

Instruction and operation manual

S220

Dew point sensor



Dear Customer,

Thank you for choosing our product.

Please read the operating instructions in full and carefully observe them before starting up the device. The manufacturer cannot be held liable for any damage which occurs as a result of non-observance or non-compliance with this manual.

Should the device be tampered with in any manner other than a procedure which is described and specified in the manual, the warranty is cancelled and the manufacturer is exempt from liability.

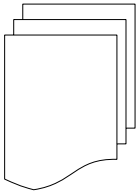
The device is destined exclusively for the described application.

SUTO offers no guarantee for the suitability for any other purpose. SUTO is also not liable for consequential damage resulting from the delivery, capability or use of this device.

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1. Safety instructions



Please check if this instruction manual accords to the product type.

Please observe all notes and instructions indicated in this manual. It contains essential information which have to be observed before and during installation, operation and maintenance. Therefore this instruction manual has to be read carefully by the technician as well as by the responsible user / qualified personnel.

This instruction manual has to be available at the operation site of the dew point sensor at any time. In case of any obscurities or questions, regarding this manual or the product, please contact the manufacturer.



WARNING!

Compressed air!

Any contact with quickly escaping air or bursting parts of the compressed air system can lead to serious injuries or even death!

- Do not exceed the maximum permitted pressure range (see sensors label).
- Only use pressure tight installation material.
- Avoid that persons get hit by escaping air or bursting parts of the instrument.
- The system must be pressureless during maintenance work.



WARNING!

Voltage used for supply!

Any contact with energized parts of the product, may lead to a electrical shock which can lead to serious injuries or even death!

- Consider all regulations for electrical installations.
- The system must be disconnected from any power supply during maintenance work.
- Any electrical work on the system is only allowed by authorized qualified personal.

**WARNING!****Permitted operating parameters!**

Observe the permitted operating parameters, any operation exceeding this parameters can lead to malfunctions and may lead to damage on the instrument or the system.

- Do not exceed the permitted operating parameters.
- Make sure the product is operated in its permitted limitations.
- Do not exceed or undercut the permitted storage and operation temperature and pressure.
- The product should be maintained and calibrated frequently, at least annually.

General safety instructions

- It is not allowed to use the product in explosive areas.
- Please observe the national regulations before/during installation and operation.

Remarks

- It is not allowed to disassemble the product.
- Always use spanner to mount the product properly.

**ATTENTION!**

Measurement values can be affected by malfunction!

The product must be installed properly and frequently maintained, otherwise it may lead to wrong measurement values, which can lead to wrong results.

Storage and transportation

- Make sure that transportation temperature of the sensor is between -30 ... +70°C.
- For storage and transportation it is recommended to use the packaging which comes with the sensor.
- Please make sure that the storage temperature of the sensor is between -20 ... 50°C.

- Avoid direct UV and solar radiation during storage.
- For the storage the humidity has to be <90%, no condensation.

2. Application

The S220 is a dew point sensor which is designed to monitor the dew point in industrial application within the permissible operating parameters. These parameters can be found in the technical data section.

The S220 can measure the following values:

- Temperature of the compressed air or gas.
- Humidity of the compressed air or gas.
- Dew point of the compressed air or gas.

The default factory settings are: temperature in °C, Humidity in % and dew point in °C Td. Other units can be programmed by the optional display or the service kit.

The S220 dew point sensor is not developed to be used in explosive areas. For the use in explosive areas please contact the manufacturer.

The S220 dew point sensor is mainly used in compressed air systems in industrial environment.

3. Features

- Small size makes it ideal for dryer installation.
- Measures dew point down to -100°C Td.
- Version with integrated pressure measurement.
- Various output versions available: 1 x 4 ... 20 mA, 2 x 4 ... 20 mA, RS-485 (Modbus), 4 ... 20 mA loop powered.
- IP65 casing provides robust protection in rough industrial environment.
- Very fast response time ensures safe and reliable indication whenever dew points are out of valid ranges.
- Can be installed directly into dryer through G 1/2" thread.
- High accuracy of ± 2 °C dew point.

4. Technical Data

4.1 General

CE	
Parameters	Standard unit dew point: °C Td Standard unit temperature: °C other units: °F, K Standard unit humidity: %
Principle of measurement	Oscillating crystal
Sensor	QCM
Measuring medium	Non-corrosive gases
Measuring range	Dew point: -100 ... 0°C Td Temperature: -30 ... 70°C Pressure: -0.1 ... 1.6 MPa
Ambient temperature	0 ... 50°C
Operating pressure	-0.1 ... 1.6 MPa
Casing material	Process connection: stainless steel Casing: zinc alloy
Protection class	IP65
Dimensions	See dimensional drawing on the next page
Screwing thread	G ½" thread (ISO 228/1);
Weight	204 g

4.2 Electrical Data

Power supply	12 ... 30 VDC / 30 mA
--------------	-----------------------

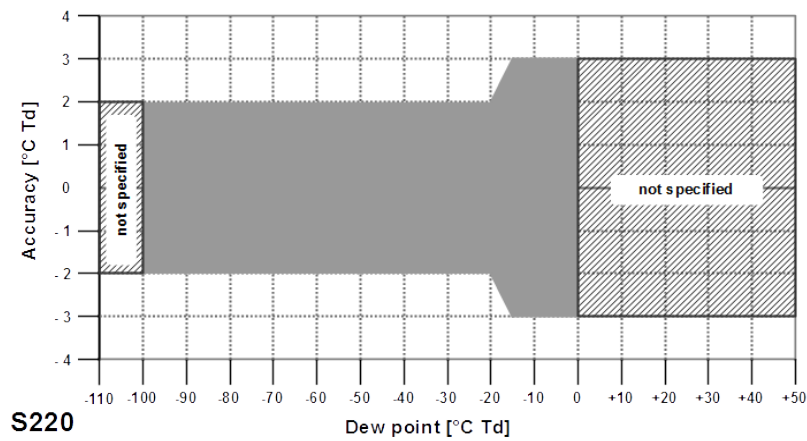
4.3 Output-Signals

Analog output	4 ... 20 mA, 3-wire 4 ... 20 mA, 2-wire
Analog output scaling	4 mA = -100°C Td 20 mA = +20°C Td
Modbus output	RS-485

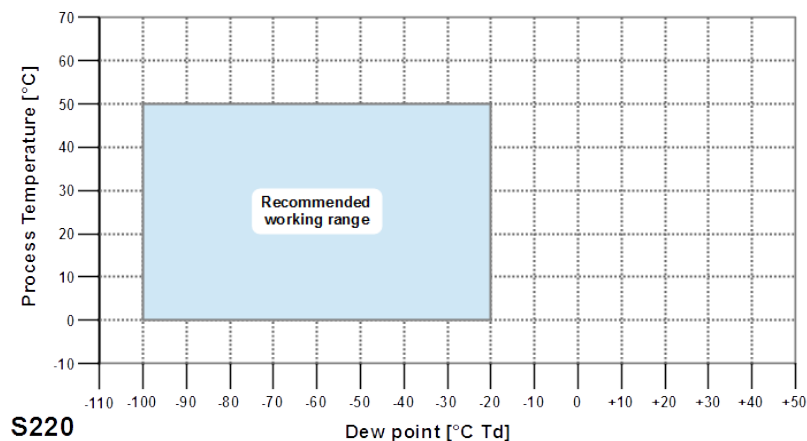
4.4 Accuracy

Accuracy	Dew point: $\pm 2^{\circ}\text{C}$ Temperature: 0.3°C Pressure: 0.05 bar
Repeatability	$\pm 0.5^{\circ}\text{C}$
Stated accuracy at	Ambient/process temperature $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$ Process temperature $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$ Ambient/process humidity $< 95\% \text{ rH}$, no condensation Airflow $> 2 \text{ l/min}$ at the sensor tip

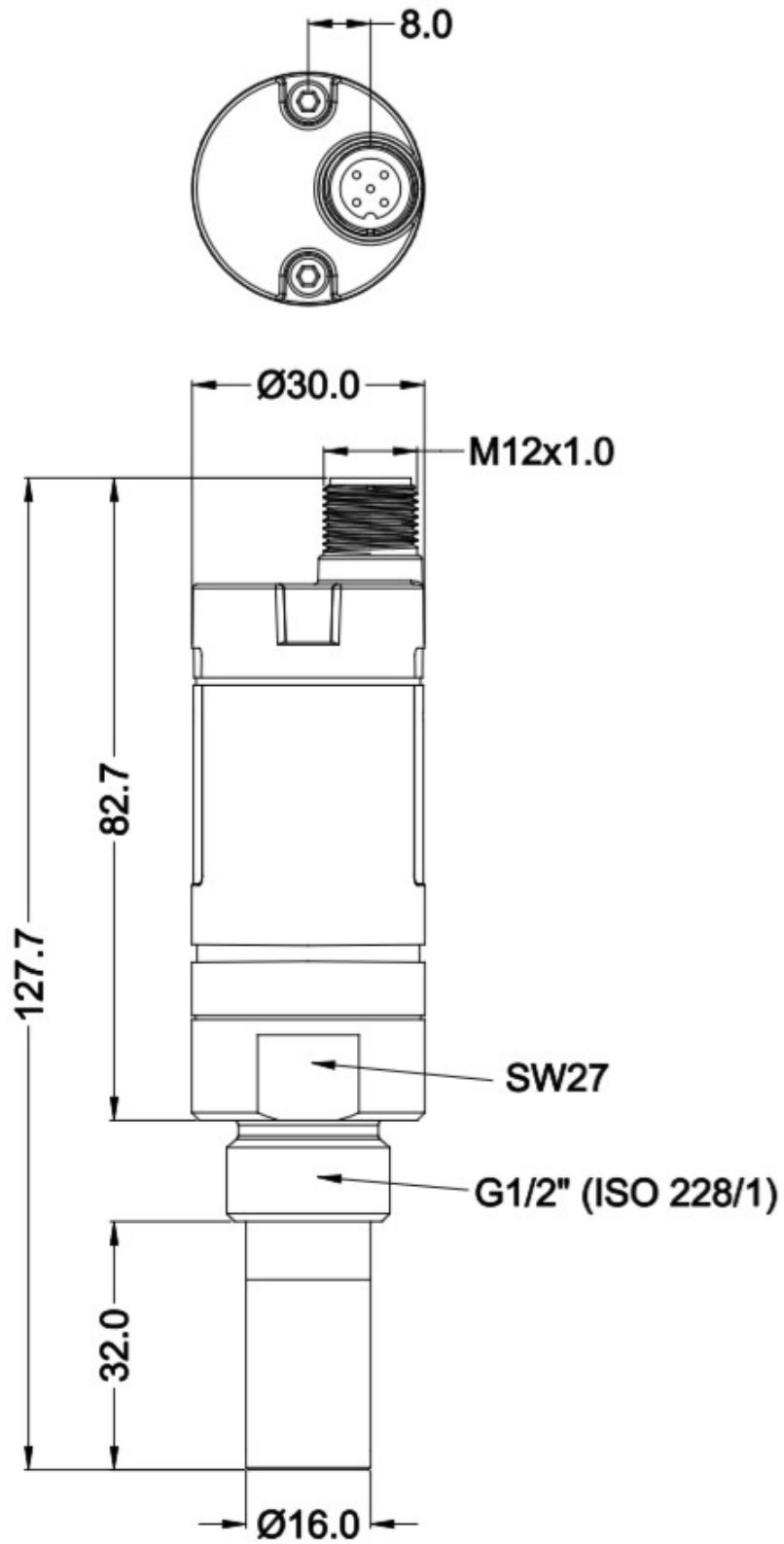
Accuracy:



Valid working range:



5. Dimensional drawing



6. Determination of the installation point

In order to maintain the accuracy stated in the technical data, the sensor must be installed correctly. The air must flow on to the sensor tip, otherwise it will lead to wrong measurement values. For further instructions, please read the next chapter carefully.

Please consider that enough space exists at your site for a adequate installation as described in this manual.



ATTENTION!

Wrong measurement is possible, if the sensor is not installed correctly.

- The sensor is for indoor use only! At an outdoor installation, the sensor must be protected from solar radiation and rain.
- It is strongly recommend not to install S220 permanently in wet environment as it exists usually right after a compressor outlet.

7. Installation

Before installing the sensor, please make sure that all components listed below are included in your package.

Qty	Description	Item No.
1	Sensor	S699 0220 S699 0221 S699 0222 S699 0223 S699 0224 S699 0225
1	M12 plug	C219 0059
1	Instruction manual	No P/N
1	Calibration certificate	No P/N

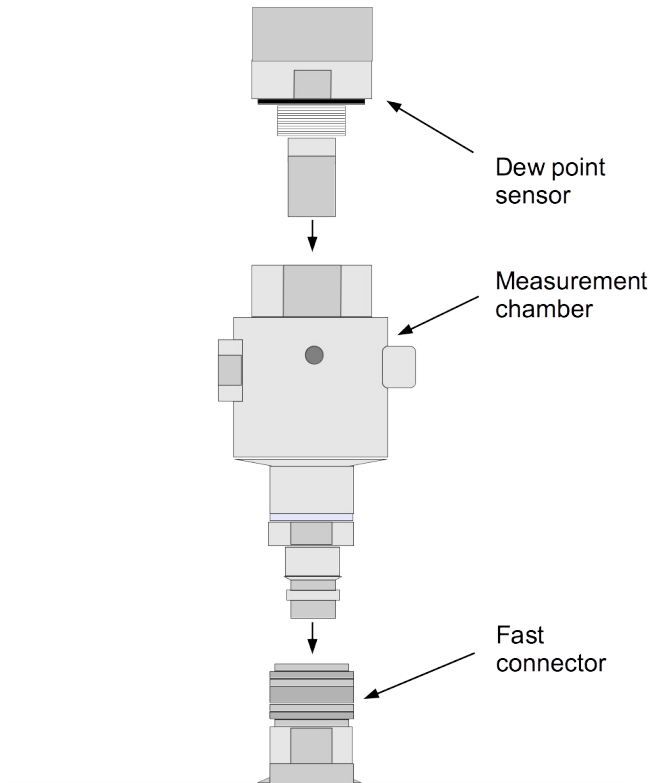
7.1 Installation Requirements

The flowing air or gas has to pass the sensor tip for a proper measurement. This can be realized with a measurement chamber. For a installation without measuring chamber you need to concern the installation depth which is described in the next chapter.

7.2 Installation Procedure

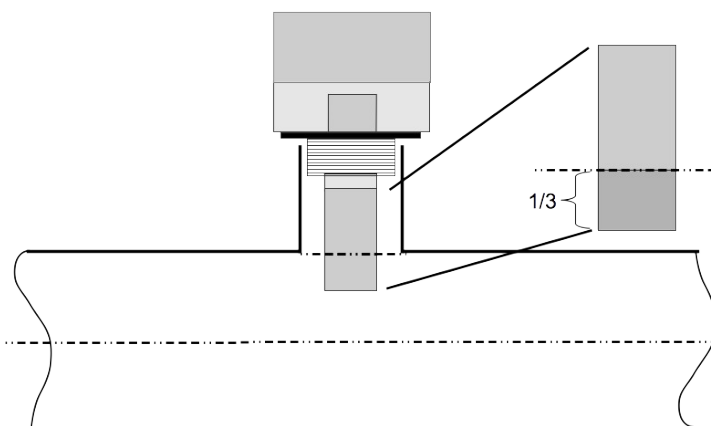
The following steps explain the procedure of an appropriate installation.

Installation of the sensor with measurement chamber



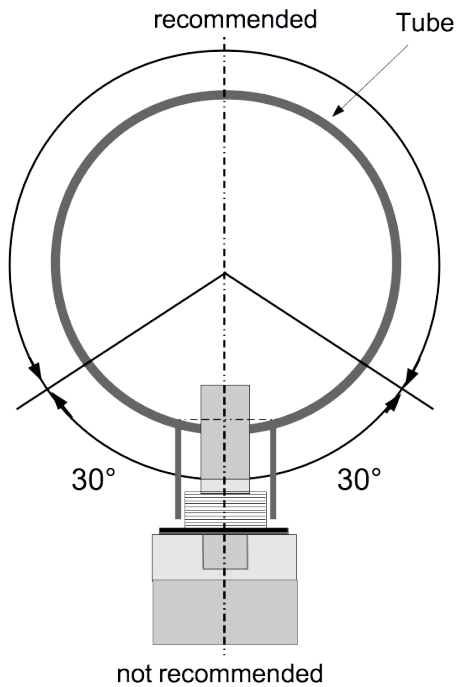
1. connect the sensor with the measurement chamber.
2. Connect the sensor and the measurement chamber with the fast connector.

Installation of the sensor without measurement chamber



- Install the sensor only if the system is pressureless.
- Not less than 1/3 of the sensor tip should be inside of the pipe. For this please check the size of the nozzle.
- The inner thread has to be G 1/2".

Remarks



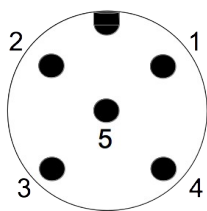
Please install the sensor only in the recommended area like you can see in the picture. A upside down installation is not permitted. Please consider that the distance to the vertical level must be $>30^\circ$.

Removal of the sensor

To remove the sensor unscrew the sensor from the measurement chamber or from the nozzle. Please observe that the system is pressureless when the sensor is removed.

7.3 Electrical connection

Connection pins connector plug M12



Connection pins (view from the clamping side)

Pin assignment connector plug M12

Model	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5
0220	SDI	$-V_B$	$+V_B$	$+I_1$	NA
0221	SDI	$-V_B$	$+V_B$	$+I_1$	$+I_2$
0222	SDI	$-V_B$	$+V_B$	+D	-D

0223	SDI	$-V_B$	$+V_B$	$+I_1$	$+I_2$
0224	SDI	$-V_B$	$+V_B$	+D	-D
0225	SDI	$-V_B$	$+V_B$		
Wire colour	brown	white	blue	black	grey

Legend to pin assignment

SDI Digital signal (internal use)

$-V_B$ Negative supply voltage

$+V_B$ Positive supply voltage

$+I_1$ Active 4 ... 20 mA signal

$+I_2$ Active 4 ... 20 mA signal

+D Positive data Modbus

-D Negative data Modbus

NA Not applicable

8. Signal outputs

8.1 Analog output

The sensor has an analog output range of 4 ... 20 mA. Depending on the model it is a 3-wire active analog output or a 2-wire passive analog, please have a look to the table below. This output is scaled to:

- 4 mA = -100°C Td
- 20 mA = $+20^{\circ}\text{C Td}$

For other ranges, please contact the manufacturer. The analog output can be allocated to the temperature, the dew point and the humidity.

Model	Analog output
S699 0220	1 x 4 ... 20 mA, 3-wire (active)
S699 0221 S699 0223	2 x 4 ... 20 mA, 3-wire (active)
S699 0225	1 x 4 ... 20 mA, 2-wire (passive)

8.2 Modbus output

Model	Digital output
S699 0222, S699 0224	RS-485, Modbus RTU

Mode	: RTU
Baud rate	: 19200
Device address	: 1
Framing / parity / stop bit	: 8, non, 1
Response time	: 1 second
Response delay	: 0 ms
Inter-frame spacing	: 7 char

Remarks

- Modbus communication settings can be changed by the service software.
- To learn more about Modbus communication, see Appendix A - Modbus communication example and Appendix B - LRC and CRC calculation.

Index	Channel description	Unit	Format	Length	Modbus address
0	Temperature	°C or °F	FLOAT	4-Byte	0
3	Relative humidity	%	FLOAT	4-Byte	2
5	Pressure	bar	FLOAT	4-Byte	4
7	Pressure dew point	°C or ° F	FLOAT	4-Byte	6
9	Atmosphere dew point	°C or ° F	FLOAT	4-Byte	8
11	Mixing ratio	g/kg	FLOAT	4-Byte	10
13	Absolute humidity	g/m ³ or mg/m ³	FLOAT	4-Byte	12
15	Atmosphere absolute humidity	g/m ³ or mg/m ³	FLOAT	4-Byte	14
17	Volume ration	ppmv	FLOAT	4-Byte	16
19	Reserved		Reserve	4-Byte	18

9. Optional extra accessories

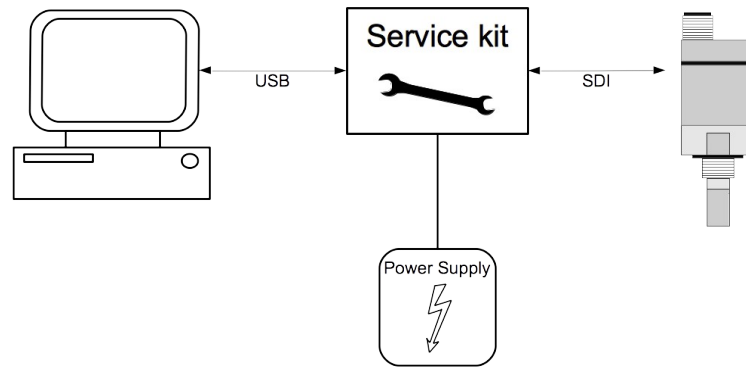
9.1 Measuring chambers

There are different types of measuring chambers, for example measuring chamber with fast connector, by-pass-by chamber with in and out connection, measuring chamber for dryer installation or high pressure chamber. For more information please contact your retailer or the manufacturer.

9.2 Service kit

The service kit is used to connect the sensor with the PC. Sensor parameters such as analog output scaling, alarm values, units etc. can be easily changed by using the service kit.

The diagram below shows the connection when using the optional service kit. Please ensure that also in this case the power supply of either S220 or of the service kit is connected because the USB port cannot supply enough power.



10. Calibration

The sensor is calibrated ex work. The exact calibration date is printed on the certificate which is supplied together with the sensor. The accuracy of the sensor is regulated by the on site conditions, parameters like oil, high humidity or other impurities can affect the calibration and furthermore the accuracy. However we recommend to calibrate the instrument at least once per year. The calibration is excluded from the instruments warranty. For this please contact the manufacturer.

11. Maintenance

Please observe from time to time the sinter cap. If it appears to be dirty, it is recommended to replace it for this please contact the manufacturer.



ATTENTION!

A dirty/wet/contaminated sinter cap or sensor tip may lead to a longer response time and to wrong measurements.

12. Disposal or waste



Electronic devices are recyclable material and do not belong in the household waste.

The sensor, the accessories and its packings must be disposed according to your local statutory requirements.

The dispose can also be carried by the manufacturer of the product, for this please contact the manufacturer.

13. Warranty

SUTO provides a warranty for this product of 24 months covering the material and workmanship under the stated operating conditions from the date of delivery. Please report any findings immediately and within the warranty time. If faults occurring during the warranty time SUTO will repair or replace the defective unit, without charge for labour and material costs but there is a charge for other service such as transport and packing costs.

Excluded from this warranty is:

- Damage caused by:
 - Improper use and non-adherence to the instruction manual.
 - Use of unsuitable accessories.
 - External influences (e.g. damage caused by vibration, damage during transportation, excess heat or moisture).

The warranty is cancelled:

- If the user opens the measurement instrument without a direct request written in this instruction manual.
- If repairs or modifications are undertaken by third parties or unauthorised persons.
- If the serial number has been changed, damaged or removed.

Other claims, especially those for damage occurring outside the instrument are not included unless responsibility is legally binding.

Warranty repairs do not extend the period of warranty.



ATTENTION!

Batteries have a reduced warranty time of 12 month.

Appendix A - Modbus communication example

03 (0x03) Read holding register

Request		Response	
Slave address	1 byte	Slave address	1 byte
Function code	1 byte	Function code	1 byte
Starting address Hi	1 byte	Byte count	1 byte
Starting address Lo	1 byte	Register Hi	1 byte
No. of points Hi	1 byte	Register Lo	1 byte
No. of points Lo	1 byte	:	:
CRC	2 bytes	Register Hi	1 byte
		Register Lo	1 byte
		CRC	2 bytes

05 (0x05) Write single coil

Request		Response	
Slave address	1 byte	Slave address	1 byte
Function code	1 byte	Function code	1 byte
Coil address Hi	1 byte	Coil address Hi	1 byte
Coil address Lo	1 byte	Coil address Lo	1 byte
Data Hi	1 byte	Data Hi	1 byte
Data Lo	1 byte	Data L	1 byte
CRC	2 bytes	CRC	2 bytes

16 (0x10) Write multiple registers

Request		Response	
Slave address	1 byte	Slave address	1 byte
Function code	1 byte	Function code	1 byte
Starting address Hi	1 byte	Starting address Hi	1 byte
Starting address Lo	1 byte	Starting address Lo	1 byte
No. of registers Hi	1 byte	No. of registers Hi	1 byte
No. of registers Lo	1 byte	No. of registers Lo	1 byte
Byte count	1 byte	CRC	2 bytes
Data Hi	1 byte		
Data Lo	1 byte		
:	:		
Data Hi	1 byte		
Data Lo	1 byte		
CRC	2 bytes		

17 (0x11) Report slave ID

Request		Response	
Slave address	1 byte	Slave address	1 byte
Function code	1 byte	Function code	1 byte
CRC	2 bytes	Byte count	1 byte
		Slave ID	2 bytes
		Device run indicator	2 bytes
		Product code	2 bytes
		Product name	20 bytes
		CRC	2 bytes

Appendix B - LRC and CRC calculation

LRC generation

The Longitudinal Redundancy Checking (LRC) field is one byte, containing an 8-bit binary value. The LRC value is calculated by the transmitting device, which appends the LRC to the message. The device that receives recalculates an LRC during receipt of the message, and compares the calculated value to the actual value it received in the LRC field. If the two values are not equal, an error results.

The LRC is calculated by adding together successive 8-bit bytes in the message, discarding any carries, and then two's complementing the result. The LRC is an 8-bit field, therefore each new addition of a character that would result in a value higher than 255 decimal simply 'rolls over' the field's value through zero. Because there is no ninth bit, the carry is discarded automatically.

A procedure for generating an LRC is:

1. Add all bytes in the message, excluding the starting 'colon' and ending CRLF. Add them into an 8-bit field, so that carries will be discarded.
2. Subtract the final field value from FF hex (all 1's) to produce the ones-complement.
3. Add 1 to produce the twos-complement.

Placing the LRC into the Message

When the 8-bit LRC (2 ASCII characters) is transmitted in the message, the high-order character will be transmitted first, followed by the low-order character. For example, if the LRC value is 61 hex (0110 0001):

Colon	Addr	Func	Data Count	Data	Data	Data	Data	LRC Hi	LRC Lo	CR	LF
								"6" 0x36	"1" 0x31		

Example: an example of a C language function performing LRC generation is shown below.

The function takes two arguments:

```
unsigned char *auchMsg; /* A pointer to the message buffer containing binary data */
                    /* to be used for generating the LRC, */
unsigned short usDataLen; /* The quantity of bytes in the message buffer. */
```

LRC generation function

```

static unsigned char LRC(unsigned char *auchMsg, unsigned short usDataLen)
{
    unsigned char uchLRC = 0 ;                /* LRC char initialized */
    while (usDataLen-->0)                    /* pass through message buffer */
        uchLRC += *auchMsg++;                /* add buffer byte without carry */
    return ((unsigned char)(~((char)uchLRC))) ; /* return twos complement */
}

```

CRC generation

The **C**yclical **R**edundancy **C**hecking (CRC) field is two bytes, containing a 16-bit binary value. The CRC value is first generated by the transmitting device, which appends the CRC to the message. The device that receives recalculates a CRC during receipt of the message, and compares the calculated value to the actual value it received in the CRC field. If the two values are not equal, an error results.

There are many ways of calculating a CRC checksum. To ensure correct calculation, please refer to [Reference 1] Modbus over serial line, where detailed descriptions and programming examples are available. Even more information and programming examples in different programming languages can be found on: www.modbus.org searching for CRC.

Below is a short text description of how the CRC is calculated. This description is then followed by a C programming example.

1. Load a 16-bit register with FFFF hex (all 1's). Call this the CRC register.
2. Exclusive OR the first 8-bit byte of the message with the low-order byte of the 16-bit CRC register, putting the result in the CRC register.
3. Shift the CRC register one bit to the right (toward the LSB), zero-filling the MSB. Extract and examine the LSB.
4. (If the LSB was 0): Repeat step 3 (another shift). (If the LSB was 1): Exclusive OR the CRC register with the polynomial value 0xA001 (1010 0000 0000 0001).
5. Repeat steps 3 and 4 until 8 shifts have been performed. When this is done, a complete 8-bit byte will have been processed.
6. Repeat steps 2 through 5 for the next 8-bit byte of the message. Continue doing this until all bytes have been processed.
7. The final content of the CRC register is the CRC value.
8. When the CRC is placed into the message, its upper and lower

bytes must be swapped as described below.

Placing the CRC into the message

When the 16-bit CRC (two 8-bit bytes) is transmitted in the message, the low-order byte will be transmitted first, followed by the high-order byte.

For example, if the CRC value is 1241 hex (0001 0010 0100 0001):

Addr	Func	Data count	Data	Data	Data	Data	CRC Lo	CRC Hi
							0x41	0x12

High-order byte table

/* Table of CRC values for high-order byte */

```
static unsigned char auchCRCHI[] = {
0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00,
0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1,
0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81,
0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40,
0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01,
0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0,
0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80,
0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41,
0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00,
0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0,
0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80,
0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01, 0xC0, 0x80, 0x41,
0x00, 0xC1, 0x81, 0x40, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x01,
0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1,
0x81, 0x40, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40, 0x01, 0xC0, 0x80,
0x41, 0x01, 0xC0, 0x80, 0x41, 0x00, 0xC1, 0x81, 0x40
};
```

Low-order byte table

/* Table of CRC values for low-order byte */

```
static char auchCRCLo[] = {
0x00, 0xC0, 0xC1, 0x01, 0xC3, 0x03, 0x02, 0xC2, 0xC6, 0x06, 0x07, 0xC7, 0x05,
0xC5, 0xC4, 0x04, 0xCC, 0x0C, 0x0D, 0xCD, 0x0F, 0xCF, 0xCE, 0x0E, 0x0A, 0xCA,
0xCB, 0x0B, 0xC9, 0x09, 0x08, 0xC8, 0xD8, 0x18, 0x19, 0xD9, 0x1B, 0xDB, 0xDA,
0x1A, 0x1E, 0xDE, 0xDF, 0x1F, 0xDD, 0x1D, 0x1C, 0xDC, 0x14, 0xD4, 0xD5, 0x15,
0xD7, 0x17, 0x16, 0xD6, 0xD2, 0x12, 0x13, 0xD3, 0x11, 0xD1, 0xD0, 0x10, 0xF0,
0x30, 0x31, 0xF1, 0x33, 0xF3, 0xF2, 0x32, 0x36, 0xF6, 0xF7, 0x37, 0xF5, 0x35,
0x34, 0xF4, 0x3C, 0xFC, 0xFD, 0x3D, 0xFF, 0x3F, 0x3E, 0xFE, 0xFA, 0x3A, 0x3B,
0xFB, 0x39, 0xF9, 0xF8, 0x38, 0x28, 0xE8, 0xE9, 0x29, 0xEB, 0x2B, 0x2A, 0xEA,
```

```

0xEE, 0x2E, 0x2F, 0xEF, 0x2D, 0xED, 0xEC, 0x2C, 0xE4, 0x24, 0x25, 0xE5, 0x27,
0xE7, 0xE6, 0x26, 0x22, 0xE2, 0xE3, 0x23, 0xE1, 0x21, 0x20, 0xE0, 0xA0, 0x60,
0x61, 0xA1, 0x63, 0xA3, 0xA2, 0x62, 0x66, 0xA6, 0xA7, 0x67, 0xA5, 0x65, 0x64,
0xA4, 0x6C, 0xAC, 0xAD, 0x6D, 0xAF, 0x6F, 0x6E, 0xAE, 0xAA, 0x6A, 0x6B, 0xAB,
0x69, 0xA9, 0xA8, 0x68, 0x78, 0xB8, 0xB9, 0x79, 0xBB, 0x7B, 0x7A, 0xBA, 0xBE,
0x7E, 0x7F, 0xBF, 0x7D, 0xBD, 0xBC, 0x7C, 0xB4, 0x74, 0x75, 0xB5, 0x77, 0xB7,
0xB6, 0x76, 0x72, 0xB2, 0xB3, 0x73, 0xB1, 0x71, 0x70, 0xB0, 0x50, 0x90, 0x91,
0x51, 0x93, 0x53, 0x52, 0x92, 0x96, 0x56, 0x57, 0x97, 0x55, 0x95, 0x94, 0x54,
0x9C, 0x5C, 0x5D, 0x9D, 0x5F, 0x9F, 0x9E, 0x5E, 0x5A, 0x9A, 0x9B, 0x5B, 0x99,
0x59, 0x58, 0x98, 0x88, 0x48, 0x49, 0x89, 0x4B, 0x8B, 0x8A, 0x4A, 0x4E, 0x8E,
0x8F, 0x4F, 0x8D, 0x4D, 0x4C, 0x8C, 0x44, 0x84, 0x85, 0x45, 0x87, 0x47, 0x46,
0x86, 0x82, 0x42, 0x43, 0x83, 0x41, 0x81, 0x80, 0x40
};
unsigned short CRC16(unsigned char *puchMsg, unsigned short usDataLen){
    unsigned char uchCRCHi = 0xFF;          /* high byte of CRC initialized
*/
    unsigned char uchCRCLo = 0xFF;        /* low byte of CRC initialized
*/
    unsigned uIndex ;                      /* will index into CRC lookup
table */
    while(usDataLen-->0)                  /* pass through message
buffer */
    {
        uIndex = uchCRCHi ^ *puchMsg++;   /* calculate the CRC */
        uchCRCHi = uchCRCLo ^ uchCRCHi[uIndex] ;
        uchCRCLo = uchCRCLo[uIndex] ;
    }
    return (unsigned short int)((uchCRCHi << 8) | uchCRCLo);
}

```

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