# D2000M SERIES Intrinsically Safe Modular Multiplexer System for Installation in Hazardous Areas Zone O, 1, 2 Gas Group IIC, IIB, IIA T4 Class I, II, III, Div. 1, Groups A, B, C, Indoor and Outdoor Hazardous Locations



Transmit up to 7936 Analog, or 3968 Digital, Signals from TC, RTD, mV, 4-20 mA, or contact, Proximity sensors, at distances up to 5 Kilometers.

# **D2000M Series Intrinsically Safe** Modular Multiplexer System

### System Features

- High Density, up to 256 Analog Inputs (TC, RTD, mV, mA, Ohm) and up to 128 Digital inputs (Contacts, Proximity sensors) on the same system.
- Interfaces with PLC/DCS via redundant Modbus RTU protocol.
- Connects directly to PC RS 232 port for system configuration and diagnostic.

Expandable up to 7936 Analog and 3968 Digital.

- Robust Galvanic Isolation
   (± 200 V channel to channel) provides high immunity against interferences and ground loops.
- Intrinsically Safe for installation in Zone 0, 1, 2, 20, 21, 22, Gas Group IIC T4 or Class I, II and III, Division 1 and Class I, Zone 0 & 1 Hazardous Location.
- Send data as far as 5 Km distance at high speed 38400 baud.
- High Accuracy 18 bits D/D converter.
- Direct connection of sensors to input plug-in type
   Terminal Blocks. No auxiliary Terminal Blocks required.
- Communication line, used also as Supply line, can be redundant.
- IEC Ex, ATEX, FM, FM-C, GOST Certifications.
- System configuration software performed

(SW free of charge).

- HAZARDOUS AREA D2010 D2011 D2011 D2011 16 CH 16 CH 16 CH 16 CH D2030 32 CH D2030 32 CH D2010 D2011 D2011 D2011 16 CH 16 CH 16 CH 16 CH E) PC D2050M **RS-232** for Configuration Gateway D2052M/D2053M 32 CH D2052M/D2053M 32 CH PLC - DCS - PC
  - Repeats input contact via Relays or O.C. Transistor Outputs.
  - Lower Cables and installation costs.
  - Lower PLC-DCS I/O card costs.
  - Lower wiring costs, 1 terminal Block per input connection, no auxiliary T.B. needed.
  - Simplified Installation.

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# Brief Information about Multiplexing Tecnique

#### Signal Data Acquisition

In industrial process is a common need to acquire a relevant number of temperatures, pressures, flows, levels and other process variables as well as the status of switches or proximitors and collect all these data in a single remote collection area (i.e. in a control room) where a PLC ( Programmable Logic Controller) or a Process Computer collect all data and use them for monitoring purposes or make them available to the operators. SCADA (Signal Conditioning And Data Acquisition) equipment are particularly suited for this purpose.

Modern micro electronics permits fast, accurate and stable Analog to Digital converters, high speed computing, sophisticated intelligence and powerful measuring capabilities.

All this performance can be packed into compact reliable units that can operate in harsh environments.

Multiplexers are a typical SCADA multi channel equipment that can be located in the field close to the process area where the input channels can be connected with short lines. All input channel signals are converted in a numeric form and transmitted to a remote location via a single communication line.

#### How a Multiplexer works

The multiplexer cyclically scans each input channel for a few milliseconds (connects with electrical or semiconductor switches each input signal, one at a time, to the internal circuits) and converts with an A/D (Analog to Digital) converter each process signal into a digital value.

This digital value is computed by a microprocessor and transformed into a numerical data expressed in terms of engineering units corresponding to the effective process variable of the channel ( °C, PSI or ATE , liters/sec etc). After completion of the scanning and conversion cycle of one channel the multiplexer connects the next channel in a sequential fashion so that in a few milliseconds all input

channel signals are converted into their corresponding numerical data, expressed in engineering units and stored on a buffer memory.

Multiplexers also perform the tagging of each variable for channel identification and diagnostic functions to detect failures, out of range values, errors in the data etc.; all data are transmitted under command in a numerical form as a sequence of strings via a single serial communication interface and connection line up to the data collection area (i.e. in a control room).

Communication line can also serve as supply line eliminating the need of an extra power line. Additionally, the supply/communication line can be dual redundant to eliminate the effects of failures in one of the lines.

#### When multiplexing is the only viable solution

In the case of revamping or add-on of new parts in the plant, the space for adding cables may be limited or the few existing spare cables are the only ones that can be used.

Radio Frequency links, beside cost and licensing problems, present severe data security and reliability limitations that make, most of the times, this technique impractical. Multiplexer becomes the only practical solution.

#### The advantages of multiplexing

When a consistent quantity of variables must be made available to a far location, instead of wiring each process variable signal with long individual connection lines up to the control room, it is advantageous to connect all input signals to a conveniently field located Multiplexer with short local connections lines to the sensors and to send all data through a single communication line to the remote data collection area. Even when space for cable is available the saving just in cable cost alone justifies, most of the times, the multiplexer solution, in addition a tidy simple connection is obtained avoiding cluttering of wires in the control room area.

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### Multiplexing in Hazardous area

For applications in classified hazardous areas each signal must be protected from the risk of causing an ignition of flammable mixtures, this requires a safety barrier for each input channel and a protection for the multiplexer itself and its communication line substantially increasing the complexity and cost of such a solution.

## The advantages of using an Intrinsically Safe Multiplexer

The use of an intrinsically safe multiplexer allows equipment installation in hazardous area and connection of all its inputs directly to the process variable signals without the requirement of any further protection; retaining the simplicity and cost effectiveness of a multiplexing solution.

In addition to the cable cost and simplicity of installation discussed above, the elimination of safety barriers drastically simplifies and reduces the cost of this solution compared to other options.

#### **D2000M Series General Description**

D2000M Series Intrinsically Safe Multiplexing System consists of one to four Analog-Temperature Multiplexer Units model D2010M, up to twelve Expander Units model D2011M, or up to four D2030M Digital Multiplexer Units, mounted in Zone 0, 1, 2 Hazardous Area, Gas Group IIC T4, connected via a single / redundant 2 wire data communication / Supply line to a Modbus Gateway Unit model D2050M, mounted in Safe Area and connected to a PLC, DCS or PC.

The Multiplexer Units D2010M, and the Expander Units D2011M can be installed in the field, close to input sensors, for data acquisition from Hazardous Areas and connected to a Safe Area PLC/DCS or other devices, via 2 wire communication link and the Gateway Unit D2050M, saving wiring, cables and costs.

The Units are primarily intended for Hazardous Areas acquisition of low level signal from Thermocouples, RTDs, mV or mA sources.

The Expander Units D2011M are controlled by D2010M Units. D2010M scans all enabled channels using state



#### D2050M Gateway Unit.

of the art solid state isolated relays, and stores all data in a memory buffer, where they can be rapidly accessed by the Modbus Gateway Unit D2050M. Each Mux Unit accepts directly up to 16 input channels and, by adding from one to three Expander Units D2011M, is expandable to 64 channels in blocks of 16





D2010M Multiplexer Unit.

each. Four D2010M Units, connected to twelve D2011M Expanders reach 256 inputs with a single Modbus Gateway Unit D2050M. Redundant communication is obtained by in built dual data/supply interface line. Safety Parameters maintain capability with Gas Group II C (A, B) even in redundant mode.

An Integrating type, High Rejection, High Accuracy (18 bits) A/D Converter, automatically calibrates Zero and Span providing accurate and stable measurements. All parameters are software configurable by serial commands via the D2050M Unit.

The Multiplexer Units D2O3OM, can be installed in the field close to input sensors, for data acquisition from Hazardous Areas and connected to a Safe Area PLC/DCS or other devices, via 2 wire communication link and Gateway Unit D2O5OM, saving wiring, cables and costs.

These Units are primarily intended for Hazardous Area acquisition from contacts or proximity detectors. D2030M scans all enabled channels and stores all data in a memory buffer, where they can be rapidly accessed by the Modbus Gateway Unit D2050M.

Each Mux Units D2O3OM accepts directly up to 32 inputs channels and from one to four Units canbe used in a System.

Four D2030M Units reach 128 inputs with a single Modbus Gateway Unit D2050M.

Redundant communication is obtained by in built dual

data/supply interface line.

Safety Parameters maintain compatibility with Gas Group II C (A, B) even in redundant mode.

The D2052M Unit is equipped with 32 relay output SPDT contacts. Connected to D2050M Unit it repeats the status of each D2030M digital input Multiplexer Unit.

The D2053M Unit is equipped with 32 Open Collector Transistor Outputs. Connected to D2050M Unit it repeats the status of each D2030M digital input Multiplexer Unit.

Distance between Gateway Unit D2050M and the field Units D2010M, D2011M, D2030M can be up to 1000 mt. for gas group IIC (A, B) and up to 5000 mt. for group IIB, II A (C, D, E, F, G).

GM CABFOO8 is an available cable for communication lines between the D2O5OM Gateway and field Units.

**NOTE:** This cable is included in the system certification and it may be substituted only by cables with same specifications, in order for the certification to maintain its validity.

ANALOG - TEMPERATURE MULTIPLEXER D2000M SERIES SYSTEM SUITABLE for INSTALLATION in ZONE 0, 1, 2 CONFIGURATION for 64 TEMPERATURE INPUTS



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ANALOG - TEMPERATURE MULTIPLEXER D2000M SERIES SYSTEM SUITABLE for INSTALLATION in ZONE 0, 1, 2 CONFIGURATION for 256 TEMPERATURE INPUTS



ANALOG - TEMPERATURE - DIGITAL MULTIPLEXER D2000M SERIES SYSTEM SUITABLE for INSTALLATION in ZONE 0, 1, 2 CONFIGURATION for 192 TEMPERATURE and 32 DIGITAL INPUTS



MULTIPLEXER D2000M SERIES SYSTEM SUITABLE for INSTALLATION in ZONE 0, 1, 2 MAX. CONFIGURATION for 128 DIGITAL INPUTS and 128 REPEATER OUTPUTS



ANALOG - TEMPERATURE - DIGITAL MULTIPLEXER D2000 SERIES SYSTEM SUITABLE for INSTALLATION in ZONE 0, 1, 2 CONFIGURATION for **128** TEMPERATURE INPUTS and **64** DIGITAL INPUTS



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# Configuring **D2010M, D2011M, D2030M** Field Units Using a PC Serial Line via the **Gateway D2050M.** Configuration Software Available, free of charge, from G.M. web site.



# SWC2090 GRAPHICAL LAYOUT

The SWC 2090 is the software to configure the

D2000M Series Multiplexer System.

It is available from our website free of charge together

with a "Quick start guide".



Unit configuration is accessed by double-clicking the corresponding icon in the layout.



# PROGRAMMING 16 CHANNELS D2010M AND D2011M ANALOG-TEMPERATURE UNITS

Anatog	names comgu						_		
1  Tag 1.	01	-20.000 to +20.000 mV	-	Burnout Up-Scale	•		-	No Filter	-
2 Tag 1.	02	Resistance 0.0 to 400.0 Oh	•	3 Wire connection	-		-	Fast Filter	-
3  Tag 1.	03	Thermocouple type B	-	No Burnout	-	Fixed Cold Junction	-	Medium Filter	
4 Tag 1.	04	Thermores. Pt 100 a=385	•	4 Wire connection	-		-	Slow Filter	-
5 Tag 1.	05	Channel Off	•				~		7
6 Tag 1.	06	-20.000 to +20.000 mV			<u> </u>		2		
7 Tag 1.	07	-20.00 to +80.00 mV Resistance 0.0 to 400.0 Oh	m		<u></u>		~		-
8 Tag 1.	08	Thermocouple type B Thermocouple type E			Ψ.		Ŧ		
9 Tag 1.	09	Thermocouple type J Thermocouple type K			<u>.</u>		Ŧ		
10 Tag 1.1	10	Thermocouple type L - DIN	т		-		Ŧ		-
11 Tag 1.1	11	Thermocouple type N	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		Ψ		Ŷ		v
2 Tag 1.	12	Thermocouple type S			· ·		Ŷ		-
13 Tag 1.1	13	Thermocouple type T Thermocouple type U			Ψ.		Ŧ		
4 Tag 1.	14	Thermocouple type A1 - G0 Thermocouple type A2 - G0	IST IST		Ŧ		÷		7
15 Tag 1.	15	Thermocouple type A3 - G0 Thermores, Pt 100 a=385	ST		Ψ		Ŧ		v
16 Tag 1.1	16	Thermores. Pt 200 a=385 Thermores. Pt 200 a=385			Ψ.		Ŧ		v
	20.0 Fixed Cold Junc	Thermores, Pt 100 a=300 Thermores, Pt 100 a=390 Thermores, Pt 100, GOST				Ok		Cancel	
		Thermores. Pt 50 · GOST							
		Thermores, Cu 100 - GOST							
		Thermores, Cu 53 · GOST Thermores, Cu 50 · GOST							
	SENS	OR TYPE SEL	.EC	CTION					

## PROGRAMMING 32 CHANNELS D2030M DIGITAL INPUT UNIT

CHANNEL OPERATING MODE SELECTION										
CHANNEL TAG				CH SC SE	ar Ar Le	NNEL ITIME CTION				
Digital Charnels C	onfiguration of Unit 4	4								
1 Tag 4.01	Active no Fault	•	1 ms scar	time 💌	] 17	Tag 4.17	Channel Off 💌	1 ms scan time	¥	
2 Tag 4.02	Active with Fault	•	1 ms scar	time 💌	18	Tag 4.18	Channel Off 💌	1 ms scan time	•	
3 Tag 4.03	Channel Off	-	1 ms scan	time	19	Tag 4.19	Channel Off 💌	1 ms scan time	•	
4 Tag 4.04	Channel Off	-	3 ms scan	time	20	Tag 4.20	Channel Off 🔹	1 ms scan time	•	
5 Tag 4.05	Channel Off	-	5 ms scan	time	21	Tag 4.21	Channel Off 🗨	1 ms scan time	-	
6 Tag 4.06	Channel Off	•	8 ms scan	time	22	Tag 4.22	Channel Off 💌	1 ms scan time	-	
7 Tag 4.07	Channel Off	-	10 ms scar 12 ms scar	n time n time	23	Tag 4.23	Channel Off 💌	1 ms scan time	-	
8 Tag 4.08	Channel Off	-	14 ms scar 16 ms scar	n time n time	24	Tag 4.24	Channel Off 🔹	1 ms scan time	-	
9 Tag 4.09	Channel Off	-	18 ms scar 20 ms scar	n time n time	25	Tag 4.25	Channel Off 🗨	1 ms scan time	•	
10 Tag 4.10	Channel Off	-	25 ms scar 30 ms scar	time	26	Tag 4.26	Channel Off 💌	1 ms scan time	-	
11 Tag 4.11	Channel Off	-	35 ms scar	time	27	Tag 4.27	Channel Off 💌	1 ms scan time	-	
12 Tag 4.12	Channel Off	•	1 ms scan	time 🔻	28	Tag 4.28	Channel Off 💌	1 ms scan time	-	
13 Tag 4.13	Channel Off	•	1 ms scan	time 💌	29	Tag 4.29	Channel Off 💌	1 ms scan time	•	
14 Tag 4.14	Channel Off	-	1 ms scan	time 💌	30	Tag 4.30	Channel Off 💌	1 ms scan time	•	
15 Tag 4.15	Channel Off	•	1 ms scan	time 💌	31	Tag 4.31	Channel Off 💌	1 ms scan time	•	
16 Tag 4.16	Channel Off	-	1 ms scan	time 💌	32	Tag 4.32	Channel Off 👻	1 ms scan time	-	

## PROGRAMMING D2050M MULTIPLEXER GATEWAY

	D2050M Configuration								
FIELD CONNECTION	Use Primary Line	<b>•</b>	Field Connection						
POWER LINE FREQUENCY	[]=====		Power Line Frequency						
NUMBER OF REPEATERS									
		<b>_</b>	Number of hepeaters						
MODBUS LINE		001	Modbus Address						
PARAMETERS	9600	•	Modbus Baudrate						
	8N1	•	Modbus Format						
	Deny	•	Configuration via Modbus						
		C	)k Cancel						

# PROGRAMMING D2052/53M CONTACT-PROXIMITY OUTPUT REPEATERS



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## GLOBAL MONITORING OF THE MULTIPLEXER SYSTEM

The entire D2000M Multiplexer System can be monitored "live", either via serial or Modbus port. All units and their corresponding channel values are displayed in one screen, for an easy global view of the Multiplexer System.

Unit 1 - Address 8 - Type D2810M         1       2       3       4       5       6       7       8       9       9       1       1       2       13       14         4×55 %       +00 %	090 1	Multiplexer	Configurat	ion Software	e - C:VBailite	CR. ( )	<u>et er genetjen</u>	100000	No.	openeted a	provingen.	a paga ang sa	<u> an </u>	de la composition de	<u>in en en</u>	- 61
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*25 ℃         *32 ℃         *42 ℃         *45 ℃         *40 ℃ <t< th=""><th>_</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>7</th><th>8</th><th>9</th><th>- 10</th><th>- 11</th><th>12</th><th>13</th><th>14</th><th>15</th><th>16</th></t<>	_	2	3	4	5	6	7	8	9	- 10	- 11	12	13	14	15	16
17         18         19         20         20         20         400 %	5.40	*25.6 °C	+0.2 °C	+6.5 °C	*0.0 °C	+0.0 *C	+0.0 °C	+0.0 °C	40.1 °C	+0.5 °C	+0.0 *C	+0.0 *C	+0.0 *C	+0.0 °C	+0.0 °C	-0.1
100 ℃         110 ℃         100 ℃        <	545	18	19	20	21	72	20	24	20.40	100 10	10.0 %	28	29	30	31	32
30         30         30         30         30         30         40         1 <th1< td=""><td>10</td><td>10.0 %</td><td>*1.9 °C</td><td>+0.0 %</td><td>40.0 °C</td><td>100 0</td><td>+0.0 *C</td><td>+0.0 %</td><td>+0.0 °C</td><td>100 0</td><td>+0.0 °C</td><td>40.0 °C</td><td>40.0 %</td><td>+00.0</td><td>+18.8 %</td><td>40.</td></th1<>	10	10.0 %	*1.9 °C	+0.0 %	40.0 °C	100 0	+0.0 *C	+0.0 %	+0.0 °C	100 0	+0.0 °C	40.0 °C	40.0 %	+00.0	+18.8 %	40.
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Unit 2 - Address 1 - Type D2818M           Unit 2 - Address 1 - Type D2818M           1         2         3         4         5         6         7         8         9         90         11         12         13         14           255 °C         +55 °C         +00 °C	2.40	+0.0 %	+1.9 %	+0.0 %	+0.0 %	+0.0 %	+0.0 %	+0.0.50	+0.0 %	+0.0 %	+0.0 %	+0.0 *C	+0.0.10	+0.0 %	+22.6.50	+72
Usit 2 - Address 1 - Type D2010M           1         2         3         4         5         6         7         8         9         10         11         12         13         14           255 °C         +255 °C         +02 °C         +65 °C         +00 °C											and a fact fact fact from the				A Section of the later	
1         2         3         4         5         6         7         8         9         90         11         12         13         14           256 ℃         +02 ℃         +65 ℃         +00 ℃<	<u>(1976)</u>	Selected.					Unit 2 -	Address 1	- Type D2	018M	0000000		<u>8666</u> 66			1933
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33         34         35         36         37         37         40         41         42         43         44         45         46         4	1.6	40.0 %	+1.9 °C	+0.0 °C	+0.0 *C	+0.0 °C	+0.0 °C	+0.0 %	+00 %	+0.0 %	+0.0 %	+0.0 *C	+0.0 %	+0.0 °C	+18.8 °C	
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40         30         31         32         33         35         36         7         8         9         9         11         12         13         14           1         2         3         4         5         6         7         8         9         90         11         12         13         14           1         1         1         12         13         20         21         22         23         24         26         26         29         30           100         16         19         20         21         22         23         24         25         26         29         30           400         19         400         400         400         400         400	1.0	40.0 %	+19%	+0.0 %	400 10	+00.0	+0.0 %	+0.0 %	+10.0 %	+10.7 %	+10.0 %	+00 %	40.0 %	+0.0 %	+/0.0 T	
Unit 3 - Address 2 - Type D281844           1         2         3         4         5         6         7         8         9         100         11         12         13         14           256 ℃         400 ℃<	1 50	-0.0 50	A1.0 %	40.0 50	+00.50	40.0.50	40.0 %	40.0 50		40.0 50	40.0 %	+0.0 50	+0.0.50	40.0 %	472.6.50	. D4
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No C         No C <t< td=""><td>100</td><td>-0.0.50</td><td>41.0.50</td><td>40.010</td><td>- 12 -</td><td>40.0.50</td><td>40.0.50</td><td>+0.0 10</td><td>-00.50</td><td>40.0.10</td><td>40.0 10</td><td>- 02</td><td>40.0 %</td><td>+0.0.10</td><td>+18.8 YC</td><td></td></t<>	100	-0.0.50	41.0.50	40.010	- 12 -	40.0.50	40.0.50	+0.0 10	-00.50	40.0.10	40.0 10	- 02	40.0 %	+0.0.10	+18.8 YC	
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49         50         51         52         53         54         55         56         57         58         59         60         61         62           400 ℃ <t< td=""><td>1.90</td><td>2001</td><td>41.9 °C</td><td>40.0 %</td><td>+0.0 *C</td><td>40.0 %</td><td>40.0 %</td><td>+0.0 %</td><td>418.9 %</td><td>+19.0 °C</td><td>+19.1 %</td><td>27 0.0%</td><td>+0.0.%</td><td>40.0 °C</td><td>425.6.10</td><td></td></t<>	1.90	2001	41.9 °C	40.0 %	+0.0 *C	40.0 %	40.0 %	+0.0 %	418.9 %	+19.0 °C	+19.1 %	27 0.0%	+0.0.%	40.0 °C	425.6.10	
κοι το		40	61	52	53	- 44	46	46	17	48	69	60	61	ED U	63	64
Unit 4 - Address 3 - Type D2030M           1         2         3         4         5         6         7         8         9         10         11         12         13         14           PT.H         OFF	340	-00°C	+1.9 °C	+0.0 *C	+0.0 *C	+0.0 °C	+0.0 °C	+0.0 *C	+0.0 °C	+0.0 °C	9° 0.0+	-0.0 °C	+0.0 °C	+0.0 °C	+22.6 °C	+22
1     2     3     4     5     6     7     8     9     90     11     12     13     14       PEXN     OFF							Unit 4 -	Address 1	- Type D2	MICH						
177 18 19 20 21 22 23 24 25 26 27 28 29 30	- T	2	3	4	5 1	6 1	7	8	9	10	11	12	13	14	15	16
OFF         OFF <td></td> <td>055</td> <td>0.07</td> <td></td> <td>055</td> <td>0.55</td> <td>055</td> <td>-</td> <td>0.05.0</td> <td>015</td> <td></td> <td></td> <td>OFF</td> <td>0.55</td> <td></td> <td></td>		055	0.07		055	0.55	055	-	0.05.0	015			OFF	0.55		
17 18 19 20 21 22 23 24 25 26 27 28 29 30		arr	un	urr	urr	un	un	urr		un	un	arr	UTT	un	urr	011
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