**SECTION 40 75 05**

**Multi-Parameter Analyzer Transmitter**

1. **General**

# SUMMARY

* + 1. Requirements for multi-parameter analytical measurement transmitter with up to eight inductively-coupled digital sensor inputs and/or fixed-cable with Memosens protocol sensor inputs for use with Memosens inductively-coupled sensors and/or fixed cable sensors using Memosens protocol. Transmitter to be modular and multi-parameter, and to be available as both a field instrument and a DIN-rail configuration.
    2. Related Sections
       1. Control and Information Systems Scope and General Requirements.
       2. Power Instruments, General.
  1. **SUBMITTALS**
     1. Furnish complete Product Data, Shop Drawings, Test Reports, Operating Manuals, Record Drawings, Manufacturer’s certifications, Manufacturer’s Field Reports.
        1. Dimensional Drawings.
        2. Materials of Construction.
        3. Enclosure Rating.
        4. Classification Rating.
        5. Power.
        6. Output options.
  2. **QUALITY ASSURANCE**
     1. Manufacturing facilities certified to the quality standards of ISO Standard 9001 - Quality Systems - Model for Quality Assurance in Design/Development, Production, Installation, and Servicing.
  3. **DELIVERY, STORAGE, AND HANDLING**
     1. Store all instruments in a dedicated structure with space conditioning to meet the recommended storage requirements provided by the manufacturer.
     2. Any instruments that are not stored in strict conformance with the manufacturer’s recommendation shall be replaced.
  4. **PROJECT OR SITE CONDITIONS**
     1. Provide instruments suitable for the installed site conditions including but not limited to material compatibility, site altitude, process and ambient temperature, and humidity conditions.
  5. **WARRANTY**
     1. The transmitter shall have standard one year warranty from date of shipment and if the measurement system is commissioned by a factory certified technician, the warranty is extended to three years from the date of shipment.
  6. **MAINTENANCE**
     1. Provide all parts, necessary for maintenance and calibration purposes throughout the warranty period. Deliver all of these supplies before project substantial completion.
  7. **LIFECYCLE MANAGEMENT**
     1. Instrument documentation, like original calibration certificates, manuals and product status information shall be accessed via a web enabled system with a license. The instrument-specific information shall be accessed via its serial number. When services are provided by an authorized service provider the services information like subsequent field calibrations shall be archived and accessible via this web enabled system.

1. **Products**
   1. **SYSTEMS/ASSEMBLIES**
      1. Manufacturer
         1. Endress+Hauser Liquiline CM44x/CM44xR digital transmitter.
      2. Performance Criteria
         1. Current outputs, (up to eight current inputs and outputs).
            1. Active; 0- 23 mA, linear
         2. Current inputs.
            1. Passive, 0-20 mA.
         3. Relay outputs.
            1. NO/NC, 24 VDC to 230 VDC, 0.1 to 2 amp.
         4. Discrete Inputs/Outputs.
            1. Input: Passive, pulse width 500 µs at 1 kHz. Input high= 1-30 VDC, low = 0-5 VDC.
            2. Output: Open collector, 30 V max., 15 mA.
      3. Certifications
         1. CE mark
         2. cCSAus
         3. FM/CSA (CM442 only) Class I, Div. 2.
         4. MCERTS (CM442 only).
      4. Environment
         1. Ambient Temperature
            1. One or two sensor inputs (CM442): -4 to 140°F (-20 to +60°C).
            2. Up to four sensor inputs (CM444): Generally -4 to +130°F (-20 to +55°C). See Technical documentation for exceptions (-4 to +120°F (-20 to +50°C)).
            3. Five to eight sensor inputs (CM448): Generally -4 to 130°F (-20 to 55°C). See technical documentation for exceptions (-4 to +120°F (-20 to +50°C)).
         2. Relative humidity: 10 to 95%, non-condensing.
   2. **MANUFACTURED UNITS**
      1. Endress+Hauser CM442, CM444 or CM448 Multi-parameter Transmitter/Controller.
         1. The transmitter/controller allows sensors to be “hot swapped” and recognized without the need to reset or power down the system. (Only ultrasonic interface sensor inputs must be predefined with all other sensor inputs automatically recognized upon connection, following initial configuration.)
         2. The transmitter/controller provides connections for up to 27 different Endress+Hauser digital Memosens® protocol-based sensors in addition to Memosens sensors from other manufacturers.
         3. The transmitter/controller has the following power requirements:
            1. Standard: Universal AC powered: 100 to 230 VAC ±15%, 50/60 Hz:

CM442: <55 VA for all configurations.

CM444/CM448: <73 VA for all configurations.

* + - * 1. Optional: 24 V powered: 24 V AC/DC ±20%, 50/60 Hz (for CM442 ONLY).

CM442: <22 watts for all configurations.

* + - 1. The transmitter/controller uses a menu-driven operating system with context sensitive “soft” keys.
      2. The transmitter/controller uses a back-lit, transflective graphic display with red display background to indicate critical alarms.
      3. The transmitter/controller includes a real-time clock that is backed up by a user replaceable, commercially available watch-style battery.
      4. The transmitter/controller has user security features.
      5. The transmitter/controller has internal memory for up to 150,000 data points per data log and allows up to eight data logs to be configured by the user for any available parameters with data scan rate definable from one second up to one hour per data point. Data logs shall be downloaded to customer provided SD card in CSV or FDM file formats. Data logs shall also be displayed in list and graphic formats on the transmitter/controller display.
      6. The transmitter/controller includes a built-in industrial SD flash drive card reader to facilitate sensor and transmitter/controller firmware updates/upgrades, downloading data, event, configuration and calibration logs, backing up complete configurations, and copying configurations to multiple devices via industrial SD card with up to 2 GB capacity.
      7. One user-definable, fully programmable SPDT alarm relay is provided and rated at 0.5 amp for a minimum of 450,000 cycles with switching voltage of 230 VAC; 650,000 cycles with switching voltage of 115 VAC; and 350,000 with switching voltage of 24 VDC.
      8. Up to four fully user-definable, fully programmable SPDT relay outputs are available with rating up to 2 amps for a minimum of 120,000 cycles with switching voltage of 230 VAC; 170,000 cycles with switching voltage of 115 VAC; and 150,000 with switching voltage of 24 VDC.
      9. The transmitter/controller shall be equipped or upgraded to a maximum total of eight 4-20 mA outputs with a maximum load of 500 ohms per output, depending on the module configuration.
      10. The transmitter/controller is available with or shall be field-upgraded to include Ethernet configuration via a TCP port combined with two-way communication with DCS or SCADA system via one of the following field-selectable (via activation code) communication protocols.
          1. HART®
          2. MODBUS RS-485
          3. MODBUS TCP
          4. PROFIBUS® DP (with PROFIBUS-PA Profile 3.0 Certification)
          5. EtherNet/IP

EtherNet/IP communication shall be supported with the Electronic Data Sheet (EDS) file available for download directly from the sampler. The Add-On Profile (AOP) for integration shall be a Level 3 profile to simplify control system integration.

The EtherNet/IP communications shall also be supported with Add-on Instructions (AOI) files and pre-configured faceplates for ease of control system integration.

* + - 1. The transmitter/controller continuously monitors:
         1. Current input overload.
         2. Current output value monitoring and verification.
         3. Board voltages and temperatures.
      2. The transmitter/controller includes a sensor (SCS) and process checking systems (PCS) to continuously monitor, detect and flag when necessary, sensor measurement reliability.
         1. Sensor check system (SCS): Monitors pH sensor glass impedance to determine if the glass impedance has shifted significantly as is commonly caused by breakage, drying out of excessive wear.
         2. Process check system (PCS): Triggers alarm if measuring signal from a sensor does not change over a preset period of time. This function is useful to detect that a sensor is fouled, a sensor has failed or that there is an unusual process condition.
      3. The transmitter will connect to sensors using a measuring cable.
         1. Memosens data cable CYK10 for digital sensors with Memosens digital technology.
         2. Memosens data cable CYK11 - Extension cable for digital sensors with Memosens digital protocol.
    1. The transmitter shall be capable of connecting to a variety of digital analytical sensors;
       1. Glass electrodes
          1. Orbisint® CPS11D
          2. Memosens CPS31D
          3. Ceraliquid CPS41D
          4. Ceragel CPS71D
          5. Orbipore CPS91D
          6. Orbipac CPF81D
       2. Enamel pH electrodes
          1. Ceramax CPS341D
       3. ORP sensors
          1. Orbisint CPS12D
          2. Ceraliquid CPS42D
          3. Ceragel CPS72D
          4. Orbipac CPF82D
          5. Orbipore CPS92D
       4. pH ISFET sensors
          1. Tophit CPS471D
          2. Tophit CPS441D
          3. Tophit CPS491D
       5. pH and ORP combined sensors
          1. Memosens CPS16D
          2. Memosens CPS76D
          3. Memosens CPS96D
       6. Inductive conductivity sensors
          1. Indumax CLS50D
          2. Indumax CLS54D
       7. Conductive conductivity sensors
          1. Condumax CLS15D
          2. Condumax CLS16D
          3. Condumax CLS21D
          4. Memosens CLS82D
       8. Oxygen sensors
          1. Oxymax COS51D
          2. Oxymax COS61D
          3. Oxymax COS22D
          4. Memosens COS81D
       9. Chlorine sensors
          1. CCS142D
       10. Ion selective sensors
           1. ISEmax CAS40D
       11. Turbidity sensors
           1. Turbimax CUS51D
           2. Turbimax CUS52D
       12. SAC and nitrate sensors
           1. Viomax CAS51D
       13. Interface measurement
           1. Turbimax CUS71D
  1. **ACCESSORIES**
     1. Weather protective cover.
     2. Post mounting kit.
     3. Additional functionality
        1. Hardware extension modules
        2. Firmware and activation codes
     4. Software
        1. Memobase Plus CYP71D
        2. Field Data Manager Software MS30
     5. SD card
     6. M12 socket and cable junction
     7. Communication-specific accessories
        1. Commubox FXA195 HART
        2. Commubox FXA291
        3. WirelessHART® adapter SWA70
        4. Fieldgate® FXA320
        5. Fieldgate FXA520
  2. **SAFETY**
     1. All electrical equipment shall meet the requirements of ANSI/NFPA 70, National Electrical Code latest addition.
     2. Electrical equipment housing shall conform to NEMA 4X classification.
     3. When meeting an electrical approval the transmitter shall be approved by a Nationally Recognized Testing Laboratory (NRTL) such as FM, UL, ETL, CSA, etc., for the specified electrical area classification.

1. **Execution**
   1. **EXAMINATION**
      1. Examine the complete set of plans, the process fluids, pressures, and temperatures and furnish instruments that are compatible with installed process condition.
      2. Examine the installation location for the instrument and verify that the instrument will work properly when installed.
   2. **INSTALLATION**
      1. Contractor shall install the transmitter and sensor in strict accordance with the manufacturer’s instructions and recommendation.
      2. The standard one-year warranty against manufacturing defects is extended to three-years on covered equipment if paid start-up service is accomplished on that covered equipment by an authorized service provider.
      3. Coordinate the installation with all trades to ensure that the mechanical system has all necessary appurtenances for proper installation of instruments.
         1. General contractor.
         2. Electrical or Instrumentation contractor.
         3. Factory trained authorized service provider or representative.
         4. Site (owner/operator) personnel.
         5. Engineer.
   3. **FIELD QUALITY CONTROL**
      1. Each instrument shall be tested before commissioning and the ENGINEER shall witness the interface capability in the PLC control system and associated registers.
         1. Each instrument shall provide direct programming capability through the PLC.
         2. Each instrument shall provide direct control of totalizer reset functions through the PLC.
         3. Each instrument shall be supported with a device profile permitting direct integration in the PLC.
      2. The ENGINEER shall witness all instrument verifications in the field.
      3. Manufacturers Field Services are available for start-up and commissioning by a Factory field service representative or a manufacturer Authorized Service Provider (ASP) – the warranty against manufacturing defects is three years.
         1. Manufacturer representative shall verify installation of all installed flow tubes and transmitters.
         2. Manufacturer representative shall notify the ENGINEER in writing of any problems or discrepancies and proposed solutions.
         3. Manufacturer representative shall generate a configuration report for each meter.
   4. **ADJUSTING**
      1. Verify factory calibration of all instruments in accordance with the Manufacturer’s instructions.
   5. **PROTECTION**
      1. All instruments shall be fully protected after installation and before commissioning. Replace any instruments damaged before commissioning.
         1. The ENGINEER shall be the sole party responsible for determining the corrective measures.