



**neptronic®**

# **SKE4 Steam Humidifier**

## **Modbus Communication Module User Guide**



## Introduction

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The SKE4 Modbus Communication Module User Guide provides information for using Neptronic<sup>®</sup> communication feature. The controller uses Modbus communication protocol over serial line in the RTU mode and provides a Modbus network interface between client devices and Neptronic SKE4 devices.

The SKE4 Modbus Guide assumes that you are familiar with Modbus terminology.

The following are the requirements for Modbus:

- **Data Model.** The SKE4 Steam Humidifier Modbus server data model uses only the Modbus Registers table.
- **Register Address:**
  - As per protocol base (base 0); for PLC add 1 to protocol base.
  - As per holding register (base 400001).



*Note: Ensure that the Modbus communication software used does not have a limit on the range of the register addresses that can be viewed and supports 6-digit holding registers.*

- **Function Codes.** The SKE4 Steam Humidifier Modbus server supports a limited function codes subset comprising:
  - Read Holding Registers (0x03)
  - Write Single Register (0x06)
  - Write Multiple Registers (0x10)
- **Exception Responses.** The SKE4 Steam Humidifier Modbus server supports the following exception codes:
  - Illegal data address
  - Illegal data value
  - Slave device busy
- **Serial Line.** The SKE4 Steam Humidifier Modbus over serial line uses RTU transmission mode over a two-wire configuration RS485 (EIA/TIA-485 standard) physical layer.
  - The physical layer can use fixed baud rate selection or automatic baud rate detection (default) as per the **Modbus Auto Baud Rate** device menu item or holding register index 1.
  - The supported baud rates are 9600, 19200, 38400, and 57600.
  - The physical layer also supports variable parity control and stop bit configuration as per the **Modbus Comport Config** device menu item or holding register index 2.
  - In auto baud rate configuration, if the device detects only consecutive bad frames (2 or more) for one second with any given baud rate, it will reinitialize itself to the next baud rate.
- **Addressing.** The SKE4 Steam Humidifier device only answers at the following address:
  - The device's unique address (1 to 246) that can be set through the device menu or through holding register index 0.

# Modbus Registers

## Table Glossary

| Name       | Description  | Name  | Description                                       |
|------------|--|-------|---|
| W          | Writable Register  | ASCII | For registers containing ASCII (8-bit) characters |
| RO         | Read Only Register   | MSB   | Most Significant Byte                             |
| Unsigned   | For range of values from 0 to 65,535, unless otherwise specified       | LSB   | Least Significant Byte                            |
| Signed     | For range of values from -32,768 to 32,767, unless otherwise specified | MSW   | Most Significant Word                             |
| Bit String | For registers with multiple values using bit mask (example, flags)     | LSW   | Least Significant Word                            |

## Modbus Registers Table

| Protocol Base | Holding Register | Description                                   | Data Type                    | Units, Limits, State Texts   | Writable | Default Value              |
|---------------|------------------|---|------------------------------|--|----------|----------------------------|
| 0             | 400001           | Modbus Address and Product Type               | Unsigned                     | MSB = Product type, not writable<br>LSB = Modbus Address (1 to 247), writable                    | W        |                            |
| 1             | 400002           | Device Baud Rate                              | Unsigned<br><i>Scale 100</i> | 0, 9600, 19200, 38400, and 57600, 0 = Auto Baud Rate Detection Value/100 (e.g. 38400 baud = 384) | W        | 19200                      |
| 2             | 400003           | Modbus Slave Communication Port Configuration | Unsigned                     | 0 = No parity, 2 Stop bits<br>1 = Even parity, 1 Stop bit<br>2 = Odd parity, 1 Stop bit          | W        | No parity,<br>2 Stops bits |
| 3             | 400004           | Product Name (characters 8 & 7)               | ASCII                        | MSB = char 6, LSB = char 7   | W        |                            |
| 4             | 400005           | Product Name (characters 6 & 5)               | ASCII                        | MSB = char 4, LSB = char 5   | W        |                            |
| 5             | 400006           | Product Name (characters 4 & 3)               | ASCII                        | MSB = char 2, LSB = char 3   | W        |                            |
| 6             | 400007           | Product Name (characters 2 & 1)               | ASCII                        | MSB = char 0, LSB = char 1   | W        |                            |

| Protocol Base | Holding Register | Description                                       | Data Type              | Units, Limits, State Texts  | Writable | Default Value |
|---------------|------------------|---|------------------------|---|----------|---------------|
| 7             | 400008           | Product Actual Firmware Version (in Integer x100) | Unsigned<br>Scale 100  | 1 to 65535 (e.g. 100)   | RO       |               |
| 8             | 400009           | Product Actual EEPROM Version (in Integer x100)   | Unsigned<br>Scale 100  | 1 to 65535 (e.g. 100)   | RO       |               |
| 2000          | 402001           | Control Signal                                    | Unsigned<br>Scale 1000 | Units: Volt (V), Range: 0V to 15V<br>Value x 1000 (e.g. 2V = 2000)  | RO       | 0V            |
| 2001          | 402002           | Room RH Signal                                    | Unsigned<br>Scale 1000 | Units: Volt (V), Range: 0V to 15V<br>Value x 1000 (e.g. 2V = 2000)  | RO       | 0V            |
| 2002          | 402003           | Supply RH Signal                                  | Unsigned<br>Scale 1000 | Units: Volt (V), Range: 0V to 15V<br>Value x 1000 (e.g. 2V = 2000)  | RO       | 0V            |
| 2003          | 402004           | Water Level Signal                                | Unsigned<br>Scale 1    | Units: Hz, Range: 0 to 30000Hz<br>Value x 1 (e.g. 10Hz = 10)        | RO       | 0Hz           |
| 2004          | 402005           | Water Level Low Signal                            | Unsigned<br>Scale 1000 | Unit: Volt (V), Range: 0V to 10V<br>Value x 1000 (e.g. 2V = 2000)   | RO       | 0V            |
| 2005          | 402006           | Water Level High Signal                           | Unsigned<br>Scale 1000 | Unit: Volt (V), Range: 0V to 10V<br>Value x 1000 (e.g. 2V = 2000)   | RO       | 0V            |
| 2006          | 402007           | Water Temperature Signal                          | Unsigned<br>Scale 1000 | Unit: Volt (V), Range: 0V to 10V<br>Value x 1000 (e.g. 2V = 2000)   | RO       | 0V            |
| 2007          | 402008           | Foam Signal                                       | Unsigned<br>Scale 1000 | Unit: Volt (V), Range: 0V to 10V<br>Value x 1000 (e.g. 2V = 2000)   | RO       | 0V            |
| 2008          | 402009           | SSR Temperature Signal                            | Unsigned<br>Scale 1000 | Unit: Volt (V), Range: 0V to 10V<br>Value x 1000 (e.g. 2V = 2000)   | RO       | 0V            |
| 2009          | 402010           | Cabinet Temperature Signal                        | Unsigned<br>Scale 1000 | Unit: Volt (V), Range: 0V to 10V<br>Value x 1000 (e.g. 2V = 2000)   | RO       | 0V            |
| 2010          | 402011           | Current Sensor 1 Signal                           | Unsigned<br>Scale 1000 | Unit: Volt (V), Range: 0V to 3.30V<br>Value x 1000 (e.g. 1V = 1000) | RO       | 0V            |

| Protocol Base | Holding Register | Description                  | Data Type              | Units, Limits, State Texts   | Writable | Default Value |
|---------------|------------------|------------------------------|------------------------|--|----------|---------------|
| 2011          | 402012           | Current Sensor 2 Signal      | Unsigned<br>Scale 1000 | Unit: Volt (V), Range: 0V to 3.30V<br>Value x 1000 (e.g. 1V = 1000)      | RO       | 0V            |
| 2012          | 402013           | Board Temperature Signal     | Unsigned<br>Scale 1000 | Unit: Volt (V), Range: 0V to 10V<br>Value x 1000 (e.g. 2V = 2000)        | RO       | 0V            |
| 2013          | 402014           | Main Power Supply            | Unsigned<br>Scale 10   | Unit: Volt (V), Range: 0V to 40V<br>Value x 10 (e.g. 2V = 20)            | RO       | 0V            |
| 4000          | 404001           | Power Output Feedback Signal | Unsigned<br>Scale 1000 | Unit: Volt (V), Range: 0V to 10V<br>Value x 1000 (e.g. 2V = 2000)        | RO       | 0V            |
| 4001          | 404002           | Heater SSR Stage             | Unsigned<br>Scale 100  | Unit: %, Range: 0% to 100%<br>Value x 100 (e.g. 10% = 1000)              | RO       | 0%            |
| 6000          | 406001           | Control Input                | Unsigned<br>Scale 100  | Unit: %, Range: 0% to 100%<br>Value x 100 (e.g. 10% = 1000)              | RO       | 0%            |
| 6001          | 406002           | Control Min                  | Unsigned<br>Scale 100  | Unit: %, Range: 0% to 100%<br>Value x 100 (e.g. 10% = 1000)              | W        | 0%            |
| 6002          | 406003           | Control Max                  | Unsigned<br>Scale 100  | Unit: %, Range: 0% to 100%<br>Value x 100 (e.g. 10% = 1000)              | W        | 0%            |
| 6003          | 406004           | Control Bias                 | Signed<br>Scale 100    | Unit: %, Range: -10% to 10%<br>Value x 100 (e.g. 10% = 1000)             | W        | 0%            |
| 6004          | 406005           | Room RH                      | Unsigned<br>Scale 100  | Unit: % RH, Range: 0% RH to 100% RH<br>Value x 100 (e.g. 10% RH = 1000)  | RO       | 0% RH         |
| 6005          | 406006           | Room RH Min                  | Unsigned<br>Scale 100  | Unit: % RH, Range: 0% RH to 100% RH<br>Value x 100 (e.g. 10% RH = 1000)  | W        | 0% RH         |
| 6006          | 406007           | Room RH Max                  | Unsigned<br>Scale 100  | Unit: % RH, Range: 0% RH to 100% RH<br>Value x 100 (e.g. 10% RH = 1000)  | W        | 0% RH         |
| 6007          | 406008           | Room RH Bias                 | Unsigned<br>Scale 100  | Unit: % RH, Range: -10% RH to 10% RH<br>Value x 100 (e.g. 10% RH = 1000) | W        | 0% RH         |

| Protocol Base | Holding Register | Description                | Data Type              | Units, Limits, State Texts   | Writable | Default Value |
|---------------|------------------|----------------------------|------------------------|--|----------|---------------|
| 6008          | 406009           | Supply High Limit RH       | Unsigned<br>Scale 100  | Unit: % RH, Range: 0% RH to 100% RH<br>Value x 100 (e.g. 10% RH = 1000)                            | RO       | 0% RH         |
| 6009          | 406010           | Supply High Limit RH Min   | Unsigned<br>Scale 100  | Unit: % RH, Range: 0% RH to 100% RH<br>Value x 100 (e.g. 10% RH = 1000)                            | W        | 0% RH         |
| 6010          | 406011           | Supply High Limit RH Max   | Unsigned<br>Scale 100  | Unit: % RH, Range: 0% RH to 100% RH<br>Value x 100 (e.g. 10% RH = 1000)                            | W        | 0% RH         |
| 6011          | 406012           | Supply High Limit RH Bias  | Signed<br>Scale 100    | Unit: %, Range: -10% RH to 10% RH<br>Value x 100 (e.g. 10% RH = 1000)                              | W        | 0% RH         |
| 6012          | 406013           | Water Temperature          | Unsigned<br>Scale 100  | Unit: °C/°F, Range: 0°C to 125°C or 32°F to 257°F<br>Value x 100 (e.g. 5°C = 500 or 10°F = 1000)   | RO       | 50°C or 122°F |
| 6013          | 406014           | Water Temperature Bias     | Signed<br>Scale 100    | Unit: °C/°F, Range: -10°C to 10°C or -18°F to 18°F<br>Value x 100 (e.g. 5°C = 500 or 14°F = 1400)  | RO       | 0°C or 32°F   |
| 6014          | 406015           | SSR Temperature            | Signed<br>Scale 100    | Unit: °C/°F, Range: -20°C to 100°C or -4°F to 212°F<br>Value x 100 (e.g. 5°C = 500 or 10°F = 1000) | RO       | 0°C or 32°F   |
| 6015          | 406016           | Cabinet Temperature        | Signed<br>Scale 100    | Unit: °C/°F, Range: -20°C to 100°C or -4°F to 212°F<br>Value x 100 (e.g. 5°C = 500 or 10°F = 1000) | RO       | 0°C or 32°F   |
| 6016          | 406017           | Current Sensor 1 (0)       | Unsigned<br>Scale 100  | Unit: Amps (A), Range: 0A to 150A<br>Value x 100 (e.g. 10A = 1000)                                 | RO       | 0A            |
| 6017          | 406018           | Current Sensor 1 (1)       |                        | Unit: Amps (A), Range: 0A to 150A  |          |               |
| 6018          | 406019           | Current Sensor 2 (0)       | Unsigned<br>Scale 100  | Unit: Amps (A), Range: 0A to 150A<br>Value x 100 (e.g. 10A = 1000)                                 | RO       | 0A            |
| 6019          | 406020           | Current Sensor 2 (1)       |                        | Unit: Amps (A), Range: 0A to 150A  |          |               |
| 6020          | 406021           | Board Temperature          | Unsigned<br>Scale 100  | Unit: °C/°F, Range: 0°C to 100°C or 32°F to 212°F<br>Value x 100 (e.g. 5°C = 500 or 32°F = 3200)   | RO       | 0°C or 32°F   |
| 6021          | 406022           | Power Output Feedback Bias | Unsigned<br>Scale 1000 | Unit: V, Range: -1V to 1V<br>Value x 100 (e.g. 10V = 1000)   | W        | 0V            |

| Protocol Base | Holding Register | Description                      | Data Type              | Units, Limits, State Texts  | Writable | Default Value |
|---------------|------------------|----------------------------------|------------------------|---|----------|---------------|
| 6022          | 406023           | Power Output Feedback Min        | Unsigned<br>Scale 1000 | Unit: V, Range: 0V to 10V<br>Value x 100 (e.g. 10V = 1000)              | W        | 0V            |
| 6023          | 406024           | Power Output Feedback Max        | Unsigned<br>Scale 1000 | Unit: V, Range: 0V to 10V<br>Value x 100 (e.g. 10V = 1000)              | W        | 0V            |
| 6024          | 406025           | Power Output Feedback            | Unsigned<br>Scale 100  | Unit: %, Range: 0% to 100%<br>Value x 100 (e.g. 10% = 1000)             | RO       | 0%            |
| 6025          | 406026           | Water Level                      | Unsigned<br>Scale 10   | Unit: %, Range: 0% to 120%<br>Value x 10 (e.g. 10% = 100)               | RO       | 78%           |
| 6026          | 406027           | Water Probe Low Pos Reading      | Unsigned<br>Scale 1    | Unit: Hz, Range: 0 to 30000 Hz<br>Value x 1 (e.g. 1 Hz = 1)             | RO       | 30000Hz       |
| 6027          | 406028           | Water Probe High Pos Reading     | Unsigned<br>Scale 1    | Unit: Hz, Range: 0 to 30000 Hz<br>Value x 1 (e.g. 1 Hz = 1)             | RO       | 30000Hz       |
| 6028          | 406029           | Water Probe Abs Low Pos Reading  | Unsigned<br>Scale 1    | Unit: Hz, Range: 0 to 30000 Hz<br>Value x 1 (e.g. 1 Hz = 1)             | RO       | 30000Hz       |
| 6029          | 406030           | Water Probe Abs High Pos Reading | Unsigned<br>Scale 1    | Unit: Hz, Range: 0 to 30000 Hz<br>Value x 1 (e.g. 1 Hz = 1)             | RO       | 30000Hz       |
| 6030          | 406031           | Room RH Network Reading          | Unsigned<br>Scale 100  | Unit: % RH, Range: 0% RH to 100% RH<br>Value x 100 (e.g. 10% RH = 1000) | RO       | 0% RH         |
| 6031          | 406032           | Room RH Setpoint                 | Unsigned<br>Scale 100  | Unit: % RH, Range: 0% RH to 100% RH<br>Value x 100 (e.g. 10% RH = 1000) | W        | 40% RH        |
| 6032          | 406033           | Room RH Unoccupied Setpoint      | Unsigned<br>Scale 100  | Unit: % RH, Range: 0% RH to 100% RH<br>Value x 100 (e.g. 10% RH = 1000) | W        | 30% RH        |
| 6033          | 406034           | Room RH Vacant Setpoint          | Unsigned<br>Scale 100  | Unit: % RH, Range: 0% RH to 100% RH<br>Value x 100 (e.g. 10% RH = 1000) | W        | 20% RH        |
| 6034          | 406035           | Room Demand Proportional Gain    | Unsigned<br>Scale 10   | No Unit, Range: 1 to 200<br>Value x 10 (e.g. 10 = 100)                  | W        | 28.5          |



| Protocol Base | Holding Register | Description                         | Data Type             | Units, Limits, State Texts   | Writable | Default Value |
|---------------|------------------|-------------------------------------|-----------------------|--|----------|---------------|
| 6035          | 406036           | Room Demand Integral Time           | Unsigned<br>Scale 10  | Unit: Seconds (sec), Range: 0 to 900 sec<br>Value x 10 (e.g. 10 sec = 100) | W        | 15 sec        |
| 6036          | 406037           | Room Demand Derivative Time         | Unsigned<br>Scale 10  | Unit: Seconds (sec), Range: 0 to 60 sec<br>Value x 10 (e.g. 10 sec = 100)  | W        | 0 sec         |
| 6037          | 406038           | Room Demand                         | Unsigned<br>Scale 100 | Unit: % RH, Range: 0% RH to 100% RH<br>Value x 100 (e.g. 10% RH = 1000)    | RO       | 0% RH         |
| 6038          | 406039           | Room Demand Proportional Band       | Unsigned<br>Scale 10  | Unit: %, Range: 1% to 100%<br>Value x 100 (e.g. 10% = 100)                 | RO       | 5%            |
| 6039          | 406040           | Supply High Limit Network Reading   | Unsigned<br>Scale 100 | Unit: % RH, Range: 0% RH to 100% RH<br>Value x 100 (e.g. 10% RH = 1000)    | W        | 0% RH         |
| 6040          | 406041           | Supply High Limit Setpoint          | Unsigned<br>Scale 100 | Unit: % RH, Range: 0% RH to 100% RH<br>Value x 100 (e.g. 10% RH = 1000)    | W        | 80% RH        |
| 6041          | 406042           | Supply High Limit Proportional Gain | Unsigned<br>Scale 10  | No Unit, Range: 1 to 200<br>Value x 10 (e.g. 10 = 100)                     | W        | 28.5          |
| 6042          | 406043           | Supply High Limit Integral Time     | Unsigned<br>Scale 10  | Unit: Seconds (sec), Range: 0 to 900 sec<br>Value x 10 (e.g. 10 sec = 100) | W        | 15 sec        |
| 6043          | 406044           | Supply High Limit Derivative Time   | Unsigned<br>Scale 10  | Unit: Seconds (sec), Range: 0 to 60 sec<br>Value x 10 (e.g. 10 sec = 100)  | W        | 0 sec         |
| 6044          | 406045           | Supply High Limit Demand            | Unsigned<br>Scale 100 | Unit: % RH, Range: 0% RH to 100% RH<br>Value x 100 (e.g. 10% RH = 1000)    | RO       | 0% RH         |
| 6045          | 406046           | Supply High Limit Proportional Band | Unsigned<br>Scale 10  | Unit: %, Range: 1% to 100%<br>Value x 100 (e.g. 10% = 100)                 | RO       | 10%           |
| 6046          | 406047           | Humidity Control Network Demand     | Unsigned<br>Scale 100 | Unit: %, Range: 0% to 100%<br>Value x 100 (e.g. 10% = 1000)                | W        | 0%            |
| 6047          | 406048           | Humidity Control Network High Limit | Unsigned<br>Scale 100 | Unit: %, Range: 0% to 100%<br>Value x 100 (e.g. 10% = 1000)                | W        | 100%          |



| Protocol Base | Holding Register | Description                       | Data Type             | Units, Limits, State Texts   | Writable | Default Value         |
|---------------|------------------|-----------------------------------|-----------------------|--|----------|-----------------------|
| 6048          | 406049           | Humidity Demand                   | Unsigned<br>Scale 100 | Unit: %, Range: 0% to 100%<br>Value x 100 (e.g. 10% = 1000)  | RO       | 0%                    |
| 6049          | 406050           | SDU Fan Off Delay                 | Unsigned<br>Scale 1   | Unit: Minutes (min), Range: 5 to 20 mins<br>Value x 1 (e.g. 5 mins = 5)  | W        | 5 min                 |
| 6050          | 406051           | Humidity Demand Low Dead Band (0) | Unsigned<br>Scale 100 | Unit: %, Range: 0% to 100%<br>Value x 100 (e.g. 10% = 1000)  | W        | 1%                    |
| 6051          | 406052           | Humidity Demand Low Dead Band (1) |                       | Unit: %, Range: 0% to 100%   |          |                       |
| 6052          | 406053           | Network Timeout (0)               | Unsigned<br>Scale 1   | Unit: Seconds (sec), Range: 1 to 900 sec<br>Value x 1 (e.g. 10sec = 10)  | W        | 900 sec               |
| 6053          | 406054           | Network Timeout (1)               |                       | Unit: Seconds (sec), Range: 1 to 900 sec   |          |                       |
| 6054          | 406055           | System Power Output               | Unsigned<br>Scale 100 | Unit: %, Range: 0% to 100%<br>Value x 100 (e.g. 10% = 1000)  | RO       | 0%                    |
| 6055          | 406056           | System Steam Capacity             | Unsigned<br>Scale 10  | Unit: kg/hr or lb/hr, Range: 0 to 3000 kg/hr or<br>0 to 6614 lb/hr<br>Value x 10 (e.g. 10kg/hr = 100 or 10lb/hr = 100) | RO       | 0 kg/hr or<br>0 lb/hr |
| 6056          | 406057           | Boiler Demand                     | Unsigned<br>Scale 100 | Unit: %, Range: 0% to 100%<br>Value x 100 (e.g. 10% = 1000)  | W        | 0%                    |
| 6057          | 406058           | Boiler Capacity                   | Unsigned<br>Scale 10  | Unit: kg/hr or lb/hr, Range: 0 to 3000 kg/hr or<br>0 to 6614 lb/hr<br>Value x 10 (e.g. 10kg/hr = 100 or 10lb/hr = 100) | RO       | 0 kg/hr or<br>0 lb/hr |
| 6058          | 406059           | Boiler Power Output               | Unsigned<br>Scale 100 | Unit: %, Range: 0% to 100%<br>Value x 100 (e.g. 10% = 1000)  | RO       | 0%                    |
| 6059          | 406060           | Boiler Run Time (0)               | Unsigned<br>Scale 100 | Units: Hours (h), Range: 0 to 2147483647 h<br>Value x 100 (e.g. 10 h = 1000)   | RO       | 0h                    |
| 6060          | 406061           | Boiler Run Time (1)               |                       | Units: Hours (h), Range: 0 to 2147483647 h   |          |                       |
| 6061          | 406062           | Boiler Run Time (2)               |                       | Units: Hours (h), Range: 0 to 2147483647 h   |          |                       |
| 6062          | 406063           | Boiler Run Time (3)               |                       | Units: Hours (h), Range: 0 to 2147483647 h   |          |                       |

| Protocol Base | Holding Register | Description                 | Data Type             | Units, Limits, State Texts   | Writable | Default Value |
|---------------|------------------|-----------------------------|-----------------------|--|----------|---------------|
| 6063          | 406064           | Boiler On Time (0)          | Unsigned<br>Scale 100 | Units: Hours (h), Range: 0 to 2147483647 h<br>Value x 100 (e.g. 10 h = 1000) | RO       | 0h            |
| 6064          | 406065           | Boiler On Time (1)          |                       | Units: Hours (h), Range: 0 to 2147483647 h                                   |          |               |
| 6065          | 406066           | Boiler On Time (2)          |                       | Units: Hours (h), Range: 0 to 2147483647 h                                   |          |               |
| 6066          | 406067           | Boiler On Time (3)          |                       | Units: Hours (h), Range: 0 to 2147483647 h                                   |          |               |
| 6067          | 406068           | Boiler Service Run Time (0) | Unsigned<br>Scale 100 | Units: Hours (h), Range: 0 to 2147483647 h<br>Value x 100 (e.g. 10 h = 1000) | RO       | 0h            |
| 6068          | 406069           | Boiler Service Run Time (1) |                       | Units: Hours (h), Range: 0 to 2147483647 h                                   |          |               |
| 6069          | 406070           | Boiler Service Run Time (2) |                       | Units: Hours (h), Range: 0 to 2147483647 h                                   |          |               |
| 6070          | 406071           | Boiler Service Run Time (3) |                       | Units: Hours (h), Range: 0 to 2147483647 h                                   |          |               |
| 6071          | 406072           | Boiler Service On Time (0)  | Unsigned<br>Scale 100 | Units: Hours (h), Range: 0 to 2147483647 h<br>Value x 100 (e.g. 10 h = 1000) | RO       | 0h            |
| 6072          | 406073           | Boiler Service On Time (1)  |                       | Units: Hours (h), Range: 0 to 2147483647 h                                   |          |               |
| 6073          | 406074           | Boiler Service On Time (2)  |                       | Units: Hours (h), Range: 0 to 2147483647 h                                   |          |               |
| 6074          | 406075           | Boiler Service On Time (3)  |                       | Units: Hours (h), Range: 0 to 2147483647 h                                   |          |               |
| 6075          | 406076           | Boiler Minimum Steam Output | Unsigned<br>Scale 1   | Unit: %, Range: 1 to 25%<br>Value x 1 (e.g. 1% = 1)                          | W        | 5%            |
| 6076          | 406077           | Boiler Drain Interval       | Unsigned<br>Scale 1   | Units: Hours (h), Range: 0 to 24 h<br>Value x 1 (e.g. 1 h = 1)               | W        | 6h            |
| 6077          | 406078           | Boiler Drain Volume         | Unsigned<br>Scale 1   | Unit: %, Range: 25 to 100%<br>Value x 1 (e.g. 30% = 30)                      | W        | 100%          |
| 6078          | 406079           | Boiler Max Steam Output     | Unsigned<br>Scale 1   | Unit: %, Range: 0 to 100%<br>Value x 1 (e.g. 1% = 1)                         | W        | 100%          |
| 6079          | 40680            | Boiler Idle Time Drain      | Unsigned<br>Scale 1   | Unit: Hours (h), Range: 0 to 72 h<br>Value x 1 (e.g. 1 h = 1)                | W        | 24h           |

| Protocol Base | Holding Register | Description                               | Data Type           | Units, Limits, State Texts  | Writable | Default Value |
|---------------|------------------|---|---------------------|---|----------|---------------|
| 6080          | 406081           | Boiler Idle Temperature Setpoint          | Unsigned<br>Scale 1 | Unit: °C/°F, Range: 0°C to 60°C or 32°F or 140°F<br>Value x 1 (e.g. 5°C = 500 or 10°F = 1000)     | W        | 0°C or 32°F   |
| 6081          | 406082           | Boiler Blowdown Rate                      | Unsigned<br>Scale 1 | Unit: %, Range: 0% to 100%<br>Value x 1 (e.g. 10% = 10)   | W        | 0%            |
| 6082          | 406083           | Boiler Service Interval                   | Unsigned<br>Scale 1 | Unit: Hours (h), Range: 1000 to 3000 h<br>Value x 1 (e.g. 1500 h = 1500)                          | W        | 1000h         |
| 6083          | 406084           | Boiler Idle Tank Rinse Interval           | Unsigned<br>Scale 1 | Unit: Days, Range: 1 to 7 days<br>Value x 1 (e.g. 1 day = 1)                                      | W        | 3day          |
| 6084          | 406085           | Boiler Anti-Freeze Drain (0)              | Signed<br>Scale 100 | Unit: °C/°F, Range: -40°C to 100°C or -40°F to 212°F, Value x 100 (e.g. 5°C = 500 or 10°F = 1000) | RO       | 1°C or 34°F   |
| 6085          | 406086           | Boiler Anti-Freeze Drain (1)              |                     | Unit: °C/°F, Range: -40°C to 100°C or -40°F to 212°F  |          |               |
| 6086          | 406087           | Boiler Anti-Freeze Keep Warm Setpoint (0) | Signed<br>Scale 100 | Unit: °C/°F, Range: -40°C to 100°C or -40°F to 212°F, Value x 100 (e.g. 5°C = 500 or 10°F = 1000) | RO       | 30°C or 86°F  |
| 6087          | 406088           | Boiler Anti-Freeze Keep Warm Setpoint (1) |                     | Unit: °C/°F, Range: -40°C to 100°C or -40°F to 212°F  |          |               |
| 6088          | 406089           | Boiler Anti-Freeze Keep Warm (0)          | Signed<br>Scale 100 | Unit: °C/°F, Range: -40°C to 100°C or -40°F to 212°F, Value x 100 (e.g. 5°C = 500 or 10°F = 1000) | RO       | 10°C or 50°F  |
| 6089          | 406090           | Boiler Anti-Freeze Keep Warm (1)          |                     | Unit: °C/°F, Range: -40°C to 100°C or -40°F to 212°F  |          |               |
| 6090          | 406091           | Water Level Replace Interval (0)          | Unsigned<br>Scale 1 | Unit: Days, Range: 0 day to 7 days<br>Value x 1 (e.g. 1 day = 1)                                  | W        | 7day          |
| 6091          | 406092           | Water Level Replace Interval (1)          |                     | Unit: Days, Range: 0 day to 7 days  |          |               |
| 6092          | 406093           | Boiler Manual Calibration Time (0)        | Unsigned<br>Scale 1 | Unit: Hours (h), Range: 0 to 21474836.47 h<br>Value x 1 (e.g. 1 h = 1)                            | RO       | 0h            |
| 6093          | 406094           | Boiler Manual Calibration Time (1)        |                     | Unit: Hours (h), Range: 0 to 21474836.47 h  |          |               |
| 6094          | 406095           | Boiler Manual Calibration Time (2)        |                     | Unit: Hours (h), Range: 0 to 21474836.47 h  |          |               |
| 6095          | 406096           | Boiler Manual Calibration Time (3)        |                     | Unit: Hours (h), Range: 0 to 21474836.47 h  |          |               |

| Protocol Base | Holding Register | Description                           | Data Type             | Units, Limits, State Texts  | Writable | Default Value |
|---------------|------------------|---------------------------------------|-----------------------|---|----------|---------------|
| 6096          | 406097           | HRL Temperature                       | Signed<br>Scale 100   | Unit: °C/°F, Range: -40°C to 260°C or -40°F to 500°F, Value x 100 (e.g. 5°C = 500 or 10°F = 1000) | RO       | 0°C or 32°F   |
| 6097          | 406098           | HRL Humidity                          | Unsigned<br>Scale 100 | Unit: %, Range: 0% RH to 100% RH<br>Value x 100 (e.g. 10% RH = 1000)                              | RO       | 0% RH         |
| 6098          | 406099           | Modbus TCP IP Keep Alive Time Out (0) | Unsigned<br>Scale 1   | Unit: Minutes (min), Range: 1 to 1440 mins<br>Value x 1 (e.g. 5 mins = 5)                         | W        | 5 min         |
| 6099          | 406100           | Modbus TCP IP Keep Alive Time Out (1) |                       | Unit: Minutes (min), Range: 1 to 1440 mins  |          |               |
| 10000         | 410001           | Air Flow                              | Unsigned<br>Scale 1   | 0 = Closed<br>1 = Open  | RO       | Closed        |
| 10001         | 410002           | Supply High Limit                     | Unsigned<br>Scale 1   | 0 = Closed<br>1 = Open  | RO       | Closed        |
| 10002         | 410003           | Interlock                             | Unsigned<br>Scale 1   | 0 = Closed<br>1 = Open  | RO       | Closed        |
| 10003         | 410004           | Binary External Demand                | Unsigned<br>Scale 1   | 0 = 0%<br>1 = 100%  | RO       | 0%            |
| 10004         | 410005           | Water Leak Detection                  | Unsigned<br>Scale 1   | 0 = Ok<br>1 = Leak  | RO       | Ok            |
| 10005         | 410006           | Thermal Cutout                        | Unsigned<br>Scale 1   | 0 = Closed<br>1 = Open  | RO       | Closed        |
| 10006         | 410007           | RS485 Interface                       | Unsigned<br>Scale 1   | 0 = No<br>1 = Yes   | RO       | No            |
| 10007         | 410008           | Ethernet Interface                    | Unsigned<br>Scale 1   | 0 = No<br>1 = Yes   | RO       | No            |
| 10008         | 410009           | Contactors PCB Fuse                   | Unsigned<br>Scale 1   | 0 = Normal<br>1 = Blown Fuse  | RO       | Normal        |
| 10009         | 410010           | Control PCB Fuse                      | Unsigned<br>Scale 1   | 0 = Normal<br>1 = Open Fuse   | RO       | Normal        |

| Protocol Base | Holding Register | Description           | Data Type           | Units, Limits, State Texts | Writable | Default Value |
|---------------|------------------|-----------------------|---------------------|----------------------------|----------|---------------|
| 11000         | 411001           | Alarm Warning Relay   | Unsigned<br>Scale 1 | 0 = Off<br>1 = On          | RO       | Off           |
| 11001         | 411002           | Service Warning Relay | Unsigned<br>Scale 1 | 0 = Off<br>1 = On          | RO       | Off           |
| 11002         | 411003           | Water Level Valve     | Unsigned<br>Scale 1 | 0 = Off<br>1 = On          | RO       | Off           |
| 11003         | 411004           | Tank Water Valve      | Unsigned<br>Scale 1 | 0 = Off<br>1 = On          | RO       | Off           |
| 11004         | 411005           | Drain Cooler Valve    | Unsigned<br>Scale 1 | 0 = Off<br>1 = On          | RO       | Off           |
| 11005         | 411006           | Drain Pump            | Unsigned<br>Scale 1 | 0 = Off<br>1 = On          | RO       | Off           |
| 11006         | 411007           | Drain Valve           | Unsigned<br>Scale 1 | 0 = Off<br>1 = On          | RO       | Off           |
| 11007         | 411008           | Main Contactor        | Unsigned<br>Scale 1 | 0 = Off<br>1 = On          | RO       | Off           |
| 11008         | 411009           | Heater Stage 1        | Unsigned<br>Scale 1 | 0 = Off<br>1 = On          | RO       | Off           |
| 11009         | 411010           | Heater Stage2         | Unsigned<br>Scale 1 | 0 = Off<br>1 = On          | RO       | Off           |
| 11010         | 411011           | Heater Stage 3        | Unsigned<br>Scale 1 | 0 = Off<br>1 = On          | RO       | Off           |
| 11011         | 411012           | SDU Fan               | Unsigned<br>Scale 1 | 0 = Off<br>1 = On          | RO       | Off           |
| 11012         | 411013           | Alarm LED             | Unsigned<br>Scale 1 | 0 = Off<br>1 = On          | RO       | Off           |

| Protocol Base | Holding Register | Description                    | Data Type           | Units, Limits, State Texts     | Writable | Default Value |
|---------------|------------------|--------------------------------|---------------------|--------------------------------|----------|---------------|
| 11013         | 411014           | Power LED                      | Unsigned<br>Scale 1 | 0 = Off<br>1 = On              | RO       | Off           |
| 11014         | 411015           | Buzzer                         | Unsigned<br>Scale 1 | 0 = Off<br>1 = On              | RO       | Off           |
| 12000         | 412001           | Network Control State          | Unsigned<br>Scale 1 | 0 = Normal<br>1 = Fault        | W        | Normal        |
| 12001         | 412002           | Water Level Low                | Unsigned<br>Scale 1 | 0 = Inactive<br>1 = Active     | RO       | Inactive      |
| 12002         | 412003           | Water Level High               | Unsigned<br>Scale 1 | 0 = Inactive<br>1 = Active     | RO       | Inactive      |
| 12003         | 412004           | Foam Sensor                    | Unsigned<br>Scale 1 | 0 = NoFoam<br>1 = Foam         | RO       | NoFoam        |
| 12004         | 412005           | Inhibit Resistive Probe        | Unsigned<br>Scale 1 | 0 = No<br>1 = Yes              | W        | No            |
| 12005         | 412006           | SDU Fan Fault                  | Unsigned<br>Scale 1 | 0 = Off<br>1 = On              | RO       | Off           |
| 12006         | 412007           | Manual Water Calibration State | Unsigned<br>Scale 1 | 0 = Ok<br>1 = Required         | RO       | Ok            |
| 12007         | 412008           | Boiler Service Operation       | Unsigned<br>Scale 1 | 0 = Not Allowed<br>1 = Allowed | W        | Allowed       |
| 12008         | 412009           | Boiler Service Due             | Unsigned<br>Scale 1 | 0 = Off<br>1 = On              | RO       | Off           |
| 12009         | 412010           | Foam                           | Unsigned<br>Scale 1 | 0 = Ok<br>1 = Detected         | RO       | Ok            |
| 12010         | 412011           | HRL Lock Setpoint              | Unsigned<br>Scale 1 | 0 = Unlock<br>1 = Lock         | W        | Unlock        |

| Protocol Base | Holding Register | Description              | Data Type           | Units, Limits, State Texts  | Writable | Default Value |
|---------------|------------------|--------------------------|---------------------|---|----------|---------------|
| 12011         | 412012           | Notify Alarm             | Unsigned<br>Scale 1 | 0 = Off<br>1 = On   | W        | Off           |
| 12012         | 412013           | Notify Warning           | Unsigned<br>Scale 1 | 0 = Off<br>1 = On   | W        | Off           |
| 12013         | 412014           | Notify App Msg           | Unsigned<br>Scale 1 | 0 = Off<br>1 = On   | W        | Off           |
| 15000         | 415001           | System Power State       | Unsigned<br>Scale 1 | 0 = Off<br>1 = On   | RO       | Off           |
| 15001         | 415002           | System Log Verbose Level | Unsigned<br>Scale 1 | 0 = None<br>1 = Emergency<br>2 = Alert<br>3 = Critical<br>4 = Error<br>5 = Warning<br>6 = Notice<br>7 = Info<br>8 = Debug | W        | Debug         |
| 15002         | 415003           | Modbus Server Units      | Unsigned<br>Scale 1 | 0 = Metric<br>1 = Imperial  | W        | Metric        |
| 15003         | 415004           | Control Signal Type      | Unsigned<br>Scale 1 | 0 = 0-10Vdc<br>1 = 2-10Vdc<br>2 = 4-20mA<br>3 = 0-20mA  | W        | 0-10Vdc       |
| 15004         | 415005           | Room RH Signal Type      | Unsigned<br>Scale 1 | 0 = 0-10Vdc<br>1 = 2-10Vdc<br>2 = 4-20mA<br>3 = 0-20mA  | W        | 0-10Vdc       |
| 15005         | 415006           | Supply RH Signal Type    | Unsigned<br>Scale 1 | 0 = 0-10Vdc<br>1 = 2-10Vdc<br>2 = 4-20mA<br>3 = 0-20mA  | W        | 0-10Vdc       |
| 15006         | 415007           | Control Profile          | Unsigned<br>Scale 1 | 0 = ExternAnalog<br>1 = ExternNetwork<br>2 = InternAnalog<br>3 = InternNetwork<br>4 = HRL<br>5 = Custom                   | W        | ExternAnalog  |



| Protocol Base | Holding Register | Description                        | Data Type           | Units, Limits, State Texts  | Writable | Default Value |
|---------------|------------------|------------------------------------|---------------------|---|----------|---------------|
| 15007         | 415008           | Modulating High Limit Profile      | Unsigned<br>Scale 1 | 0 = Disabled<br>1 = ExternAnalog<br>2 = ExternNetwork<br>3 = InternAnalog<br>4 = InternNetwork<br>5 = Custom                    | W        | Disabled      |
| 15008         | 415009           | Occupancy State                    | Unsigned<br>Scale 1 | 0 = Occupied<br>1 = Unoccupied<br>2 = Vacant<br>3 = Off   | RO       | Occupied      |
| 15009         | 415010           | Room RH Source                     | Unsigned<br>Scale 1 | 0 = None<br>1 = RoomRH<br>2 = Network<br>3 = HRL  | W        | None          |
| 15010         | 415011           | Room RH Setpoint Source            | Unsigned<br>Scale 1 | 0 = None<br>1 = Internal<br>2 = ControllInput   | W        | None          |
| 15011         | 415012           | Supply High Limit Reading Source   | Unsigned<br>Scale 1 | 0 = None<br>1 = SuppyHLRH<br>2 = Network  | W        | None          |
| 15012         | 415013           | Supply High Limit Setpoint Source  | Unsigned<br>Scale 1 | 0 = None<br>1 = Internal<br>2 = ControllInput   | W        | None          |
| 15013         | 415014           | Humidity Control Demand Source     | Unsigned<br>Scale 1 | 0 = None<br>1 = ControllInput<br>2 = RoomDemand<br>3 = Network  | W        | ControllInput |
| 15014         | 415015           | Humidity Control High Limit Source | Unsigned<br>Scale 1 | 0 = None<br>1 = ControllInput<br>2 = SupplyHLDemand<br>3 = Network  | W        | None          |
| 15015         | 415016           | Humidity Control Cutout State      | Unsigned<br>Scale 1 | 0 = Off<br>1 = Normal<br>2 = LowLimit<br>3 = HighLimit<br>4 = NoAirFlow<br>5 = Interlock  | RO       | Off           |
| 15016         | 415017           | SDU Fan Target                     | Unsigned<br>Scale 1 | 0 = None<br>1 = SDUFan  | W        | None          |
| 15017         | 415018           | Boiler Request                     | Unsigned<br>Scale 1 | 0 = None<br>1 = Reset Alarms<br>2 = Drain<br>3 = Reset Counters<br>4 = Filling<br>5 = WaterCalib                                | W        | None          |
| 15018         | 415019           | Boiler State                       | Unsigned<br>Scale 1 | 0 = Off<br>1 = Idle<br>2 = LineRinse<br>3 = TankRinse<br>4 = Filling<br>5 = Draining<br>6 = Heating<br>7 = Boiling<br>8 = Alarm | RO       | Off           |

| Protocol Base | Holding Register | Description                | Data Type           | Units, Limits, State Texts  | Writable | Default Value |
|---------------|------------------|----------------------------|---------------------|---|----------|---------------|
| 15019         | 415020           | Boiler Fill Mode           | Unsigned<br>Scale 1 | 0 = OneShot<br>1 = Pulsed   | W        | Pulsed        |
| 15020         | 415021           | Boiler Alarm               | Unsigned<br>Scale 1 | 0 = Normal<br>1 = FailedPump<br>2 = FillTimeout<br>3 = BlockedPiping<br>4 = HeatTimeout<br>5 = Overheat<br>6 = WaterLeak<br>7 = Service<br>8 = Foaming<br>9 = TankBlocked<br>10 = RefillDelay | RO       | Normal        |
| 15021         | 415022           | Boiler Idle Tank Rinse On  | Unsigned<br>Scale 1 | 0 = Off<br>1 = On   | W        | Off           |
| 15022         | 415023           | Boiler Idle Tank Rinse Off | Unsigned<br>Scale 1 | 0 = Off<br>1 = On   | W        | Off           |
| 15023         | 415024           | Water Probe Auto Calib.    | Unsigned<br>Scale 1 | 0 = Off<br>1 = On   | W        | On            |
| 15024         | 415025           | Water Level Probe Warning  | Unsigned<br>Scale 1 | 0 = Ok<br>1 = Calib<br>2 = Replace  | RO       | Ok            |
| 15025         | 415026           | Water Level Probe Failure  | Unsigned<br>Scale 1 | 0 = None<br>1 = Capacitive<br>2 = Resistive<br>3 = Both   | RO       | None          |
| 15026         | 415027           | Water Level Probe Alarm    | Unsigned<br>Scale 1 | 0 = Ok<br>1 = Defect<br>2 = NoCalib   | RO       | Ok            |
| 15027         | 415028           | Boiler Startup Tank Rinse  | Unsigned<br>Scale 1 | 0 = Off<br>1 = On   | W        | Off           |

# Notes

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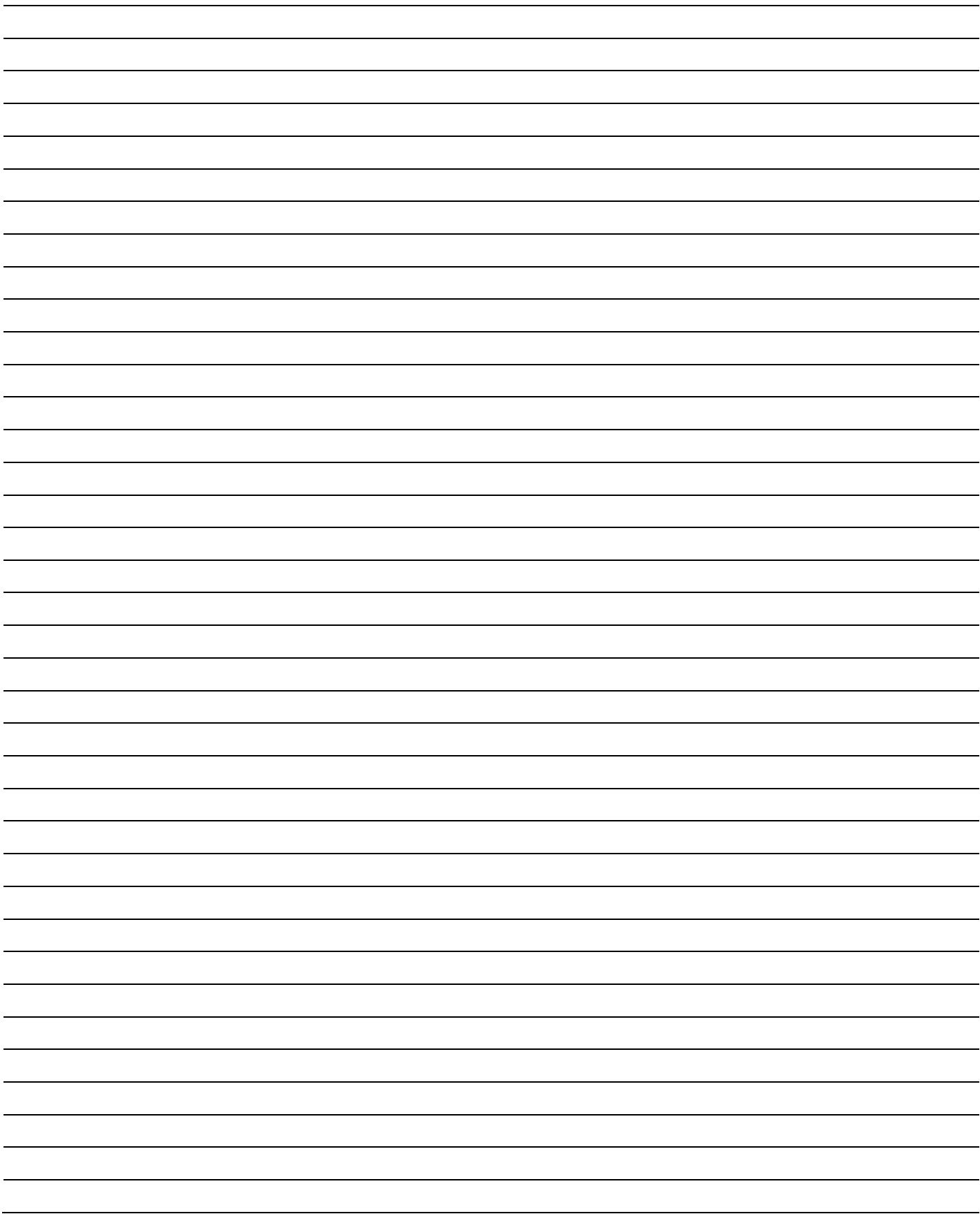
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