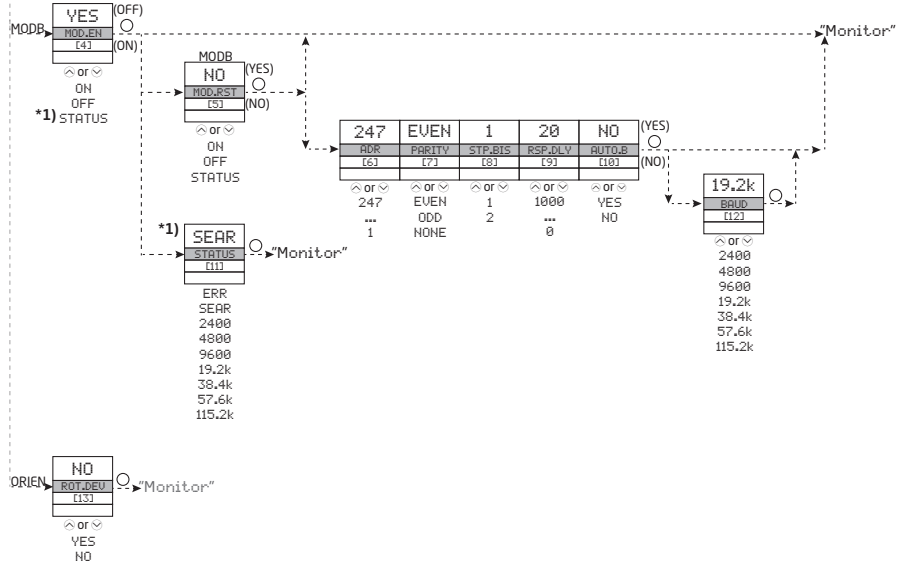
- [1] Set correct password
- [2] Enter advanced setup menu
- [3] Perform memory operations
 - Enter display setup
 - Enter simulation setup
 - Enter password setup
 - Enter language setup
 - Enter rail setup (System 9000)
 - Enter Modbus setup
- [4] Check automatic baudrate detection status
 - Enable Modbus communication
 - Disable Modbus communication
- [5] Reset Modbus to default
- [6] Select Modbus slave address
- [7] Select parity for Modbus
- [8] Select number of stop bits
- [9] Select response delay in ms
- [10] Enable automatic baudrate detection
- [11] Searching for Modbus baudrate
 - Modbus baudrate detected
 - Modbus baudrate not detected
- [12] Select baudrate in bps
- [13] Rotate device upside down?

* 1) Only if automatic baudrate detection is enabled

Please note:

If no keys are activated for 1 minute, the 4511 display will return to the "Monitor" view without saving. The display will also return to "Monitor" upon successful Modbus write command!

The grayed-out menus and texts are only shown for guidance and are not a part of the 4511 specific submenu. The Modbus submenu is located in the Advanced Setting menu structure of any host device using the 4511. The actual placement is defined for each particular device.



We are near you, *all over the world*

Our trusted red boxes are supported wherever you are

All our devices are backed by expert service and a 5-year warranty. With each product you purchase, you receive personal technical support and guidance, day-to-day delivery, repair without charge within the warranty period and easily accessible documentation.

We are headquartered in Denmark, and have offices and authorized partners the world over. We are a local business

with a global reach. This means that we are always nearby and know your local markets well.

We are committed to your satisfaction and provide PERFORMANCE MADE SMARTER all around the world.

For more information on our warranty program, or to meet with a sales representative in your region, visit prelectronics.com.

Benefit today from *PERFORMANCE MADE SMARTER*

PR electronics is the leading technology company specialized in making industrial process control safer, more reliable and more efficient. Since 1974, we have been dedicated to perfecting our core competence of innovating high precision technology with low power consumption. This dedication continues to set new standards for products communicating, monitoring and connecting our customers' process measurement points to their process control systems.

Our innovative, patented technologies are derived from our extensive R&D facilities and from having a great understanding of our customers' needs and processes. We are guided by principles of simplicity, focus, courage and excellence, enabling some of the world's greatest companies to achieve PERFORMANCE MADE SMARTER.