



# Smartline Vacuum Transmitter PROFINET Communication Manual



VSR/VCR/VSL/VCL/VSP/VCP



VSM/VS1



VSH

Version: 2.0  
Release: February 22, 2023  
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## 1 Introduction / Product Description

### 1.1 Validity

This supplementary information describes important variations to the standard product and is only valid together with its main operation manual.

### 1.2 Function

The electrically isolated PROFINET IO-device interface is equipped with an integrated 2-port switch and supports 100 Mbit/s full duplex communication. The connection to a PROFINET system is possible via connections designated "PN P1" and "PN P2" (2 x M12, D-coded, 4pin, female).

### 1.3 Installation

#### 1.3.1 PROFINET address assignment

**Note:** on delivery, the gauge has no IP address!

During normal operation (data exchange mode) the IP address is assigned to the device by the PROFINET IO-controller (PLC). For it the device has a device name on which it is addressed (see chapter [1.3.2](#)).

The IP address can be assigned manually or via a DHCP server.

#### 1.3.2 PROFINET device name

**Note:** on delivery, the gauge has no device name!

The device name is assigned via the configuration software of the device.

#### 1.3.3 Projecting

Use any project planning tool for project planning. You can download the GSDML files from the Thyracont webpage (<https://thyracont-vacuum.com/>).

**Note:** There was a rearrangement of the output modules 9 to 12 in GSDML-V2.42. Hence when updating from GSDML-V2.33 to GSDML-V2.42 or higher, please make sure to also adapt the module addresses on your PLC.

#### 1.3.4 Powering / Cabling

Power is always supplied to the transmitter via the RS-485 connector (see operating instruction of the standard version). Make cabling in compliance with the valid regulations.

## 1.4 Communication

The device is parameterized and configured by the PROFINET IO-controller during startup phase. Only after a correct termination of the startup phase the data exchange with external devices will take place.

Communication is via cyclic and acyclic data exchange.

### Input Data

- Input Modules

### Commands

- Output Modules

## 2 Modules

### 2.1 Input Modules

#### 2.1.1 Actual Pressure

| Module ID=IDM_1: Actual Pressure    |                                     |                             |                             |                  |
|-------------------------------------|-------------------------------------|-----------------------------|-----------------------------|------------------|
| Module Ident Number                 | 0x00040000                          |                             |                             |                  |
| Information                         | Contains the actual pressure value. |                             |                             |                  |
| Category                            | Input modules                       |                             |                             |                  |
| Submodule ID=IDS_1: Actual Pressure |                                     |                             |                             |                  |
| Submodule Ident Number              | 0x00000001                          |                             |                             |                  |
| I&M 5 Supported                     | <input type="checkbox"/> No         |                             |                             |                  |
| Cyclic Input Data                   |                                     |                             |                             | Item consistency |
| Name                                | Data Type                           | Display as Bits             | Subordinate                 | Length [Bytes]   |
| Actual Pressure                     | Float32                             | <input type="checkbox"/> No | <input type="checkbox"/> No |                  |

**Note:** This module is also used for acyclic data exchange ([3.7](#)) and diagnosis data ([4.1](#)).

### 2.1.2 Relative Pressure

| Module ID=IDM_13: Relative Pressure    |                                       |                 |             |                  |
|--|---------------------------------------|-----------------|-------------|------------------|
| Module Ident Number                    | 0x00040000                            |                 |             |                  |
| Information                            | Contains the relative pressure value. |                 |             |                  |
| Category                               | Input modules                         |                 |             |                  |
| Submodule ID=IDS_13: Relative Pressure |                                       |                 |             |                  |
| Submodule Ident Number                 | 0x0000000D                            |                 |             |                  |
| I&M 5 Supported                        | No                                    |                 |             |                  |
| Cyclic Input Data                      |                                       |                 |             | Item consistency |
| Name                                   | Data Type                             | Display as Bits | Subordinate | Length [Bytes]   |
| Relative Pressure                      | Float32                               | No              | No          |                  |

### 2.1.3 Actual GCF 1

| Module ID=IDM_2: Actual GCF 1    |  |                             |                             |                  |
|----------------------------------|--|-----------------------------|-----------------------------|------------------|
| Module Ident Number              | 0x00020000   |                             |                             |                  |
| Category                         | Input modules  |                             |                             |                  |
| Submodule ID=IDS_2: Actual GCF 1 |  |                             |                             |                  |
| Submodule Ident Number           | 0x00000002   |                             |                             |                  |
| Information                      | Contains the actual Gas Correction Factor (GCF) for Pirani sensor. |                             |                             |                  |
| I&M 5 Supported                  | <input type="checkbox"/> No  |                             |                             |                  |
| Cyclic Input Data                |  |                             |                             | Item consistency |
| Name                             | Data Type  | Display as Bits             | Subordinate                 | Length [Bytes]   |
| Actual GCF 1                     | Unsigned16   | <input type="checkbox"/> No | <input type="checkbox"/> No |                  |

Actual GCF 1: Contains the actual Gas Correction Factor (GCF) for Pirani sensor of all Smartline transmitters.

| Type    | Data Range                 |
|---------|----------------------------|
| VSR/VCR | 0x0014 – 0x0320 (20 – 800) |
| VSL/VCL | 0x0014 – 0x0320 (20 – 800) |
| VSP/VCP | 0x0014 – 0x0320 (20 – 800) |
| VSM     | 0x0014 – 0x0320 (20 – 800) |
| VSI     | 0x0000 (0), fixed          |
| VSH     | 0x0014 – 0x0320 (20 – 800) |

### 2.1.4 Actual GCF 2

| Module ID=IDM_3: Actual GCF 2    |  |                 |             |                  |
|----------------------------------|--|-----------------|-------------|------------------|
| Module Ident Number              | 0x00020000   |                 |             |                  |
| Information                      | Contains the actual Gas Correction Factor (GCF) for hot or cold cathode (0 if sensor not installed). |                 |             |                  |
| Category                         | Input modules  |                 |             |                  |
| Submodule ID=IDS_3: Actual GCF 2 |  |                 |             |                  |
| Submodule Ident Number           | 0x00000003   |                 |             |                  |
| I&M 5 Supported                  | No   |                 |             |                  |
| Cyclic Input Data                |  |                 |             | Item consistency |
| Name                             | Data Type  | Display as Bits | Subordinate | Length [Bytes]   |
| Actual GCF 2                     | Unsigned16   | No              | No          |                  |

Actual GCF 2: Contains the actual Gas Correction Factor (GCF) for hot or cold cathode for Smartline transmitters.

| Type    | Data Range                                  |
|---------|---|
| VSR/VCR | 0x0000 (0), fixed                           |
| VSL/VCL | 0x0000 (0), fixed                           |
| VSP/VCP | 0x0000 (0), fixed                           |
| VSM/VSJ | 0x0014 – 0x0320 (20 – 800) for cold cathode |
| VSH     | 0x0014 – 0x0320 (20 – 800) for hot cathode  |



### 2.1.5 Transmitter Status and Type

| Module ID=IDM_4: Transmitter Status and Type    |  |   |                             |                  |
|---|--|---|-----------------------------|------------------|
| Module Ident Number                             | 0x00010000   |   |                             |                  |
| Information                                     | Contains information about Status and Type of the Transmitter. |   |                             |                  |
| Category  | Input modules  |   |                             |                  |
| Submodule ID=IDS_4: Transmitter Status and Type |  |   |                             |                  |
| Submodule Ident Number                          | 0x00000004   |   |                             |                  |
| I&M 5 Supported                                 | <input type="checkbox"/> No                                    |   |                             |                  |
| Cyclic Input Data                               |  |   |                             | Item consistency |
| Name  | Data Type  | Display as Bits   | Subordinate                 | Length [Bytes]   |
| Transmitter Status and Type                     | OctetString  | Bit 0: Sensor Type<br>Bit 1: Sensor Type<br>Bit 2: Sensor Type<br>Bit 3: DeGas active<br>Bit 4: High vacuum cathode inactive<br>Bit 5: Spare Filament<br>Bit 6: Sensor Switch Mode<br>Bit 7: Sensor Switch Mode | <input type="checkbox"/> No | 1                |

Bit 0-2: Sensor Type: Contains the Smartline Transmitter Type

| Type    | Data    |
|---------|---------|
| VSR/VCR | 0x1 (1) |
| VSP     | 0x2 (2) |
| VSM     | 0x3 (3) |
| VSH     | 0x4 (4) |
| VCP     | 0x5 (5) |
| VSI     | 0x6 (6) |
| VSL/VCL | 0x7 (7) |

Bit 3: DeGas active: Indicates the status of DeGas.

| Type                                    | Data    | Description                 |
|---|---------|-----------------------------|
| VSR/VCR<br>VSL/VCL<br>VSP/VCP<br>VSM/VS | 0x0 (0) | fixed                       |
| VSH                                     | 0x0 (0) | Degas is inactive (default) |
|   | 0x1 (1) | Degas is active             |

Bit 4: High vacuum cathode inactive: For certain vacuum processes it may be favored to suppress the start of the hot cathode (VSH) or cold cathode (VSM/VSI) sensor, which is automatically controlled by the transducer electronics.

| Type                          | Data    | Description                      |
|-------------------------------|---------|----------------------------------|
| VSR/VCR<br>VSL/VCL<br>VSP/VCP | 0x0 (0) | fixed                            |
| VSM/VSI                       | 0x0 (0) | cold cathode is active (default) |
|                               | 0x1 (1) | cold cathode is inactive         |
| VSH                           | 0x0 (0) | hot cathode is active (default)  |
|                               | 0x1 (1) | hot cathode is inactive          |

Bit 5: Spare Filament: VSH transmitters have two filaments. This bit indicates that the VSH transmitter has switched to the spare filament, filament 1 is depleted.

| Type                                     | Data    | Description   |
|--|---------|---|
| VSR/VCR<br>VSL/VCL<br>VSP/VCP<br>VSM/VSI | 0x0 (0) | fixed   |
| VSH                                      | 0x0 (0) | Filament 1 is active, CoE Object is FALSE                 |
|  | 0x1 (1) | Filament 2 (spare Filament) is active, CoE Object is TRUE |

Bit 6-7: Sensor Switch Mode: By default a combi transmitter (VSR/VCR, VSL/VCL, VSM, VSH) performs a continuous transition between their sensors principles over a pressure range whereupon an assimilation of the sensor signals is carried out. The Sensor Switch Mode contains the actual mode.

| Type               | Data    | Description   |
|--------------------|---------|---|
| VSR/VCR<br>VSL/VCL | 0x0 (0) | no transition, direct switch at 1 mbar                          |
|                    | 0x1 (1) | continuous transition between 5 mbar and 15 mbar (default)      |
|                    | 0x3 (3) | custom transition (if set via serial interface or acyclic data) |
| VSP/VCP<br>/VSI    | 0x0 (0) | fixed   |
| VSM                | 0x0 (0) | no transition, direct switch at 1E-3 mbar                       |
|                    | 0x1 (1) | continuous transition between 1E-3 mbar and 2E-3 mbar (default) |
|                    | 0x3 (3) | custom transition (if set via serial interface or acyclic data) |
| VSH                | 0x0 (0) | no transition, direct switch at 4E-4 mbar                       |
|                    | 0x1 (1) | continuous transition between 1E-3 mbar and 2E-3 mbar (default) |
|                    | 0x2 (2) | continuous transition between 2E-3 mbar and 5E-3 mbar           |
|                    | 0x3 (3) | custom transition (if set via serial interface or acyclic data) |

### 2.1.6 Transmitter Warnings and Errors

| Module ID=IDM_5: Transmitter Warnings and Errors    |  |   |             |                  |
|---|--|---|-------------|------------------|
| Module Ident Number                                 | 0x00010000   |   |             |                  |
| Information   | Contains Information about Warnings and Errors of the Transmitter. |   |             |                  |
| Category  | Input modules  |   |             |                  |
| Submodule ID=IDS_5: Transmitter Warnings and Errors |  |   |             |                  |
| Submodule Ident Number                              | 0x00000005   |   |             |                  |
| I&M 5 Supported                                     | No   |   |             |                  |
| Cyclic Input Data                                   |  |   |             | Item consistency |
| Name  | Data Type  | Display as Bits   | Subordinate | Length [Bytes]   |
| Transmitter Warnings and Errors                     | OctetString  | Bit 0: Warning - Overrange<br>Bit 1: Warning - Underrange<br>Bit 3: Error - Filament 1 defect<br>Bit 4: Error - Filament 2 defect<br>Bit 5: Error - Internal Communication<br>Bit 6: Error - EEPROM failure<br>Bit 7: Error - Sensor defect/stacked out | No          | 1                |

#### Bit 0: Warning – Overrange

| Type | Data    | Description   |
|------|---------|---|
| all  | 0x0 (0) | no error  |
|      | 0x1 (1) | overrange detected, pressure level exceeds the measurement range; the Actual Pressure will be set to 2E+38. |

#### Bit 1: Warning – Underrange

| Type | Data    | Description  |
|------|---------|--|
| all  | 0x0 (0) | no error   |
|      | 0x1 (1) | underrange detected, pressure level is lower than the measurement range; the Actual Pressure will be set to 2E-38. |

#### Bit 3: Error – Filament 1 defect

| Type                                     | Data    | Description          |
|--|---------|----------------------|
| VSR/VCR<br>VSL/VCL<br>VSP/VCP<br>VSM/VSJ | 0x0 (0) | fixed                |
| VSH                                      | 0x0 (0) | no error             |
|  | 0x1 (1) | Filament 1 is defect |

#### Bit 4: Error – Filament 2 defect

| Type                                     | Data    | Description                           |
|--|---------|---------------------------------------|
| VSR/VCR<br>VSL/VCL<br>VSP/VCP<br>VSM/VSJ | 0x0 (0) | fixed                                 |
| VSH                                      | 0x0 (0) | no error                              |
|  | 0x1 (1) | Filament 2 (spare filament) is defect |

Bit 5: Error – Internal Communication

| Type | Data    | Description   |
|------|---------|---|
| all  | 0x0 (0) | no error  |
|      | 0x1 (1) | internal communication error of the transmitter electronics |

Bit 6: Error – EEPROM failure

| Type | Data    | Description       |
|------|---------|-------------------|
| all  | 0x0 (0) | no error          |
|      | 0x1 (1) | failure on EEPROM |

Bit 7: Error – Sensor defect/stacked out

| Type | Data    | Description   |
|------|---------|---|
| all  | 0x0 (0) | no error  |
|      | 0x1 (1) | sensor head is stacked out or sensor head is defect |

### 2.1.7 Syntax Error

| Module ID=IDM_6: Syntax Error    |  |   |             |                  |
|----------------------------------|--|---|-------------|------------------|
| Module Ident Number              | 0x00010000   |   |             |                  |
| Information                      | Contains syntax error information for the last executed command. |   |             |                  |
| Category                         | Input modules  |   |             |                  |
| Submodule ID=IDS_6: Syntax Error |  |   |             |                  |
| Submodule Ident Number           | 0x00000006   |   |             |                  |
| I&M 5 Supported                  | No   |   |             |                  |
| Cyclic Input Data                |  |   |             | Item consistency |
| Name                             | Data Type  | Display as Bits   | Subordinate | Length [Bytes]   |
| Syntax Error                     | OctetString  | Bit 2: Error - Sensor Switch Mode, Value mismatch<br>Bit 3: Error - GCF 1, Value mismatch<br>Bit 4: Error - GCF 2, Value mismatch<br>Bit 5: Error - Pressure Adjust, Value mismatch<br>Bit 6: Error - Command not supported<br>Bit 7: Error - Command invalid | No          | 1                |

#### Bit 2: Error – Sensor Switch Mode, Value mismatch

| Type                  | Data    | Description   |
|-----------------------|---------|---|
| VSP/VCP /VSI          | 0x0 (0) | fixed   |
| VSR/VCR               | 0x0 (0) | no error  |
| VSL/VCL<br>VSH<br>VSM | 0x1 (1) | The value in Data Sensor Switch Mode is wrong or out of range |

#### Bit 3: Error – GCF 1, Value mismatch

| Type                             | Data    | Description                                      |
|----------------------------------|---------|--|
| VSI                              | 0x0 (0) | fixed  |
| VSR/VCR                          | 0x0 (0) | no error   |
| VSL/VCL<br>VSP/VCP<br>VSM<br>VSH | 0x1 (1) | The value in Data GCF 1 is wrong or out of range |

#### Bit 4: Error – GCF 2, Value mismatch

| Type                          | Data    | Description                                      |
|-------------------------------|---------|--|
| VSR/VCR<br>VSL/VCL<br>VSP/VCP | 0x0 (0) | fixed  |
| VSH                           | 0x0 (0) | no error   |
| VSM/VSI                       | 0x1 (1) | The value in Data GCF 2 is wrong or out of range |

Bit 5: Error – Pressure Adjust, Value mismatch

| Type | Data    | Description   |
|------|---------|---|
| all  | 0x0 (0) | no error  |
|      | 0x1 (1) | The value in Data Pressure is wrong or out of range |

Bit 6: Error – Command not supported

| Type | Data    | Description           |
|------|---------|-----------------------|
| all  | 0x0 (0) | Command not supported |
|      | 0x1 (1) | no error              |

Bit 7: Error – Command invalid

| Type | Data    | Description                              |
|------|---------|--|
| all  | 0x0 (0) | no error                                 |
|      | 0x1 (1) | Command is invalid and can't be executed |

### 2.1.8 Command executed

| Module ID=IDM_7: Command executed    |  |                             |                             |                  |
|--------------------------------------|--|-----------------------------|-----------------------------|------------------|
| Module Ident Number                  | 0x00010000                                       |                             |                             |                  |
| Information                          | Contains the value of the last executed command. |                             |                             |                  |
| Category                             | Input modules                                    |                             |                             |                  |
| Submodule ID=IDS_7: Command executed |  |                             |                             |                  |
| Submodule Ident Number               | 0x00000007                                       |                             |                             |                  |
| I&M 5 Supported                      | <input type="checkbox"/> No                      |                             |                             |                  |
| Cyclic Input Data                    |  |                             |                             | Item consistency |
| Name                                 | Data Type  | Display as Bits             | Subordinate                 | Length [Bytes]   |
| Command executed                     | Unsigned8  | <input type="checkbox"/> No | <input type="checkbox"/> No |                  |

#### Command executed

| Type | Data | Description   |
|------|------|---|
| all  |      | Contains the value of the last executed command that was written in Command |

## 2.2 Output Modules

### 2.2.1 Adjust Value Pressure

| Module ID=IDM_8: Adjust Value Pressure    |                                      |                 |             |                  |
|---|--------------------------------------|-----------------|-------------|------------------|
| Module Ident Number                       | 0x00000004                           |                 |             |                  |
| Information                               | Reference pressure for readjustment. |                 |             |                  |
| Category                                  | Output modules                       |                 |             |                  |
| Submodule ID=IDS_8: Adjust Value Pressure |                                      |                 |             |                  |
| Submodule Ident Number                    | 0x00000008                           |                 |             |                  |
| I&M 5 Supported                           | No                                   |                 |             |                  |
| Cyclic Output Data                        |                                      |                 |             | Item consistency |
| Name                                      | Data Type                            | Display as Bits | Subordinate | Length [Bytes]   |
| Adjust Value Pressure                     | Float32                              | No              | No          |                  |

#### Adjust Value Pressure

| Type | Data | Description                             |
|------|------|---|
| all  | Var. | Contains a Pressure value as 32bit Real |



### 2.2.2 Set Data GCF 1

| Module ID=IDM_9: Set Data GCF 1    |  |                                 |                                 |                  |
|------------------------------------|--|---------------------------------|---------------------------------|------------------|
| Module Ident Number                | 0x00000002   |                                 |                                 |                  |
| Information                        | New value for the Gas Correction Factor (GCF), used for Pirani sensor (ignored if sensor not installed). |                                 |                                 |                  |
| Category                           | Output modules   |                                 |                                 |                  |
| Submodule ID=IDS_9: Set Data GCF 1 |  |                                 |                                 |                  |
| Submodule Ident Number             | 0x00000009   |                                 |                                 |                  |
| I&M 5 Supported                    | <input type="text" value="No"/>  |                                 |                                 |                  |
| Cyclic Output Data                 |  |                                 |                                 | Item consistency |
| Name                               | Data Type  | Display as Bits                 | Subordinate                     | Length [Bytes]   |
| Set Data GCF 1                     | Unsigned16   | <input type="text" value="No"/> | <input type="text" value="No"/> |                  |

#### Set Data GCF 1

| Type  | Data                          | Description                                     |
|---|-------------------------------|---|
| VSI   |                               | all data values will be ignored                 |
| VSR/VCR<br>VSL/VCL<br>VSP/VCP<br>VSM<br>VSH | 0x0014 – 0x0320<br>(20 – 800) | New value for the GCF 1, used for Pirani sensor |

### 2.2.3 Set Data GCF 2

| Module ID=IDM_10: Set Data GCF 2    |  |                                 |                                 |                  |
|-------------------------------------|--|---------------------------------|---------------------------------|------------------|
| Module Ident Number                 | 0x00000002   |                                 |                                 |                  |
| Information                         | New value for the Gas Correction Factor (GCF), used for hot cathode or cold cathode (ignored if sensor not installed). |                                 |                                 |                  |
| Category                            | Output modules   |                                 |                                 |                  |
| Submodule ID=IDS_10: Set Data GCF 2 |  |                                 |                                 |                  |
| Submodule Ident Number              | 0x0000000A   |                                 |                                 |                  |
| I&M 5 Supported                     | <input type="text" value="No"/>  |                                 |                                 |                  |
| Cyclic Output Data                  |  |                                 |                                 | Item consistency |
| Name                                | Data Type  | Display as Bits                 | Subordinate                     | Length [Bytes]   |
| Set Data GCF 2                      | Unsigned16   | <input type="text" value="No"/> | <input type="text" value="No"/> |                  |

#### Set Data GCF 2

| Type                          | Data                          | Description  |
|-------------------------------|-------------------------------|--|
| VSR/VCR<br>VSL/VCL<br>VSP/VCP |                               | all data values will be ignored                                |
| VSH<br>VSM/VS1                | 0x0014 – 0x0320<br>(20 – 800) | New value for the GCF 2, used for hot cathode and cold cathode |

## 2.2.4 Set Data Sensor Switch Mode

| Module ID=IDM_11: Set Data Sensor Switch Mode    |   |                             |                             |                  |
|--|---|-----------------------------|-----------------------------|------------------|
| Module Ident Number                              | 0x00000001  |                             |                             |                  |
| Information                                      | The set value determines the mode of the sensor transition. |                             |                             |                  |
| Category   | Output modules  |                             |                             |                  |
| Submodule ID=IDS_11: Set Data Sensor Switch Mode |   |                             |                             |                  |
| Submodule Ident Number                           | 0x0000000B  |                             |                             |                  |
| I&M 5 Supported                                  | <input type="checkbox"/> No                                 |                             |                             |                  |
| Cyclic Output Data                               |   |                             |                             | Item consistency |
| Name   | Data Type   | Display as Bits             | Subordinate                 | Length [Bytes]   |
| Set Data Sensor Switch Mode                      | Unsigned8   | <input type="checkbox"/> No | <input type="checkbox"/> No |                  |

### Set Data Sensor Switch Mode

| Type        | Data    | Description   |
|-------------|---------|---|
| VSR/VCR     | 0x0 (0) | no transition, direct switch at 1 mbar                          |
| VSL/VCL     | 0x1 (1) | continuous transition between 5 mbar and 15 mbar (default)      |
| VSP/VCP/VSI | -       | VSP/VCP/VSI has no transition                                   |
| VSM         | 0x0 (0) | no transition, direct switch at 1E-3 mbar                       |
|             | 0x1 (1) | continuous transition between 1E-3 mbar and 2E-3 mbar (default) |
| VSH         | 0x0 (0) | no transition, direct switch at 4E-4 mbar                       |
|             | 0x1 (1) | continuous transition between 1E-3 mbar and 2E-3 mbar (default) |
|             | 0x2 (2) | continuous transition between 2E-3 mbar and 5E-3 mbar           |

### 2.2.5 Command

| Module ID=IDM_12: Command    |                         |                 |             |                  |
|------------------------------|-------------------------|-----------------|-------------|------------------|
| Module Ident Number          | 0x00000001              |                 |             |                  |
| Information                  | Command to be executed. |                 |             |                  |
| Category                     | Output modules          |                 |             |                  |
| Submodule ID=IDS_12: Command |                         |                 |             |                  |
| Submodule Ident Number       | 0x0000000C              |                 |             |                  |
| I&M 5 Supported              | No                      |                 |             |                  |
| Cyclic Output Data           |                         |                 |             | Item consistency |
| Name                         | Data Type               | Display as Bits | Subordinate | Length [Bytes]   |
| Command                      | Unsigned8               | No              | No          |                  |

#### Command

| Type    | Data      | Description                      |
|---------|-----------|----------------------------------|
| all     | 0x00 (0)  | Zero Command                     |
|         | 0x01 (1)  | Adjust High Vacuum               |
|         | 0x02 (2)  | Adjust Atmospheric Pressure      |
|         | 0x03 (3)  | Set Gas Correction Factors (GCF) |
| VSL/VCL | 0x04 (4)  | Adjust Relative Pressure         |
|         | 0x39 (57) | Set Sensor Switch Mode           |
| VSR/VCR | 0x39 (57) | Set Sensor Switch Mode           |
| VSP/VCP | -         | no special VSP/VCP commands      |
| VSM/VS1 | 0x46 (70) | Activate Cold Cathode            |
|         | 0x47 (71) | Deactivate Cold Cathode          |
| VSM     | 0x4D (77) | Set Sensor Switch Mode           |
| VSH     | 0x50 (80) | Active Hot Cathode               |
|         | 0x51 (81) | Deactivate Hot Cathode           |
|         | 0x55 (85) | Activate DeGas                   |
|         | 0x56 (86) | Deactivate DeGas                 |
|         | 0x57 (87) | Set Sensor Switch Mode           |

### 3 Commands

#### 3.1 Command List

All commands are separated into two groups:

- General Commands, that are valid for all Smartline transmitter
- Commands, that are valid only for a specific transmitter

Rules for commands:

- Each command will be executed only once.
- Always the last executed command will be written into Command executed

| Type    | Data      | Name                             |
|---------|-----------|----------------------------------|
| all     | 0x00 (0)  | Zero Command                     |
|         | 0x01 (1)  | Adjust High Vacuum               |
|         | 0x02 (2)  | Adjust Atmospheric Pressure      |
|         | 0x03 (3)  | Set Gas Correction Factors (GCF) |
| VSL/VCL | 0x04 (4)  | Adjust Relative Pressure         |
|         | 0x39 (57) | Set Sensor Switch Mode           |
| VSR/VCR | 0x39 (57) | Set Sensor Switch Mode           |
| VSP/VCP | -         | No special VSP commands          |
| VSM/VSJ | 0x46 (70) | Activate Cold Cathode            |
|         | 0x47 (71) | Deactivate Cold Cathode          |
| VSM     | 0x4D (77) | Set Sensor Switch Mode           |
| VSH     | 0x50 (80) | Active Hot Cathode               |
|         | 0x51 (81) | Deactivate Hot Cathode           |
|         | 0x55 (85) | Activate DeGas                   |
|         | 0x56 (86) | Deactivate DeGas                 |
|         | 0x57 (87) | Set Sensor Switch Mode           |

### 3.2 General Command Chain for all Smartline Transmitter

#### 3.2.1 0x00 (0) – Zero Command

| Type | Chain | Name         | Data     | Description            |
|------|-------|--------------|----------|------------------------|
| all  | 1.    | Zero Command | 0x00 (0) | clear Command executed |

#### 3.2.2 0x01 (1) – Adjust High Vacuum

| Type | Chain | Name                  | Data           | Description                               |
|------|-------|-----------------------|----------------|---|
| all  | 1.    | Zero Command          | 0x00 (0)       | mandatory if Command executed is 0x01 (1) |
|      | 2.    | Adjust Value Pressure | 0x00000000 (0) | mandatory                                 |
|      | 3.    | Command               | 0x01 (1)       | adjust high vacuum                        |

#### 3.2.3 0x02 (2) – Adjust Atmospheric Pressure

| Type                     | Chain | Name                  | Data              | Description                               |
|--------------------------|-------|-----------------------|-------------------|---|
| VSL/VCL<br>VSR/VCR       | 1.    | Zero Command          | 0x00 (0)          | mandatory if Command executed is 0x02 (2) |
|                          | 2.    | Adjust Value Pressure | variable          | actual atmospheric pressure               |
|                          | 3.    | Command               | 0x02 (2)          | adjust atmospheric pressure               |
| VSP<br>VCP<br>VSM<br>VSH | 1.    | Zero Command          | 0x00 (0)          | mandatory if Command executed is 0x02 (2) |
|                          | 2.    | Adjust Value Pressure | 0x447A0000 (1000) | 1000 mbar                                 |
|                          | 3.    | Command               | 0x02 (2)          | adjust atmospheric pressure               |

#### 3.2.4 0x03 (3) – Set Gas Correction Factors

| Type                             | Chain | Name           | Data                       | Description   |
|----------------------------------|-------|----------------|----------------------------|---|
| VSL/VCL<br>VSR/VCR<br>VSP<br>VCP | 1.    | Zero Command   | 0x00 (0)                   | mandatory if Command executed is 0x03 (3)                       |
|                                  | 2.    | Set Data GCF 1 | 0x0014 (20) – 0x0320 (800) | Gas Correction Factor for Pirani                                |
|                                  | 3.    | Set Data GCF 2 | d.c.                       | will be ignored, value  |
|                                  | 4.    | Command        | 0x03 (3)                   | set GCF factors   |
| VSM<br>VSH                       | 1.    | Zero Command   | 0x00 (0)                   | mandatory if Command executed is 0x03 (3)                       |
|                                  | 2.    | Set Data GCF 1 | 0x0014 (20) – 0x0320 (800) | Gas Correction Factor for Pirani                                |
|                                  | 3.    | Set Data GCF 2 | 0x0014 (20) – 0x0320 (800) | Gas Correction Factor for Hot Cathode (BA) or Cold Cathode (CC) |
|                                  | 4.    | Command        | 0x03 (3)                   | set GCF factors   |
| VSI                              | 1.    | Zero Command   | 0x00 (0)                   | mandatory if Command executed is 0x03 (3)                       |
|                                  | 2.    | Set Data GCF 1 | d.c.                       | will be ignored, value  |
|                                  | 3.    | Set Data GCF 2 | 0x0014 (20) – 0x0320 (800) | Gas Correction Factor for Cold Cathode (CC)                     |
|                                  | 4.    | Command        | 0x03 (3)                   | set GCF factors   |

### 3.3 VSL/VCL Commands

#### 3.3.1 0x04 (4) – Adjust Relative Pressure

| Chain | Name          | Data     | Description                               |
|-------|---------------|----------|---|
| 1.    | Zero Command  | 0x00 (0) | mandatory if Command executed is 0x04 (4) |
| 2.    | Data Pressure | d.c.     | Value will be ignored                     |
| 3.    | Command       | 0x04 (4) | adjust relative pressure to zero          |

#### 3.3.2 0x39 (57) – Set Sensor Switch Mode

| Chain | Name                        | Data               | Description                                |
|-------|-----------------------------|--------------------|--|
| 1.    | Zero Command                | 0x00 (0)           | mandatory if Command executed is 0x39 (57) |
| 2.    | Set Data Sensor Switch Mode | 0x0 (0) or 0x1 (1) |  |
| 3.    | Command                     | 0x39 (57)          | set sensor switch mode                     |

### 3.4 VSR/VCR Commands

#### 3.4.1 0x39 (57) – Set Sensor Switch Mode

| Chain | Name                        | Data               | Description                                |
|-------|-----------------------------|--------------------|--|
| 1.    | Zero Command                | 0x00 (0)           | mandatory if Command executed is 0x39 (57) |
| 2.    | Set Data Sensor Switch Mode | 0x0 (0) or 0x1 (1) |  |
| 3.    | Command                     | 0x39 (57)          | set sensor switch mode                     |

### 3.5 VSM/VSJ Commands

#### 3.5.1 0x46 (70) – Activate Cold Cathode

| Chain | Name         | Data      | Description                                |
|-------|--------------|-----------|--|
| 1.    | Zero Command | 0x00 (0)  | mandatory if Command executed is 0x46 (70) |
| 2.    | Command      | 0x46 (70) | activate cold cathode                      |

#### 3.5.2 0x47 (71) – Deactivate Cold Cathode

| Chain | Name         | Data      | Description                                |
|-------|--------------|-----------|--|
| 1.    | Zero Command | 0x00 (0)  | mandatory if Command executed is 0x47 (71) |
| 2.    | Command      | 0x47 (71) | deactivate cold cathode                    |

### 3.5.3 0x4D (77) – Set Sensor Switch Mode (VSM only)

| Chain | Name                        | Data               | Description                                |
|-------|-----------------------------|--------------------|--|
| 1.    | Zero Command                | 0x00 (0)           | mandatory if Command executed is 0x4D (77) |
| 2.    | Set Data Sensor Switch Mode | 0x0 (0) or 0x1 (1) |  |
| 3.    | Command                     | 0x4D (77)          | set sensor switch mode                     |

## 3.6 VSH Commands

### 3.6.1 0x50 (80) – Activate Hot Cathode

| Chain | Name         | Data      | Description                                |
|-------|--------------|-----------|--|
| 1.    | Zero Command | 0x00 (0)  | mandatory if Command executed is 0x50 (80) |
| 2.    | Command      | 0x50 (80) | activate hot cathode                       |

### 3.6.2 0x51 (81) – Deactivate Hot Cathode

| Chain | Name         | Data      | Description                                |
|-------|--------------|-----------|--|
| 1.    | Zero Command | 0x00 (0)  | mandatory if Command executed is 0x51 (81) |
| 2.    | Command      | 0x51 (81) | deactivate hot cathode                     |

### 3.6.3 0x55 (85) – Activate DeGas

| Chain | Name         | Data      | Description                                |
|-------|--------------|-----------|--|
| 1.    | Zero Command | 0x00 (0)  | mandatory if Command executed is 0x55 (85) |
| 2.    | Command      | 0x55 (85) | activate DeGas                             |

### 3.6.4 0x56 (86) – Deactivate DeGas

| Chain | Name         | Data      | Description                                |
|-------|--------------|-----------|--|
| 1.    | Zero Command | 0x00 (0)  | mandatory if Command executed is 0x56 (86) |
| 2.    | Command      | 0x56 (86) | deactivate DeGas                           |

### 3.6.5 0x57 (87) – Set Sensor Switch Mode

| Chain | Name                        | Data                        | Description                                |
|-------|-----------------------------|-----------------------------|--|
| 1.    | Zero Command                | 0x00 (0)                    | mandatory if Command executed is 0x57 (87) |
| 2.    | Set Data Sensor Switch Mode | 0x0 (0), 0x1 (1) or 0x2 (2) | Data value depends on transmitter          |
| 3.    | Command                     | 0x57 (87)                   | set sensor switch mode                     |



### 3.7 Acyclic Data Exchange

Using acyclic data records, the limited range of commands in cyclic data communication to configure a gauge is now extended to all commands available (see the corresponding transmitter manual). For sending and receiving acyclic data records a simplified version of the Thyracont communication protocol V2 needs to be applied. The protocol documentation with more information regarding the commands, as well as a demo on how to use the acyclic data exchange with our PROFINET gauges, can be found on our homepage (see also chapter [5](#)). The following table shows the parameters to apply in a project planning tool for using the acyclic data exchange:

|            | Write Record                                 | Read Record  |
|------------|--|--|
| ID         | <a href="#">IDM_1</a> (Actual Pressure)      | <a href="#">IDM_1</a> (Actual Pressure)              |
| INDEX      | 1  | 1  |
| LEN / MLEN | Number of bytes to be transmitted (max. 104) | 110 (max. number of bytes allowed to be transmitted) |
| RECORD     | See Thyracont communication protocol V2      | See Thyracont communication protocol V2              |

In general, each command (independent of writing data to, or reading data from the gauge) needs to be sent via "Write Record". The response of the device can then be read out via "Read Record" within **6 seconds**. After this time, the response will be a PROFINET timeout error.

In case of configuration commands, it is recommended to evaluate the device response for success or error.

## 4 Device Diagnostics

### 4.1 Manufacturer Specific Channel Diagnosis

| Value (Hex) | Content   |
|-------------|---|
| 0x0013      | Internal communication error<br>The internal communication could not be reset automatically. The device must be switched off and back on again. If this warning occurs frequently, please inform the service. |
| 0x001B      | Sensor error<br>The sensor was stacked out, or is defect and must be exchanged.   |

## 5 Additional Files (GSDML, Documentation)

You can download the GSDML files and related documents (transmitter, communication protocol) from the Thyracont webpage:

1. Open Thyracont webpage <https://thyracont-vacuum.com/>
2. Browse to Support → [Download Center](#)
3. Section “Smartline - Intelligent Vacuum Measurement”
  - a. Transmitter manuals (PDF)
  - b. GSDML files (ZIP)
4. Section “Software and Apps, protocols, drivers and other”
  - a. Communication manuals (PDF)

## 6 Document History

| Date       | Version | Comment   | Script-Revision Number | Firmware Version     |
|------------|---------|---|------------------------|----------------------|
| 2019-01-09 | 1.0     | Initial Release v1.0  | V 3.1.2_0615_1         | 3.1.3                |
| 2020-02-17 | 1.1     | VSL PN communication manual added   | V 3.1.3                | 3.1.3                |
| 2021-06-25 | 1.2     | VCL, VCR added  | V 3.1.3                | 3.1.3                |
| 2021-xx-xx | 1.3     | Fixes   | V 3.1.3                | 3.1.3                |
| 2023-02-22 | 2.0     | Removed parts of old PROFINET interface;<br>Added parts for new PROFINET interface<br>and Acyclic Data Exchange | -                      | 1.0.0.1<br>(5.4.0.6) |

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