

Communication Protocol

PROFINET



for Cold Cathode & Cold Cathode Pirani Gauges

Gemini[®] MAG500, MAG504, MAG550, MAG554

Gemini[®] MPG500, MPG504, MPG550, MPG554

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For cross-references within this document, the symbol (→  XY) is used, for cross-references to further documents, listed under literature, the symbol (→  [Z]).

General Information

Caution

Data transmission errors

Any attempt to simultaneously operate the gauge via the RS232C Serial Interface and PROFINET interface may result in incorrect data and data transmission errors.

Therefore, it is inadmissible to simultaneously operate the gauge via the RS232C Serial Interface and PROFINET interface.

The terminology in this document corresponds to the PROFINET standardization. For historical reasons, other INFICON product-specific documents (e.g. operating manuals) use the term "setpoint" instead of "trip point".

Intended Use

This Communication Protocol contains instructions for operating PROFINET interfaces (slaves) together with a master.



For safety information, specifications and operation instructions of the vacuum gauges refer to the appropriate document (→ [1]).

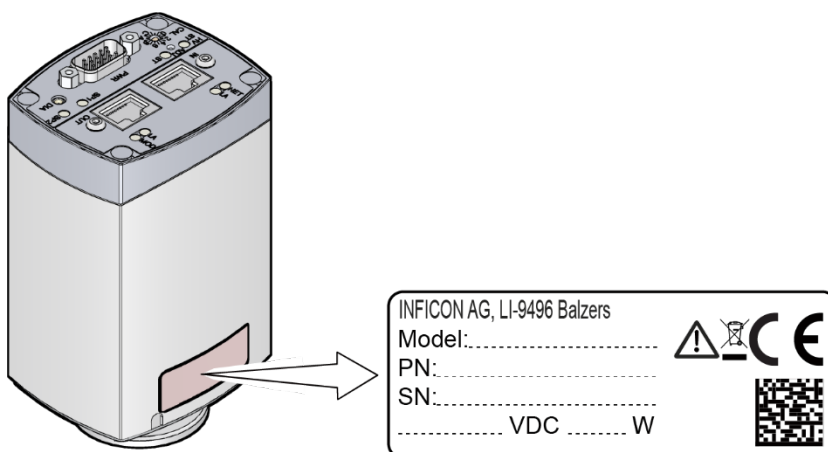
PROFINET Interface

This manual describes the functionality of the PROFINET MxG5xx family. The family consists of MAG500, MAG504, MAG550, MAG554 and MPG500, MPG504, MPG550 and MPG554 gauges.

For operating the gauge via PROFINET, prior installation of the device specific GSDML file is required on the bus master side. This file can be downloaded from our website. The MAG5xx and MPG5xx devices use a common MxG5xx PROFINET GSDML file (→ [2]).

Product Identification

In all communications with INFICON, please specify the information on the product nameplate. For convenient reference copy that information into the space provided below.

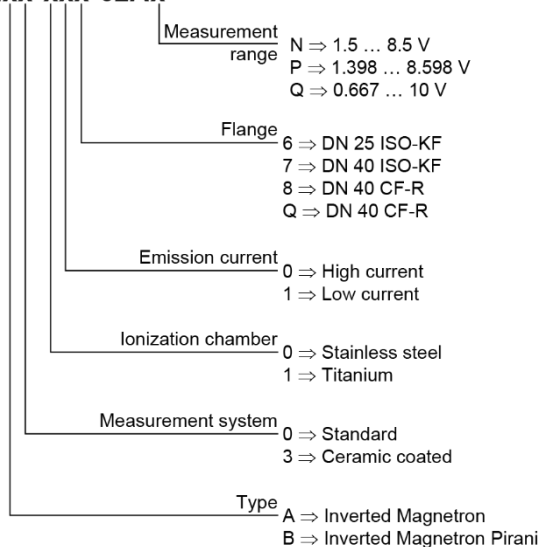


Validity

This document applies to products of the Gemini Cold Cathode Gauges with Pirani Sensor (MPG500, MPG504, MPG550, MPG554) and Gemini Cold Cathode Gauges without Pirani Sensors (MAG500, MAG504, MAG550, MAG554) with PROFINET interface.

Part numbers of standard products are indicated below. OEM products have other part numbers and different parameter settings (e.g. factory setting of trip points) as defined in the corresponding ordering information.

3Mxx-xxx-62Ax



The part number (PN) can be taken from the product nameplate.

If not indicated otherwise in the legends, the illustrations in this document correspond to MPG550 gauges with DN 25 ISO-KF vacuum connection. They apply to other gauges by analogy.

Trademark

PROFINET PROFIBUS Nutzerorganisation e.V., 76131 Karlsruhe, DE
 Gemini® INFICON Holding AG

1 Technical Data



Further technical data → [1].

Status signal (digital output)

Supply voltage	≤30 V (dc)
Current rating	100 mA (sink)
High voltage is ON	0 V
High voltage is OFF	open

High voltage cut-in, low active (digital input)

Input voltage	≤30 V (dc)
High voltage ON	<2.5 V (dc)
High voltage OFF	>4.0 V (dc)

Switching functions SP1, SP2 (mechanical relays)

Number	2
Type	NO (normally open), potential free
Setting range (N ₂)	
MAG5xx	1×10 ⁻⁹ ... 1×10 ⁻² mbar
MPG5xx	1×10 ⁻⁹ ... 1000 mbar
Hysteresis	10% of threshold
Switching characteristics	Low Trip Point (default)
Contact rating	<30 V (ac) / (dc), ≤0.5 A (dc) resistive
closed	LED on
open	LED off

The hysteresis and the switching characteristics can be programmed via the PROFINET interface.

Power supply



DANGER

The gauge may only be connected to power supplies, instruments, or control devices that conform to the requirements of a grounded protective extra-low voltage (PELV) and limited power source (LPS), Class 2. The connection to the gauge has to be fused.

Supply voltage at the gauge	+14.5 ... +30 V (dc) Class 2 / LPS
Ripple	≤1 V _{pp}
Power consumption	≤2.5 W
Fuse to be connected	1 AT

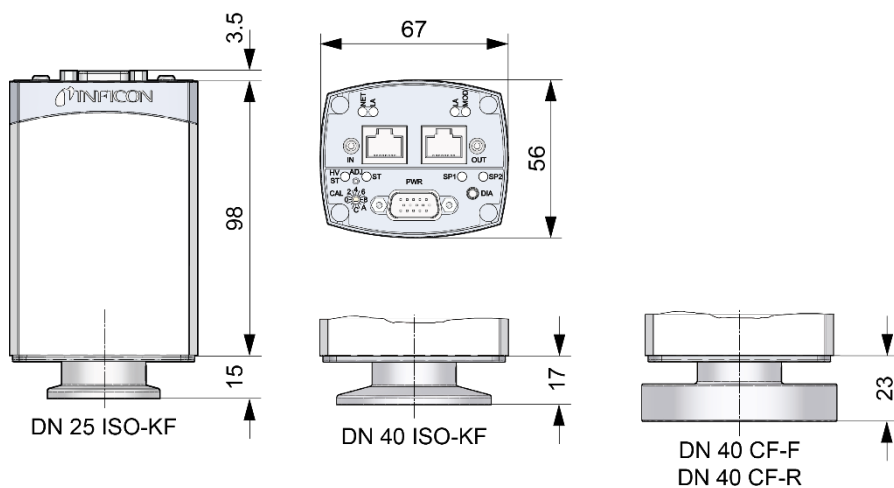
The minimum voltage of the power supply unit must be increased proportionally to the length of the sensor cable.

Electrical connection	D-sub HD, 15-pin, male
Sensor cable	15-pin, shielded

PROFINET Interface

Communication protocol	protocol specialized for PROFINET IO
Type	PROFINET IO-Device
Conformance Class	A, B
Support	MRP
Data rate	100 MBit/s
Physical layer	100BASE-Tx (IEEE 802.3)
PROFINET connector	2 × RJ45, 8-pin (socket) <IN>: PROFINET input <OUT>: PROFINET output
Cable	Shielded Ethernet Patch Cable (CAT5e quality or higher)
Cable length	≤100 m

Dimensions [mm]



2 Interface Connection



Make sure the vacuum connection is properly made (→ Operating Manual).



DANGER

The gauge may only be connected to power supplies, instruments, or control devices that conform to the requirements of a grounded protective extra-low voltage (PELV) and limited power source (LPS), Class 2. The connection to the gauge has to be fused.

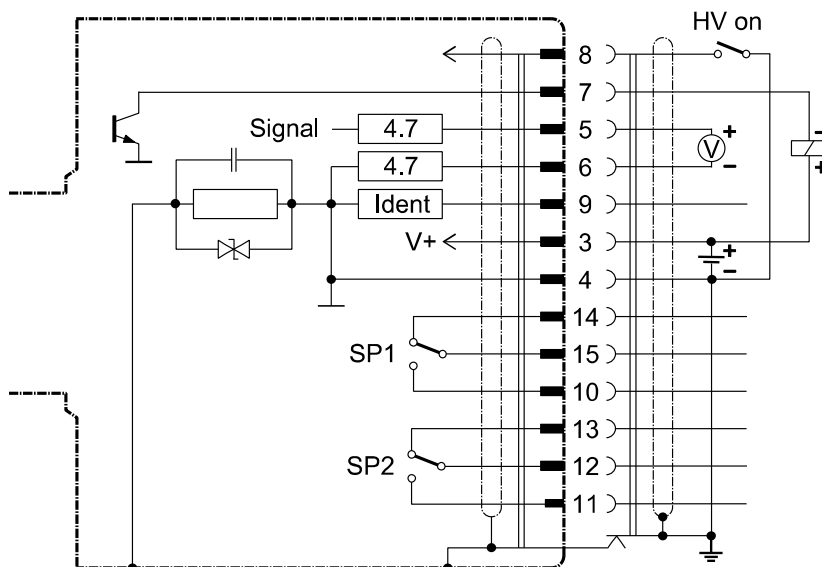


Ground loops, differences of potential, or EMC problems may affect the measurement signal. For optimum signal quality, please do observe the following notes:

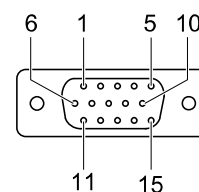
- Use an overall metal braided shielded cable. The connector must have a metal case.
- Connect the supply common with protective ground directly at the power.
- Use differential measurement input (signal common and supply common conducted separately).
- Potential difference between supply common and housing ≤ 6 V (overvoltage protection).

2.1 D-sub HD, 15-pin Connector

If no sensor cable is available, make one according to the following diagram.



- Pin 1, 2 n.c.
- Pin 3 Supply 14.5 ... 30 V
- Pin 4 Supply Common GND
- Pin 5 Signal output
- Pin 6 Signal common
- Pin 7 Status (low = HV on)
- Pin 8 ¹⁾ High voltage HV on (low active)
- Pin 9 Gauge identification
- Pin 10 Relay SP 1 (NO)
- Pin 11 Relay SP 2 (NO)
- Pin 12 Relay SP 2 com
- Pin 13 Relay SP 2 (NC)
- Pin 14 Relay SP 1 (NC)
- Pin 15 Relay SP 1 com



D-sub HD, 15-pin
female
soldering side

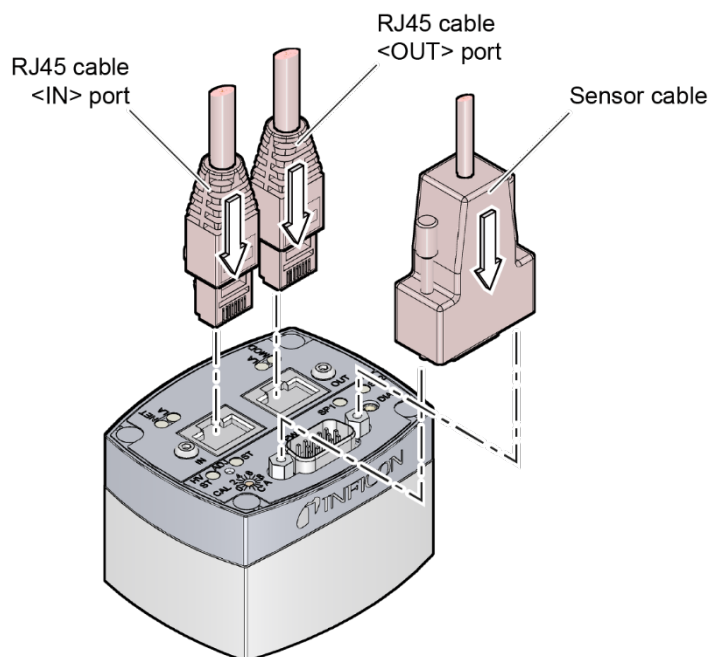
¹⁾ MAG only. HV is switched on via PROFINET interface.

2.2 PROFINET, RJ45 Connector

For operating the MxG5xx gauge via PROFINET, an Ethernet Patch Cable (CAT5e quality) with RJ45 connector is required.

The device supports daisy-chained operation:

- The previous device or PROFINET Controller has to be connected to the PxG55x <IN> port.
- Optionally, the cable from the PxG55x <OUT> port has to be connected to the next PROFINET device.



3 Operation

3.1 Introduction

The following data is exchanged over the PROFINET protocol:

- Pressure reading
- Setting for pressure unit (mTorr, Torr, mbar, Pa)
- Status and error messages
- Status of the switching functions
- Settings for Trip Points of the switching functions
- Adjustment of the Pirani sensor



Caution

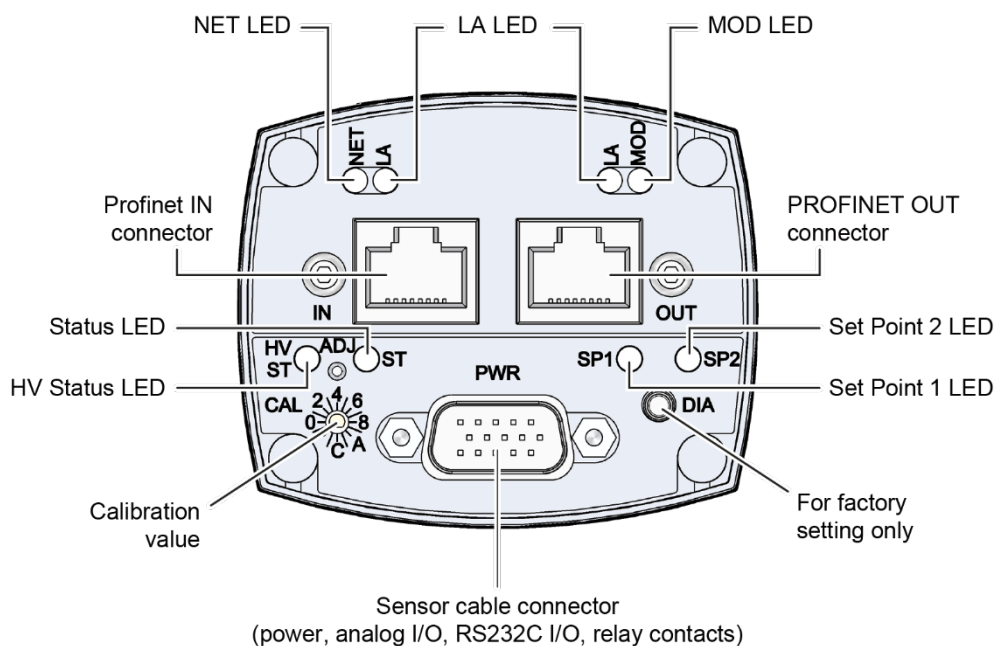


Data transmission errors

Any attempt to simultaneously operate the gauge via the RS232C Serial Interface and PROFINET interface may result in incorrect data and data transmission errors.

Therefore, it is inadmissible to simultaneously operate the gauge via the RS232C Serial Interface and PROFINET interface.

3.2 Front View



Label	Function
NET	The NET LED indicates the network status of the MxG5xx gauge
MOD	The MOD LED indicates the module status of the MxG5xx gauge
IN	PROFINET IN connector
LA	Link activity PROFINET IN and OUT
OUT	PROFINET OUT connector
PWR	Sensor cable connector (Power, analog I/O and Relay contacts)
ST	Status of the gauge
SP1	Status of Trip Point 1
SP2	Status of Trip Point 2
DIA	Diagnosis port
ADJ	Adjust

3.3 Indicators

For information on the LEDs <ST>, <SP1> and <SP2> indicators see respective operating manual (→ [1]).

3.3.1 <NET> LED



Displays the network status.

Color	LED State	Description
	off	No power No connection with IO Controller
green	1 flash	Connection with IO Controller established IO Controller in STOP state or IO data bad IRT synchronization not finished
	blinking	Used by engineering tools to identify the node on the network
	on	Connection with IO Controller established IO Controller in RUN state
red	on	Major internal error (the indication is combined with a red module status LED)
	1 flash	Station name not set
	2 flashes	IP address not set
	3 flashes	Expected Identification differs from read identification

3.3.2 <MOD> LED



Displays the module status.

Color	LED State	Description
	off	No power OR Module in SETUP or NW_INIT state
green	on	Module has shifted from the NW_INIT state
	1 flash	Diagnostic event(s) present
red	on	Device in state Exception Major internal error (this indication is combined with a red network status LED)
red/ green	alternating (red/green)	Firmware update. Do NOT power off the module. Turning the module off during this phase could cause permanent damage.

3.3.3 <LA> LED (<IN> Port)



Displays the input status.

Color	LED State	Description
green	off	Port not connected or no power applied to device
	blinking	Port connected and communication active
	on	Port connected but no communication

3.3.4 <LA> LED (<OUT> Port)



Displays the output status.

Color	LED State	Description
green	off	Port not connected or no power applied to device
	blinking	Port connected and communication active
	on	Port connected but no communication

4 Communication

PROFINET provides cyclic and acyclic data. Cyclic data is automatically updated on a regular basis. Acyclic data needs to be requested by the user. In order to read or write a parameter Index, Slot and Subslot need to be correct.

This chapter gives an overview of the cyclic (→ 4.1) and acyclic data (→ 4.2). A list of all record data provided in the appendix.

Important abbreviations:

DAP	Device Access Points, PROFINET Slot 0
PAP	Parameter Access Point, PROFINET Subslot 1 (or 10 for DAP)
Pir	Pirani / common heat transfer sensor
VPG	Vacuum Pressure Gauge
Fieldbus Unit	Unit, which translates PROFINET commands into commands known to the vacuum pressure gauge and vice versa

Explanations for the abbreviations in the columns of the tables are given below:

Abbr.	Description
Access	parameter read/write access <ul style="list-style-type: none"> RO: object can only be read RW: object can be both read and written
Index	Index for the parameter
NV	Nonvolatile; attribute value is maintained through power cycles
Data Type	<ul style="list-style-type: none"> Boolean: 1 bit, BOOL Unsigned8: 8 bits, USINT Unsigned16: 16 bits, UINT Unsigned32: 32 bits, UDINT Float32: 32 bits, REAL String[n]: ASCII, ARRAY[0..n-1] OF CHAR OctetString[n]: Byte string, ARRAY[0..n-1] OF BYTE BitArea[8]: 8 bits, BYTE, ARRAY[0..7] OF BOOL BitArea[16]: 16 bits, WORD, ARRAY[0..15] OF BOOL BitArea[32]: 32 bits, DWORD, ARRAY[0..31] OF BOOL

4.1 Process Data

The following parameters are provided and updated cyclically. The provided GSDML file describes the PROFINET device and specially its process data (→ [\[2\]](#)).

4.1.1 Trip Points

The vacuum sensor has two independent switching logics named trip points on the fieldbus interface. The operating manual describes the configuration and usage of the Trip Points ("Switching Functions" → [\[1\]](#)).

They can be configured on record data (→ ch. 4.2.6).

Slot	SubSlot	Index	Data Type	Access	Name
PG(1)	20	0	BitArea[32]	RO	Trip Point Output All

Subslot 20:

This status bitfield is composed of the high and low trip point.

Trip Point Output All	
Bit 0	Status High Trip 1
Bit 1	Status Low Trip 1
Bit 2	Status High Trip 2
Bit 3	Status Low Trip 2

4.1.2 Pressure Gauge

General information on the gauge consisting of pressure value (gauge active value), active sensor number and Gauge Active Status.

Slot	SubSlot	Index	Data Type	Access	Name
PG(1)	21	0	Real32	RO	Gauge Active Value
	22	0	Unsigned16	RO	Gauge Active Sensor Number
	23	0	BitArea[8]	RO	Gauge Active Status

Subslot 21:

The Gauge Active Value is composed of the measurement of the containing sensor(s).

The pressure data unit can be configured via acyclic data (→ ch. 4.2.2).

Subslot 22:

Gauge Active Sensor Number	
0	Initial or both sensors invalid.
1	The Cold Cathode is providing the active value
2	The Pirani is providing the active value

Subslot 23:

This overall status of the gauge provides information on the validity of the active gauge value as well as out of range effects.

Gauge Active Status	
Bit 0	Value Valid
Bit 1	Overrange
Bit 2	Underrange
Bit 3	High Voltage ON
Bit 4	Plasma Ignited
Bit 5...7	Reserved - always 0

4.1.3 Exceptions

The exception status indicates that any error or any warning is present.

Slot	SubSlot	Index	Data Type	Access	Name
PG(1)	24	0	BitArea[8]	RO	Active Exception Status

Subslot 24:

Consolidated parameter to show that the device has any warning or error. The warnings and errors are disaggregated in separate parameters, which are part of the acyclic data (→ ch. 4.2.5).

Active Exception Status	
Bit 0	Any warning active.
Bit 2	Any error active.

4.1.4 Pressure Gauge Control

The gauge can be directly be controlled via process data.

- MAG5xx: This control word controls the Cold Cathode.
- MPG5xx: This control word can be used to control the Cold Cathode, but the Cold Cathode can also be directly controlled via Pirani sensor (default).

Slot	SubSlot	Index	Data Type	Access	Name
PG(1)	25	0	Unsigned8	W	Gauge Control Command

Subslot 25:

Gauge Control Command	
0	No change
1	Cold Cathode Off
2	Cold Cathode On
3	Cold Cathode controlled by Pirani (MPG5xx only)

4.2 Record Data

The vacuum gauge can be accessed and configured via record data.

4.2.1 Device

4.2.1.1 General Information

The most relevant device data is provided via the I&M data.

The following information is provided additionally:

Slot	SubSlot	Index	DataType	Access	Name
DAP(0)	PAP(10)	0x0022	Unsigned32	RO	Serial Number VPG
		0x0023	String[18]	RO	Mac Address
		0x00B4	String[14]	RO	SW Version Complete Device
		0x00B5	String[14]	RO	SW Version VPG
		0x00B6	String[14]	RO	SW Version Fieldbus
		0x00B7	String[14]	RO	SW Version NP40
		0x00B8	String[41]	RO	SW Git Hash Fieldbus
		0x00B9	String[41]	RO	SW Git Hash BL Fieldbus
		0x00BA	String[14]	RO	SW Version BL Fieldbus
		0x00BB	String[9]	RO	HW Version Fieldbus
		0x00FE	String[25]	RO	Device Type

Index 0x0022: Serial number of the vacuum pressure gauge

Index 0x0023: Mac address of the device.
Format: AA:BB:CC:DD:EE:FF

Index 0x00B4: Software version of the complete device, equals to the Software version of the fieldbus unit.
Format: AA.BB.CC.DDDD

SW Version Complete Device	
AA	Compatibility
BB	Release Version
CC	Development Version
DDDD	Build Version

Index 0x00B5: Software version of the vacuum pressure gauge.
Format: AA.BB.CC.DDDD

SW Version VPG	
AA	Compatibility
BB	Release Version
CC	Development Version
DDDD	Build Version

Index 0x00B6: Software version of the fieldbus unit.
Format: AA.BB.CC.DDDD

SW Version Fieldbus	
AA	Compatibility
BB	Release Version
CC	Development Version
DDDD	Build Version

Index 0x00B7: Software version of the NP40 chip.
Format: AA.BB.CC

SW Version NP40	
AA	Major Version
BB	Minor Version
CC	Build Version

Index 0x00B8: Git hash of the current software version of the fieldbus device.

Index 0x00B9: Git hash of the current software version of the bootloader.

Index 0x00BA: Bootloader Software version of the fieldbus unit.
Format: AA.BB.CC.DDDD

SW Version BL Fieldbus	
AA	Compatibility
BB	Release Version
CC	Development Version
DDDD	Build Version

Index 0x00BB: Hardware version of the fieldbus unit.
Format: AA.BB.CC

HW Version Fieldbus	
AA	Compatibility
BB	Release Version
CC	Development Version

Index 0x00FE: Shows the name of the product.

4.2.1.2 Device Reset

The device can be reset (SW reboot) via following command.



In a PROFINET network you should take into consideration that all devices connected after the device that you'd like to reset are subsequently disconnected from the network.

Slot	SubSlot	Index	Data Type	Access	Name
DAP(0)	PAP(10)	0x0082	OctetString[6]	RW	Device Reset Command
		0x0083	Unsigned8	RO	Device Reset Status
		0x0084	Unsigned8[2]	RO	Device Reset Response

Index 0x0082:

A device reset is initiated by sending the following byte pattern:

Device Reset Command	
Byte 0	0x74
Byte 1	0x65
Byte 2	0x73
Byte 3	0x65
Byte 4	0x72
Byte 5	Standard Reset = 0x00, Factory Reset = 0x66

Index 0x0083:

Device Reset Status	
0	Last command completed, no errors, no reply available
1	Last command completed, no errors, reply available
2	Last command completed, errors present, no reply available
3	Last command completed, errors present, reply available
255	command is processing

After a successful sending the device reset command, the device will reboot. The status and response might not be able to be called while rebooting and the values will return to the default values after rebooting.

Index 0x0084:

Device Reset Response	
Byte 0	see subindex 2
Byte 1	Reserved - always 0

4.2.2 Pressure Gauge

4.2.2.1 Configuration

The pressure data unit can be configured through the following parameter.

Slot	SubSlot	Index	DataType	Access	Name
DAP(0)	PAP(10)	0x0021	Unsigned8	RW	Data Unit

Index 0x0021:

Data Unit	
1	Pa
4	mbar
5	Torr
6	mTorr

The Data Unit is stored non-volatile.

4.2.2.2 Sensor Value

Slot	SubSlot	Index	DataType	Access	Name
PG(1)	PAP(1)	0x0001	Unsigned8	RO	Gauge Reading Valid
		0x0002	Unsigned8	RO	Gauge Overrange Exceeded
		0x0003	Unsigned8	RO	Gauge Underrange Exceeded
		0x0004	Real32	RO	Gauge Active Value
		0x0005	Unsigned16	RO	Gauge Active Sensor Number

Index 0x0001:

Gauge Reading Valid	
0	The value is invalid.
1	The value is valid.

Index 0x0002:

Gauge Overrange Exceeded	
0	Default value.
1	Pirani is in overrange

Index 0x0003:

Gauge Underrange Exceeded	
0	Default value.
1	Pirani is in underrange

Index 0x0004:

The Gauge Active Value is composed of the measurement of the containing sensor(s).

The pressure data unit can be configured via acyclic data (→ 4.2.2).

Index 0x0005:

Identifies the sensor that is influencing the gauge active value the most.

Gauge Active Sensor Number	
0	Initial or both sensors invalid.
1	The Cold Cathode is providing the active value
2	The Pirani is providing the active value

4.2.2.3 Status

Slot	SubSlot	Index	Data Type	Access	Name
PG(1)	PAP(1)	0x0006	Bitarea[8]	RO	Gauge Active Status

Index 0x0006:

Gauge Active Status	
Bit 0	Value Valid
Bit 1	Overrange
Bit 2	Underrange
Bit 3	High Voltage ON
Bit 4	Plasma Ignited
Bit 5...7	Reserved - always 0

4.2.3 Cold Cathode

The Cold Cathode is used in high to ultrahigh vacuum.

4.2.3.1 Sensor Value

Slot	SubSlot	Index	Data Type	Access	Name
PG(1)	PAP(1)	0x0400	Real32	RO	Sensor Value
		0x0401	Unsigned8	RO	Reading Valid
		0x0402	Unsigned8	RO	Ovrange Exceeded
		0x0403	Unsigned8	RO	Underrange Exceeded

Index 0x0400:

The corrected, converted, calibrated final pressure value of the Cold Cathode sensor.

Index 0x0401:

Reading Valid	
0	The value is invalid.
1	The value is valid.

Index 0x0402:

Ovrange Exceeded	
0	Default value.
1	Cold Cathode is in ovrange

Index 0x0403:

Underrange Exceeded	
0	Default value.
1	Cold Cathode is in underrange

4.2.3.2 Sensor Status

Slot	SubSlot	Index	Data Type	Access	Name
PG(1)	PAP(1)	0x0404	Unsigned8	RO	High Voltage Status
		0x0405	Unsigned8	RO	Ignition Status

Index 0x0404:

Cold Cathode high voltage status:

High Voltage Status	
0	HV is off
1	HV is on

The troubleshooting is detailed in the device manual (→ [1]).

Index 0x0405:

Cold Cathode ignition status:

Ignition Status	
0	Cold Cathode is not ignited
1	Cold Cathode is ignited

The troubleshooting is detailed in the device manual (→ [1]).

4.2.3.3 Exceptions

Slot	SubSlot	Index	Data Type	Access	Name
PG(1)	PAP(1)	0x0440	BitArea[16]	RO	Sensor Warning
		0x0441	BitArea[16]	RO	Sensor Error

Index 0x0440:

Sensor Warning	
Bit 0	Sensor element warning
Bit 1	Electronics warning

All bits are active high.

Index 0x0441:

Sensor Error	
Bit 0	Sensor element failure
Bit 1	Electronics failure

All bits are active high.

4.2.4 Heat Transfer (Pirani) - only for MPG5xx

The Pirani is used in medium to low vacuum. It is available in MPG5xx, but not in MAG5xx.

4.2.4.1 Sensor Value

Slot	SubSlot	Index	Data Type	Access	Name
PG(1)	PAP(1)	0x0300	Real32	RO	Sensor Value ¹⁾
		0x0301	Unsigned8	RO	Reading Valid ¹⁾
		0x0302	Unsigned8	RO	Overrange Exceeded ¹⁾
		0x0303	Unsigned8	RO	Underrange Exceeded ¹⁾

¹⁾ Only available for MPG5xx.

Index 0x0300:

The corrected, converted, calibrated final pressure value of the Pirani sensor.

Index 0x0301:

Reading Valid	
0	The value is invalid.
1	The value is valid.

Index 0x0302:

Overrange Exceeded	
0	Default value.
1	Pirani is in overrange

Index 0x0303:

Underrange Exceeded	
0	Default value.
1	Pirani is in underrange

4.2.4.2 Exceptions

Slot	SubSlot	Index	Data Type	Access	Name
PG(1)	PAP(1)	0x0340	BitArea[16]	RO	Sensor Warning ¹⁾
		0x0341	BitArea[16]	RO	Sensor Error ¹⁾

¹⁾ Only available for MPG5xx

Index 0x0340:

Sensor Warning	
Bit 0	Sensor element warning
Bit 1	Electronics warning

All bits are active high.

The troubleshooting is detailed in the device manual (→ [1]).

Index 0x0341:

Sensor Error	
Bit 0	Sensor element failure
Bit 1	Electronics failure

All bits are active high.


The troubleshooting is detailed in the device manual (→ [1]).

4.2.4.3 Adjusting the Pirani

The gauge is factory calibrated. Due to mounting, long time operation or contamination, a zero drift can occur. If necessary, check the zero drift and adjust the gauge periodically.

For adjusting the zero point, operate the gauge under the same constant ambient conditions and in the same mounting orientation as normally.

Procedure

- 1 If you are using a seal with centering ring and filter, check that they are clean or replace them if necessary ("Deinstallation" →  [1]).
- 2 Put the gauge into operation and operate it at atmospheric pressure for at least 10 minutes.
- 3 Perform an ATM adjustment described below "Full Scale Adjust Command Heat Transfer (Pirani)".
- 4 Full Scale Adjust Status Pirani and Full Scale Adjust Response Pirani provide you with the information on the successful execution of the ATM adjustment. If it was not successful repeat step 3.
- 5 Evacuate the vacuum system to $p \ll 10^{-5}$ mbar and wait at least 2 minutes (If your system can not evacuate to $p \ll 10^{-5}$ mbar go to step 8).
- 6 Perform a Zero adjustment described below.
- 7 Zero Adjust Status Pirani and Zero Adjust Response Pirani provide you with the information on the successful execution of the ATM adjustment. If it was not successful repeat step 6.

If your system can not evacuate to $p \ll 10^{-5}$ mbar:

- 8 Evacuate the vacuum system to the lowest possible value and wait at least 2 minutes.
- 9 Perform a Zero adjustment with target offset described below.
- 10 Reading Zero Adjust Status Pirani and Zero Adjust Response Pirani provides you with the information if the zero adjustment was successful. If not repeat step 9.

4.2.4.4 Full Scale Adjustment Pirani

Please follow the described procedure for executing an ZeroAdjust of the Pirani sensor (→ ch. 4.2.4.3).

Slot	SubSlot	Index	Data Type	Access	Name
DAP(0)	PAP(10)	0x0370	Unsigned8[6]	RW	Zero Adjust Command
		0x0371	Unsigned8	RO	Zero Adjust Status
		0x0372	Unsigned8[3]	RO	Zero Adjust Response

Index 0x0370:

Zero Adjust Command	
Byte 0	Mode 0: Zero adjust with no offset. must be executed $\leq 10E-5$ mbar.
Byte 1	Index of the Sub Sensor Instance: Pirani at MPG5xx = 2
Byte 2-5	always 0

Read Access: Shows the last command that has been written to this parameter.

Example MPG5xx: Write 00-02-00-00-00-00 (hex) to this parameter for starting the adjustment at vacuum $\leq 10E-5$ mbar.

Index 0x0371:

Zero Adjust Status	
0	Last command completed, no errors, no reply available
1	Last command completed, no errors, reply available
2	Last command completed, errors present, no reply available
3	Last command completed, errors present, reply available
255	command is processing

Index 0x0372:

Zero Adjust Response	
Byte 0	See Zero Adjust Status
Byte 1	Unused
Byte 2	0: Zeroing successful 1: Zeroing failed: out-of-range 254: No previous Zero Adjust command issued

4.2.4.5 Zero Adjustment Pirani

Please follow the described procedure for executing an ZeroAdjust of the Pirani sensor (→ ch. 4.2.4.3).

Slot	SubSlot	Index	Data Type	Access	Name
DAP(0)	PAP(10)	0x0370	Unsigned8[6]	RW	Zero Adjust Command ¹⁾
		0x0371	Unsigned8	RO	Zero Adjust Status ¹⁾
		0x0372	Unsigned8[3]	RO	Zero Adjust Response ¹⁾

¹⁾ Only available for MPG5xx.

Index 0x0370:

Zero Adjust Command	
Byte 0	Mode 0: Zero adjust with no offset. must be executed $\leq 10E-5$ mbar.
Byte 1	Index of the Sub Sensor Instance: Pirani at MPG5xx = 2
Byte 2-5	Always 0



For MPG5xx, the Pirani sensor is instance 2. MAG5xx does not have a Pirani sensor.

Read Access: Shows the last command that has been written to this parameter.

Example: Write 00-02-00-00-00-00 (hex) to this parameter for starting the adjustment at vacuum $\leq 10E-5$ mbar.

Index 0x0371:

Zero Adjust Status	
0	Last command completed, no errors, no reply available
1	Last command completed, no errors, reply available
2	Last command completed, errors present, no reply available
3	Last command completed, errors present, reply available
255	command is processing

Index 0x0372:

Zero Adjust Response	
Byte 0	See Zero Adjust Status
Byte 1	Unused
Byte 2	0: Zeroing successful 1: Zeroing failed: out-of-range 254: No previous Zero Adjust command issued

4.2.4.6 Full Scale Adjustment

Slot	SubSlot	Index	Data Type	Access	Name
DAP(0)	PAP(10)	0x0374	Unsigned8[6]	RW	Full Scale Adjust Command ¹⁾
		0x0375	Unsigned8	RO	Full Scale Adjust Status ¹⁾
		0x0376	Unsigned8[3]	RO	Full Scale Adjust Response ¹⁾

¹⁾ Only available for MPG5xx.

Index 0x0374:

Full Scale Adjust Command	
Byte 0	Mode 0: Full Scale Adjust
Byte 1	Index of the Sub Sensor Instance: Pirani at MPG5xx = 2
Byte 2-5	Full Scale Value - always 0

Read Access: Shows the last command that has been written to this parameter.

Example: Write 00-02-00-00-00-00 (hex) to this parameter for starting the adjustment on atmospheric pressure.


Index 0x0375:

Full Scale Adjust Status	
0	Last command completed, no errors, no reply available
1	Last command completed, no errors, reply available
2	Last command completed, errors present, no reply available
3	Last command completed, errors present, reply available
255	command is processing

Index 0x0376:

Full Scale Adjust Response	
Byte 0	See Full Scale Adjust Status
Byte 1	Unused
Byte 2	0: Full Scale Adjust successful 1: Full Scale Adjust failed: out-of-range 254: No previous Full Scale Adjust command issued

4.2.5 Exceptions

The following chapter explains all acyclic requests to gather error or warning information. For further error handling refer to the troubleshooting named in the device manual ("Troubleshooting" →  [1]).

4.2.5.1 Status

The exception status indicates any error or warning present.

Slot	SubSlot	Index	Data Type	Access	Name
DAP(0)	PAP(10)	0x0040	BitArea[8]	RO	Active Exception Status

Index 0x0040:

The exception status indicates any error or warning present. The warnings and errors are detailed in separate registers.

Active Exception Status	
Bit 0	Any warning active.
Bit 2	Any error active.

4.2.5.2 Global Exceptions

Errors and warnings unrelated to a measurement principle are consolidated in the global exception registers.

Slot	SubSlot	Index	Data Type	Access	Name
DAP(0)	PAP(10)	0x0050	BitArea[16]	RO	Active Global Warning Details
		0x0051	BitArea[16]	RO	Active Global Error Details

Index 0x0050:

Active Global Warning Details	
Bit 0	Internal Diagnostics: Communication between fieldbus and vacuum pressure gauge is interrupted or sensor does not fit together with electronics → Replace with the correct sensor type

All bits are active high.

Index 0x0051:

Active Global Error Details	
Bit 0	Internal Diagnostics: Communication between fieldbus and vacuum pressure gauge is interrupted or sensor does not fit together with electronics → Replace with the correct sensor type
Bit 1	Time out EEPROM access
Bit 2	CRC error
Bit 3	EEPROM exception of fieldbus or base unit → Turn the gauge off and on again after 5s (reset)

All bits are active high.

4.2.6 Trip Points

The vacuum sensor has two independent switching logics named trip points on the fieldbus interface. The operating manual describes the configuration and usage of the Trip Points ("Switching Functions" → [1]).

The status of the trip points determines if the gauge pressure is below or above a certain value.

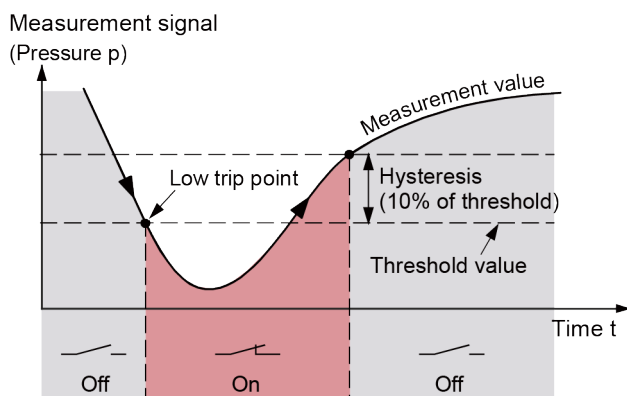
- The status of the low trip point is on, if the pressure falls below a certain threshold value.
- The status of the high trip point is on, if the pressure surpasses a certain threshold value.

To prevent a toggling behavior of the status at pressure close to the threshold value, a hysteresis is added to the threshold value.

All parameters for the Trip Points are saved non-volatile on the device.

Low Trip Point (default)

If the pressure in the vacuum system is lower than the trip point, the corresponding LED (<SP1> or <SP2>) 1 is lit solid and Status Low Trip Point 1 / 2 is set to 1. The corresponding relay is closed.



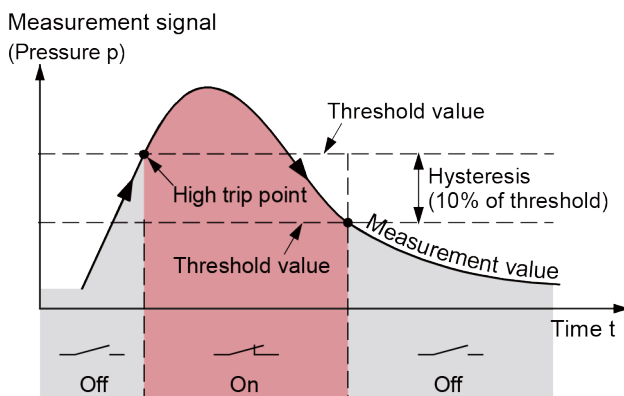
The trip points SP1 and SP2 are factory set to the lower measurement range limit and therefore do not switch.

Procedure to set a low trip at 0.05 mbar for the trip point 1:

- 1 Write 0.05 to the parameter Low Trip Point Limit 1.
- 2 Enable the trip point by writing 1 to parameter Low Trip Enable 1.

High Trip Point

If the pressure in the vacuum system is higher than the trip point, the corresponding LED (<SP1> or <SP2>) is lit solid and Status High Trip Point 1 / 2 is set to 1. The corresponding relay is closed.



Procedure to set at high trip at 5 [current pressure unit (e.g. Pa)] for the trip point 2:

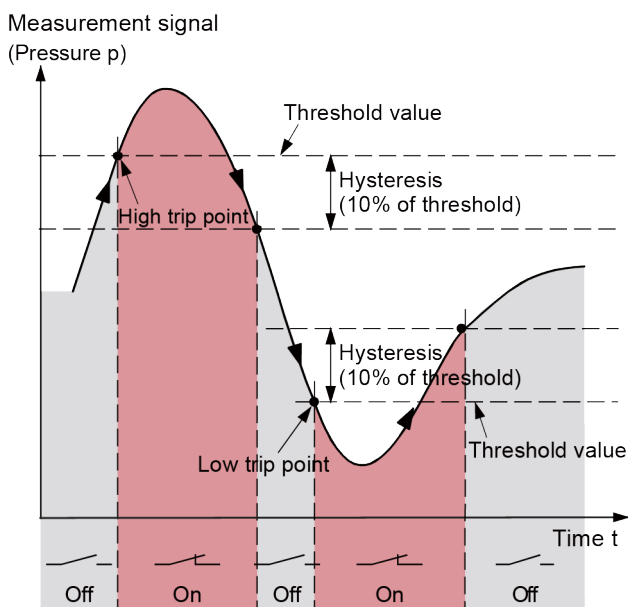
- 1 Write 5 to the parameter High Trip Point Limit 2.
- 2 Enable the trip point by writing 1 to parameter High Trip Enable 2.

High & Low Trip Point

Both a High Trip Point and a Low Trip Point are active. The output of the logic is controlled by an "OR" logic from High or Low Trip Point.

If the pressure in the vacuum system is higher than the defined High Trip Point threshold, the corresponding LED (<SP1> or <SP2>) is lit and Status High Trip Point 1/2 is set to 1. The corresponding relay is closed.

If the pressure in the vacuum system is lower than the defined Low Trip Point threshold, the corresponding LED (<SP1> or <SP2>) is lit and Status Low Trip Point 1/2 is set to 1. The corresponding relay is closed.



4.2.6.1 Status

The states of the Trip Points are also visible on the LEDs on the sensor (→ 3.3).

Slot	SubSlot	Index	DataType	Access	Name
PG(1)	PAP(1)	0x0010	BitArea[32]	RO	Trip Point Output All

Index 0x0010:

This status bitfield is composed from StatusHighTrip1, StatusLowTrip1, StatusHighTrip2 and StatusLowTrip2

Trip Point Output All	
Bit 0	Status High Trip 1
Bit 1	Status Low Trip 1
Bit 2	Status High Trip 2
Bit 3	Status Low Trip 2

The trip status is equal to the related relays state.

4.2.6.2 Trip Point 1

Slot	SubSlot	Index	DataType	Access	Name
PG(1)	PAP(1)	0x0800	Unsigned8	RO	Status High Trip 1
		0x0801	Unsigned8	RO	Status Low Trip 1
		0x0820	Unsigned8	RW	High Trip Enable 1
		0x0821	Unsigned8	RW	Low Trip Enable 1
		0x0826	Real32	RW	High Trip Point Limit 1
		0x0829	Real32	RW	Low Trip Point Limit 1
		0x082C	Real32	RW	High Trip Hysteresis 1
		0x082D	Real32	RW	Low Trip Hysteresis 1

Index 0x0800:

Status High Trip 1	
0	Trip is not active
1	Trip is active

Index 0x0801:

Status Low Trip 1	
0	Trip is not active
1	Trip is active

Index 0x0820:

High Trip Enable 1	
0	Disable
1	Enable

Index 0x0821:

Low Trip Enable 1	
0	Disable
1	Enable

Index 0x0826:

Threshold value to trigger the High Trip Point 1 condition if pressure is above this value.

Index 0x0829:

Threshold value to trigger the Low Trip Point 1 condition if pressure is below this value.

Index 0x082C: Hysteresis value for High Trip Point 1.
This value is subtracted from the High Trip Point Limit. The resulting value indicates the lower hysteresis point for the High Trip 1.

Index 0x082D: Hysteresis value for Low Trip Point 1.
This value is added to the Low Trip Point Limit. The resulting value indicates the upper hysteresis point for the Low Trip 1.

4.2.6.3 Trip Point 2

Slot	SubSlot	Index	Data Type	Access	Name
PG(1)	PAP(1)	0x0900	Unsigned8	RO	Status High Trip 2
		0x0901	Unsigned8	RO	Status Low Trip 2
		0x0920	Unsigned8	RW	High Trip Enable 2
		0x0921	Unsigned8	RW	Low Trip Enable 2
		0x0926	Real32	RW	High Trip Point Limit 2
		0x0929	Real32	RW	Low Trip Point Limit 2
		0x092C	Real32	RW	High Trip Hysteresis 2
		0x092D	Real32	RW	Low Trip Hysteresis 2

Index 0x0900:

Status High Trip 2	
0	Trip is not active
1	Trip is active

Index 0x0901:

Status Low Trip 2	
0	Trip is not active
1	Trip is active

Index 0x0920:

High Trip Enable 2	
0	Disable
1	Enable

Index 0x0921:

Low Trip Enable 2	
0	Disable
1	Enable

Index 0x0926: Threshold value to trigger the High Trip Point 2 condition if pressure is above this value.




Index 0x0929: Threshold value to trigger the Low Trip Point 2 condition if pressure is below this value.

Index 0x092C: Hysteresis value for High Trip Point 2.
This value is subtracted from the High Trip Point Limit. The resulting value indicates the lower hysteresis point for the High Trip 2.

Index 0x092D: Hysteresis value for Low Trip Point 2.
This value is added to the Low Trip Point Limit. The resulting value indicates the upper hysteresis point for the Low Trip 2.

Appendix

A: Literature

-  [1] Operating Manual
MAG550, MAG554, MPG550, MPG554
tina83d1 (German)
tina83e1 (English)
INFICON AG, LI-9496 Balzers, Liechtenstein
-  [2] PROFINET Device Description GSDML
MAG550, MAG554, MPG550, MPG554
INFICON AG, LI-9496 Balzers, Liechtenstein
-  [3] www.profibus.com
Profibus user organization

B: List of Parameters for a MPG55x

Slot	SubSlot	Index	DataType	Access	Group	Name
DAP(0)	PAP(10)	0x0021	Unsigned8	RW	Pressure Gauge	Data Unit
DAP(0)	PAP(10)	0x0022	Unsigned32	RO	Device	Serial Number VPG
DAP(0)	PAP(10)	0x0023	String[18]	RO	Device	Mac Address
DAP(0)	PAP(10)	0x0040	Unsigned8	RO	Exceptions	Active Exception Status
DAP(0)	PAP(10)	0x0050	Unsigned16	RO	Exceptions	Active Global Warning Details
DAP(0)	PAP(10)	0x0051	Unsigned16	RO	Exceptions	Active Global Error Details
DAP(0)	PAP(10)	0x0082	Unsigned8[6]	RW	Device	Device Reset Command
DAP(0)	PAP(10)	0x0083	Unsigned8[1]	RO	Device	Device Reset Status
DAP(0)	PAP(10)	0x0084	Unsigned8[2]	RO	Device	Device Reset Response
DAP(0)	PAP(10)	0x00B4	String[14]	RO	Device	SW Version Complete Device
DAP(0)	PAP(10)	0x00B5	String[14]	RO	Device	SW Version VPG
DAP(0)	PAP(10)	0x00B6	String[14]	RO	Device	SW Version Fieldbus
DAP(0)	PAP(10)	0x00B7	String[14]	RO	Device	SW Version NP40
DAP(0)	PAP(10)	0x00B8	String[41]	RO	Device	SW Git Hash Fieldbus
DAP(0)	PAP(10)	0x00B9	String[41]	RO	Device	SW Git Hash BL Fieldbus
DAP(0)	PAP(10)	0x00BA	String[14]	RO	Device	SW Version BL Fieldbus
DAP(0)	PAP(10)	0x00BB	String[9]	RO	Device	HW Version Fieldbus
DAP(0)	PAP(10)	0x00FE	String[25]	RO	Device	Device Type
DAP(0)	PAP(10)	0x0370	Unsigned8[6]	RW	Pressure Gauge Pirani	Zero Adjust Command
DAP(0)	PAP(10)	0x0371	Unsigned8[1]	RO	Pressure Gauge Pirani	Zero Adjust Status
DAP(0)	PAP(10)	0x0372	Unsigned8[3]	RO	Pressure Gauge Pirani	Zero Adjust Response
DAP(0)	PAP(10)	0x0374	Unsigned8[6]	RW	Pressure Gauge Pirani	Full Scale Adjust Command
DAP(0)	PAP(10)	0x0375	Unsigned8[1]	RO	Pressure Gauge Pirani	Full Scale Adjust Status
DAP(0)	PAP(10)	0x0376	Unsigned8[3]	RO	Pressure Gauge Pirani	Full Scale Adjust Response
PG(1)	PAP(1)	0x0001	Unsigned8	RO	Pressure Gauge	Gauge Reading Valid
PG(1)	PAP(1)	0x0002	Unsigned8	RO	Pressure Gauge	Gauge Overrange Exceeded
PG(1)	PAP(1)	0x0003	Unsigned8	RO	Pressure Gauge	Gauge Underrange Exceeded
PG(1)	PAP(1)	0x0004	Real32	RO	Pressure Gauge	Gauge Active Value
PG(1)	PAP(1)	0x0005	Unsigned16	RO	Pressure Gauge	Gauge Active Sensor Number
PG(1)	PAP(1)	0x0006	Unsigned8	RO	Pressure Gauge	Gauge Active Status
PG(1)	PAP(1)	0x0010	Unsigned32	RO	Trip Points	Trip Point Output All
PG(1)	PAP(1)	0x0300	Real32	RO	Pressure Gauge Pirani	Sensor Value
PG(1)	PAP(1)	0x0301	Unsigned8	RO	Pressure Gauge Pirani	Reading Valid
PG(1)	PAP(1)	0x0302	Unsigned8	RO	Pressure Gauge Pirani	Overrange Exceeded
PG(1)	PAP(1)	0x0303	Unsigned8	RO	Pressure Gauge Pirani	Underrange Exceeded
PG(1)	PAP(1)	0x0340	Unsigned16	RO	Pressure Gauge Pirani	Sensor Warning
PG(1)	PAP(1)	0x0341	Unsigned16	RO	Pressure Gauge Pirani	Sensor Error
PG(1)	PAP(1)	0x0400	Real32	RO	Pressure Gauge Cold Cathode	Sensor Value
PG(1)	PAP(1)	0x0401	Unsigned8	RO	Pressure Gauge Cold Cathode	Reading Valid
PG(1)	PAP(1)	0x0402	Unsigned8	RO	Pressure Gauge Cold Cathode	Overrange Exceeded
PG(1)	PAP(1)	0x0403	Unsigned8	RO	Pressure Gauge Cold Cathode	Underrange Exceeded
PG(1)	PAP(1)	0x0404	Unsigned8	RO	Pressure Gauge Cold Cathode	High Voltage Status
PG(1)	PAP(1)	0x0405	Unsigned8	RO	Pressure Gauge Cold Cathode	Ignition Status
PG(1)	PAP(1)	0x0440	Unsigned16	RO	Pressure Gauge Cold Cathode	Sensor Warning
PG(1)	PAP(1)	0x0441	Unsigned16	RO	Pressure Gauge Cold Cathode	Sensor Error

Slot	SubSlot	Index	DataType	Access	Group	Name
PG(1)	PAP(1)	0x0800	Unsigned8	RO	Trip Points	Status High Trip 1
PG(1)	PAP(1)	0x0801	Unsigned8	RO	Trip Points	Status Low Trip 1
PG(1)	PAP(1)	0x0820	Unsigned8	RW	Trip Points	High Trip Enable 1
PG(1)	PAP(1)	0x0821	Unsigned8	RW	Trip Points	Low Trip Enable 1
PG(1)	PAP(1)	0x0826	Real32	RW	Trip Points	High Trip Point Limit 1
PG(1)	PAP(1)	0x0829	Real32	RW	Trip Points	Low Trip Point Limit 1
PG(1)	PAP(1)	0x082C	Real32	RW	Trip Points	High Trip Hysteresis 1
PG(1)	PAP(1)	0x082D	Real32	RW	Trip Points	Low Trip Hysteresis 1
PG(1)	PAP(1)	0x0900	Unsigned8	RO	Trip Points	Status High Trip 2
PG(1)	PAP(1)	0x0901	Unsigned8	RO	Trip Points	Status Low Trip 2
PG(1)	PAP(1)	0x0920	Unsigned8	RW	Trip Points	High Trip Enable 2
PG(1)	PAP(1)	0x0921	Unsigned8	RW	Trip Points	Low Trip Enable 2
PG(1)	PAP(1)	0x0926	Real32	RW	Trip Points	High Trip Point Limit 2
PG(1)	PAP(1)	0x0929	Real32	RW	Trip Points	Low Trip Point Limit 2
PG(1)	PAP(1)	0x092C	Real32	RW	Trip Points	High Trip Hysteresis 2
PG(1)	PAP(1)	0x092D	Real32	RW	Trip Points	Low Trip Hysteresis 2

C: List of Parameters for a MAG55x

Slot	SubSlot	Index	DataType	Access	Group	Name
DAP(0)	PAP(10)	0x0021	Unsigned8	RW	Pressure Gauge	Data Unit
DAP(0)	PAP(10)	0x0022	Unsigned32	RO	Device	Serial Number VPG
DAP(0)	PAP(10)	0x0023	String[18]	RO	Device	Mac Address
DAP(0)	PAP(10)	0x0040	Unsigned8	RO	Exceptions	Active Exception Status
DAP(0)	PAP(10)	0x0050	Unsigned16	RO	Exceptions	Active Global Warning Details
DAP(0)	PAP(10)	0x0051	Unsigned16	RO	Exceptions	Active Global Error Details
DAP(0)	PAP(10)	0x0082	Unsigned8[6]	RW	Device	Device Reset Command
DAP(0)	PAP(10)	0x0083	Unsigned8[1]	RO	Device	Device Reset Status
DAP(0)	PAP(10)	0x0084	Unsigned8[2]	RO	Device	Device Reset Response
DAP(0)	PAP(10)	0x00B4	String[14]	RO	Device	SW Version Complete Device
DAP(0)	PAP(10)	0x00B5	String[14]	RO	Device	SW Version VPG
DAP(0)	PAP(10)	0x00B6	String[14]	RO	Device	SW Version Fieldbus
DAP(0)	PAP(10)	0x00B7	String[14]	RO	Device	SW Version NP40
DAP(0)	PAP(10)	0x00B8	String[41]	RO	Device	SW Git Hash Fieldbus
DAP(0)	PAP(10)	0x00B9	String[41]	RO	Device	SW Git Hash BL Fieldbus
DAP(0)	PAP(10)	0x00BA	String[14]	RO	Device	SW Version BL Fieldbus
DAP(0)	PAP(10)	0x00BB	String[9]	RO	Device	HW Version Fieldbus
DAP(0)	PAP(10)	0x00FE	String[25]	RO	Device	Device Type
PG(1)	PAP(1)	0x0001	Unsigned8	RO	Pressure Gauge	Gauge Reading Valid
PG(1)	PAP(1)	0x0002	Unsigned8	RO	Pressure Gauge	Gauge Overage Exceeded
PG(1)	PAP(1)	0x0003	Unsigned8	RO	Pressure Gauge	Gauge Underrange Exceeded
PG(1)	PAP(1)	0x0004	Real32	RO	Pressure Gauge	Gauge Active Value
PG(1)	PAP(1)	0x0005	Unsigned16	RO	Pressure Gauge	Gauge Active Sensor Number
PG(1)	PAP(1)	0x0006	Unsigned8	RO	Pressure Gauge	Gauge Active Status
PG(1)	PAP(1)	0x0010	Unsigned32	RO	Trip Points	Trip Point Output All
PG(1)	PAP(1)	0x0400	Real32	RO	Pressure Gauge Cold Cathode	Sensor Value
PG(1)	PAP(1)	0x0401	Unsigned8	RO	Pressure Gauge Cold Cathode	Reading Valid
PG(1)	PAP(1)	0x0402	Unsigned8	RO	Pressure Gauge Cold Cathode	Overrange Exceeded
PG(1)	PAP(1)	0x0403	Unsigned8	RO	Pressure Gauge Cold Cathode	Underrange Exceeded
PG(1)	PAP(1)	0x0404	Unsigned8	RO	Pressure Gauge Cold Cathode	High Voltage Status
PG(1)	PAP(1)	0x0405	Unsigned8	RO	Pressure Gauge Cold Cathode	Ignition Status
PG(1)	PAP(1)	0x0440	Unsigned16	RO	Pressure Gauge Cold Cathode	Sensor Warning
PG(1)	PAP(1)	0x0441	Unsigned16	RO	Pressure Gauge Cold Cathode	Sensor Error
PG(1)	PAP(1)	0x0800	Unsigned8	RO	Trip Points	Status High Trip 1
PG(1)	PAP(1)	0x0801	Unsigned8	RO	Trip Points	Status Low Trip 1
PG(1)	PAP(1)	0x0820	Unsigned8	RW	Trip Points	High Trip Enable 1
PG(1)	PAP(1)	0x0821	Unsigned8	RW	Trip Points	Low Trip Enable 1
PG(1)	PAP(1)	0x0826	Real32	RW	Trip Points	High Trip Point Limit 1
PG(1)	PAP(1)	0x0829	Real32	RW	Trip Points	Low Trip Point Limit 1
PG(1)	PAP(1)	0x082C	Real32	RW	Trip Points	High Trip Hysteresis 1
PG(1)	PAP(1)	0x082D	Real32	RW	Trip Points	Low Trip Hysteresis 1
PG(1)	PAP(1)	0x0900	Unsigned8	RO	Trip Points	Status High Trip 2
PG(1)	PAP(1)	0x0901	Unsigned8	RO	Trip Points	Status Low Trip 2
PG(1)	PAP(1)	0x0920	Unsigned8	RW	Trip Points	High Trip Enable 2
PG(1)	PAP(1)	0x0921	Unsigned8	RW	Trip Points	Low Trip Enable 2

Slot	SubSlot	Index	DataType	Access	Group	Name
PG(1)	PAP(1)	0x0926	Real32	RW	Trip Points	High Trip Point Limit 2
PG(1)	PAP(1)	0x0929	Real32	RW	Trip Points	Low Trip Point Limit 2
PG(1)	PAP(1)	0x092C	Real32	RW	Trip Points	High Trip Hysteresis 2
PG(1)	PAP(1)	0x092D	Real32	RW	Trip Points	Low Trip Hysteresis 2

D: Change History

Revision	Chapter	Description
-	all	Initial revision

Original: English



11R878E1



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