CMC SENSOR WITH MODBUS

CMC Sensor Specification

Contents

PROJECT NAME	PROJECT ID	CUSTOMER	
CMC Sensor with modbus	[Project ID]	Cerlic	
PREPARED	STATUS	SECURITY LEVEL	
J.Pöppönen	DRAFT	INTERNAL	
APPROVED	DOCUMENT KIND		
[Approved By Person] [Approval Date]	Specification		
BUSINESS LINE	DOCUMENT ID		
	S41140141		
OWNING ORGANIZATION	REVISION ID	LANGUAGE CODE	PAGE
KPM	[Revision]	en	1/10

1. Purpose and Basic Description

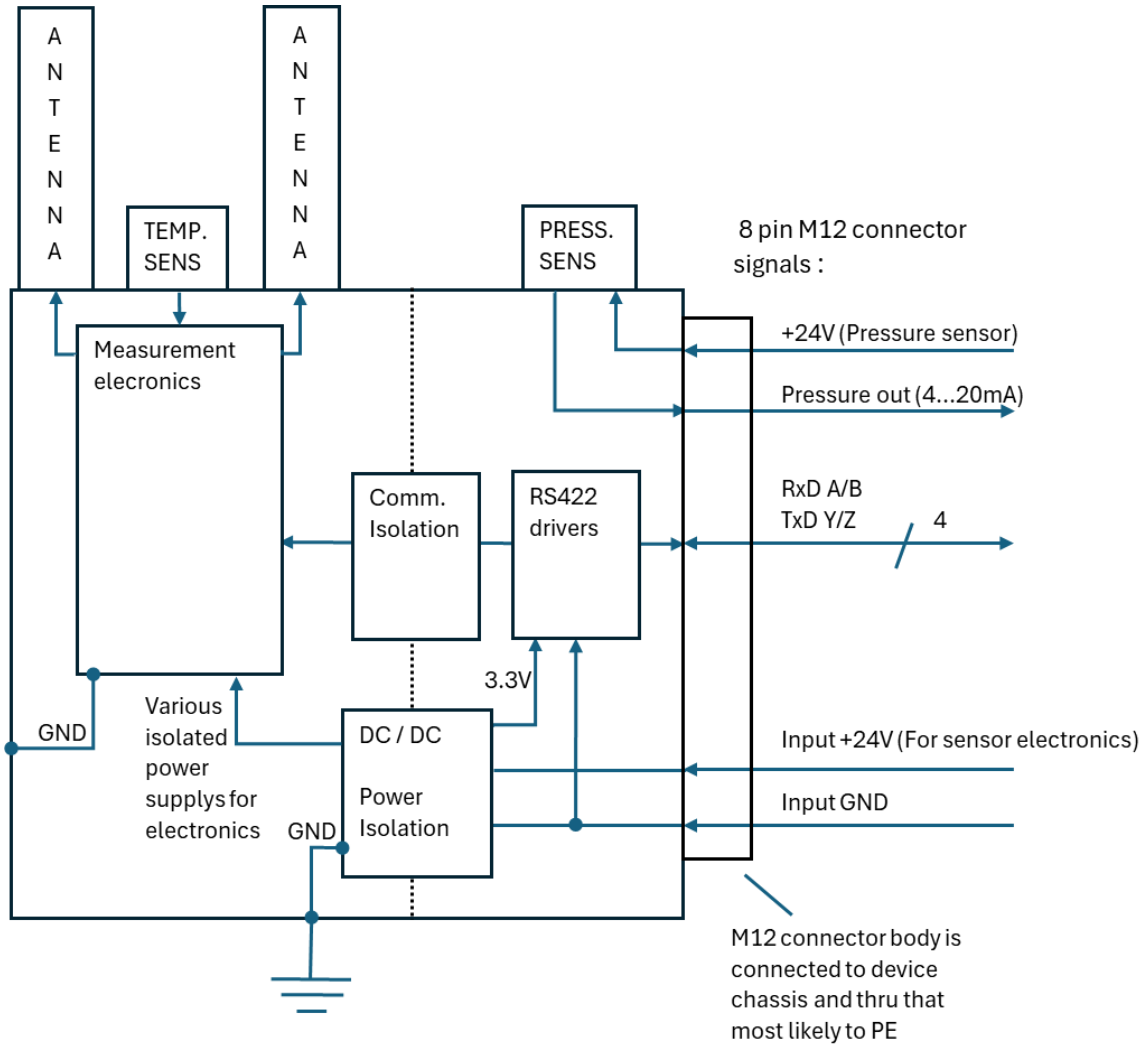
This document describes standalone CMC sensor with modbus communication. It is meant for integrators how needs to integrate CMC sensors into their systems.

The document will contain a description of the sensor's hardware level, communication and functionality.

2. Sensor Hardware

2.1. Introduction

Overall block diagram of CMC sensor:



The principle of grounding and isolation can be seen from the above picture.

2.2. Power supply

Input ground is isolated from CMC sensor chassis ground. Sensor chassis ground is used as ground for antennas and measurement electronic.

It is recommended +24V is isolated from PE ground in display unit.

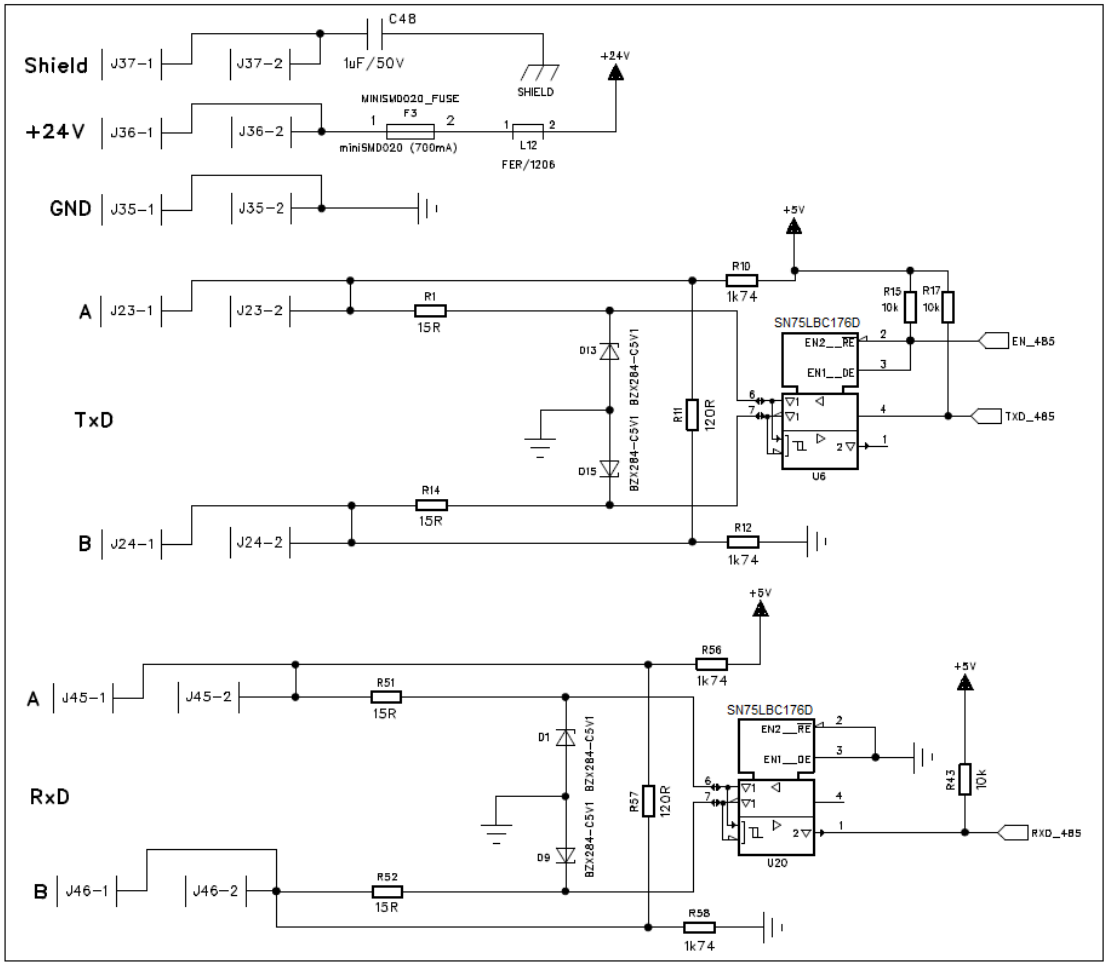
Parameter	**Value**
Supply voltage	24V
Tolerance	+-0.5V
Current consumption (typical max current)	0.5 A

2.3. Communication hardware

Sensor uses 4- wire RS422 full-duplex communication, so each sensor needs its own dedicated 4- wire interface.

Since communication is full duplex, there are no termination resistors on the sensor side.

For your reference, this is a circuit from the current CMC display unit (with physical keys, not the touchscreen model):



Notes about it:

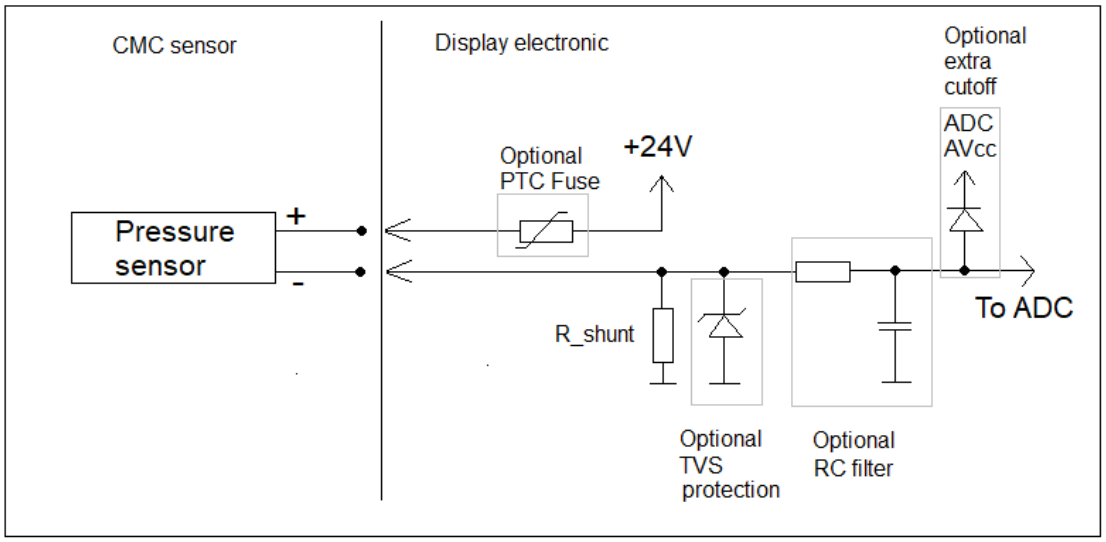
- This drawing is only for reference, and it is not intended to be copied directly, but rather to provide inspiration
- It is not mandatory to use +5V driver circuits. In this design it is so because all logic is 5V logic. In sensor side, driver circuits use +3.3V logic.
- It is recommended to use some modern driver circuit to ensure availability in the future (SN75LBC176D is EOL). Also, it is possible to use a combined chip for Tx/Rx.
- It is possible to put some FET- switch to sensor +24V feed line to make it possible to disconnect power if the sensor and reset it totally. However, the current CMC display doesn't have this option.
- Termination and biasing systems can be different. Also, Tx side enabling (EN_485) is not mandatory. It can be connected to enable transmission permanently.

2.4. Pressure sensor

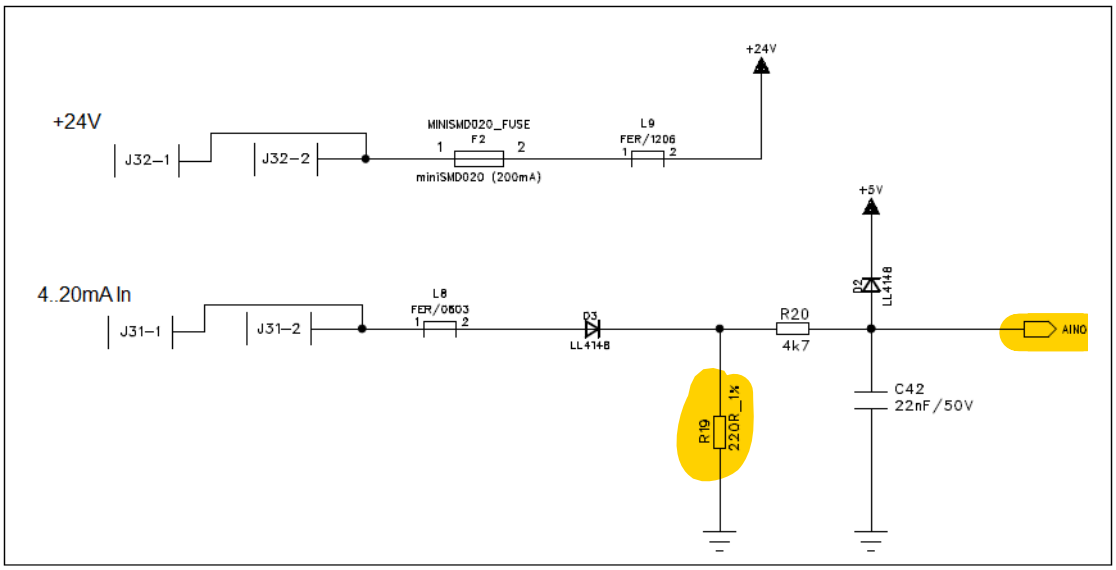
Sensor includes pressure sensor for pipe water pressure. Sensor needs +24V supply. Pressure signal is then sent back to display with 4…20mA current. The pressure sensor can share the same ground with communication and sensor power supply.

Sensor current output is scaled to 0 – 10 bars.

Basic circuit as reference:



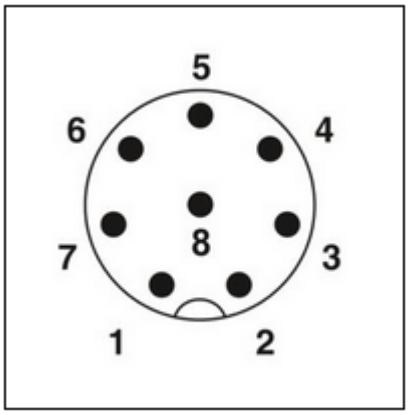
Reference circuit from current CMC display:



- The circuit is multipurpose, so it is not intended to be copied directly, but rather to provide inspiration
- Note that Rshunt (R19) is calculated for 0…5V Adc input range.

2.5. Sensor physical connector

CMC sensor physical connector is 8 pin A coded M12 male. The Connector type in sensor is SACC-EM12MS-8CON-M16/0,5 VA



M12 pin	Signal in sensor side	Note
1	+24V feed/sensor electronic	
2	Ground	
3	RxD A	Connect to TxD Y (A) at display
4	RxD B	Connect to TxD Z (B) at display
5	TxD Y	Connect to RxD A at display
6	TxD Z	Connect to RxD B at display
7	Pressure sensor 4…20mA output	
8	+24V feed/pressure sensor	The pressure sensor 24V must be fed through this pin. Supply pins are not connected inside of sensor, so pins 1 and 8 need to be fed separately.

It is recommended to use shielded cable!

However, it is not allowed to make PE ground loop through the sensor cable shield. It is recommended to use 1uF/min 50V capacitor between cable shield and PE ground in the display unit to block low frequency loop currents.

2.6. Sensor cable

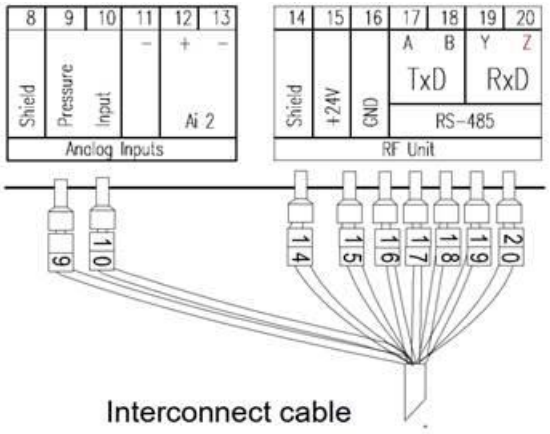
Currently, there are two solutions available to connect CMC sensor to ABB display unit.

2.6.1. M12 on the other end only (old-style)

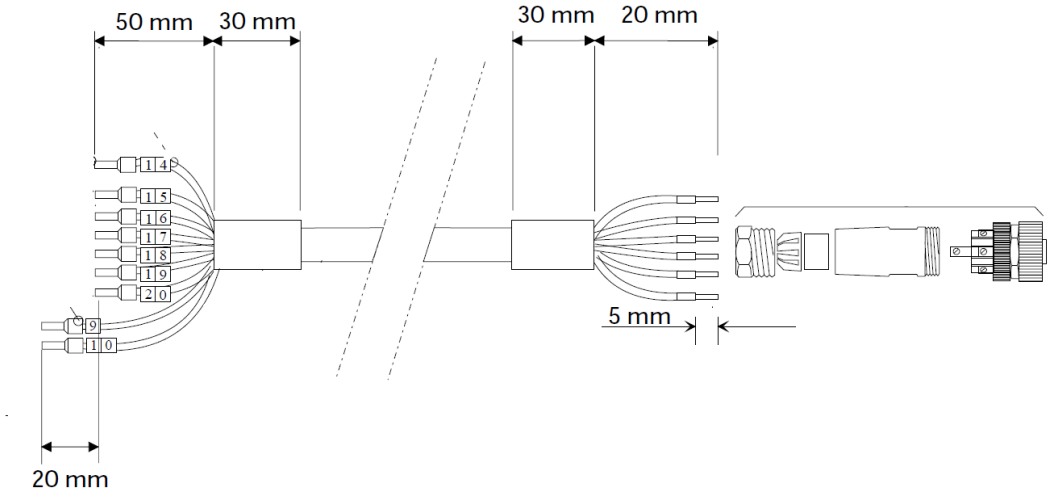
In this option, the display unit must have connector terminals on the PCB for the wires.

For example, Phoenix MKDSP 1,5/ x-5,08 (x is position count) is suitable. As minimal,1.5mm2 terminal is needed since shield- signal wire is thicker than other wires.

Connection to the current display unit, as a reference:



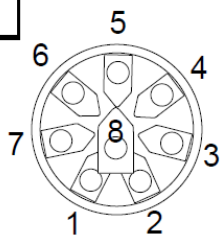
Dimensions:



Signals/colors:

Free end number	Signal (From sensor perspective)	Color LiYCY 8 x 0.25	Phoenix SACC-M12FS-8CON-PG9-M pin nr
14		Shield	
15	+24 (sensor)	White	1
16	GND	Brown	2
17	RxD A	Green	3
18	RxD B	Yellow	4
19	TxD Y	Grey	5
20	TxD Z	Pink	6
10	Pressure Out	Blue	7
9	Pressure +24V	Red	8

M12 connects (from behind)



In the display unit, Shield-signal must be connected to the PE ground through 1uF/min 50V capacitor

2.6.2. M12 on both ends

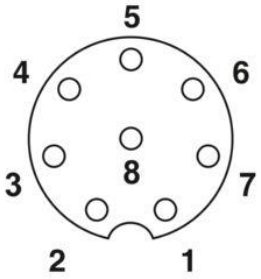
Other possibility is to use ready 8 pin male- female M12 cable.

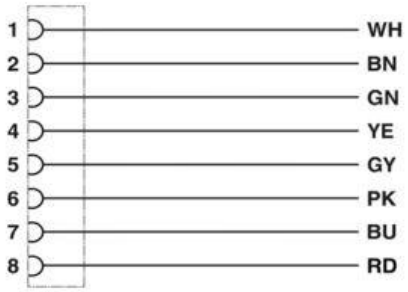
This cable is used in ABB new KC7 display: Phoenix SAC-8P-M12MS/10-28X/M12FSSHOD

It is 10 meters long.

For this cable, one suitable 8 pin A coded female M12 connector for this cable is Phoenix SACC-E-M12FS-8CON-M16/0,5 VAX

It has free end wires so it can be connected to some header of display unit adapter PCB.





3. Communication

3.1. Protocol

Sensor uses Modbus RTU protocol. The communication baud rate is 9K6 with 8 data bit, no parity and one stop bit.

3.2. Implemented modbus commands

TBD

4. Functional description

TBD

5. References

5.1. List of related documents

Ref #	Title, Link	Document ID
1		
2		
3		
4		
5		

6. Revision history

Revision	Page (P) Chapt. (C)	Description	Date Dept./Init.
0.1		First version created	13.1.2025