

SPECIFICATIONS
&
SPECIAL CONDITIONS
FOR
INSTALLATION OF
SILVER IONIZATION
&
BULK METER

WATER SUPPLY & SANITATION
DEPARTMENT PUNJAB

SILVER IONIZATION

TECHNICAL SPECIFICATIONS OF SILVER IONIZATION

A) MICRO PROCESSOR BASED CONTROL SYSTEM

- I. The control should work on a single phase 220 V/50 Hz power supply and should be housed in a metallic box of 18 SWG thickness. The box should be fully powder coated and weather proof. It should have a seven segment display with display driver. The equipment should be capable of working continuously for 24 hours and 365 days a year.
- II. The equipment should be automatically switch ON when the pump is switched on.
- III. The pump Active signal should ON when the pump starts running.
- IV. The booster pump start automatically when the pump starts.
- V. The water should flow through the flow meter and it should be indicated by the rotation of the wheel.
- VI. It should have a seven segment display for setting the actual flow in the pumping main
- VII. The dosage should automatically be set when the light emitting diode is set in the required - M³/ Hr. The light emitting diode set should stay constant even when the power goes and comes back again.
- VIII. The control should indicate SIGNAL when there is accumulation of dirt/scale formation on the electrode.
- IX. The control should give a BEEP sound when there is a short circuit of electrode.
- X. The water chamber must be constructed of stainless Steel and should use only investment casting SS 304 material with SS 304 Pipes.
- XI. The chambers must be non corrosive and should not leave any harmful by products.
- XII. Chamber shall be made of SS 304 investment casting material and should have single chamber or double chamber as per capacity of the silver ionization plant.
- XIII. Water chamber should have high quality Ball Valves for easy operation.

OTHER SPECIFICATIONS / CONDITION ARE AS UNDER:

1. The electrodes should be fixed on anti-corrosive material.
2. The composition of Electrode should be Non Toxic and hazard free.
3. The electrode should be made of 99.9% pure silver and it should under go proper metallurgical treatment and chemical treatment for dissipation of minute ionic disinfection.
4. The disinfectant should able to kill bacteria etc.
5. The electrode life should be mentioned in million litres as per below table.

S.N	Electrode for Plant Capacity	Life of Electrodes @ 0.01 PPM
		10 Million Litres
1	5000 LPH	20 Million Litres
2	15000 LPH	30 Million Litres
3	25000 LPH	60 Million Litres
4	50000 LPH	100 Million Litres
5	100000 LPH	150 Million Litres
6	150000 LPH	200 Million Litres
7	200000 LPH	300 Million Litres
8	300000 LPH	400 Million Litres
9	400000 LPH	500 Million Litres
10	500000 LPH	

6. The residual effect of the disinfectant must be present for at least 2 days.
7. The electrode assembly must be able to be removed and fixed by lay men. Necessary spanner must be provided.
8. The disinfectant must not leave any bad smell or taste.
9. The equipment should have all safety features for Voltage fluctuation and change indirection of current.
10. The equipment should have miniature circuit breaker of reputed make with necessary fuses in the control box.
11. The control panel water chamber electrodes and controls switches must be placed in a powder coated M.S fabricated box of 20 SWG.
12. It should have locks with universal Key forsafety.
13. The equipment must be wall mountable or fixed on a platform bed.
14. The equipment must have a multiform chord with plug for plugging in socket.
15. Necessary instructions for operation and maintenance must be pasted inside the equipment.
16. The disinfected water should not contain any coliform as per IS: 10500 even at the tail end.
17. The residual effect should be present at the tail end also.
18. Test Kit must be supplied along with the equipment to do a minimum of 10 tests.
19. The tenderer must mention the life of electrode in million litres dosage of 0.01 PPM.

20. Installations charges will be quote separately for all capacities of plant Electricity connections and proper space for installation will be provided by the department.
21. Tenderer must indicate Weight of Silver electrode to be supplied with the equipment (being costly metal) & for transparency name of the supplier Weight of silver rod & its purity should be engraved upon the silver rod whether to be supplied with the plant or separately.
22. Tenderer must quote the prices of each capacity of plant separately.
23. Tenderer must quote the price of electrodes for each capacity & plant separately.
24. Tenderer must quote the price of test kit carry out the minimum ten tests separately.
25. The plant to have minimum 2 years guarantee / warranty from the date of supply against all manufacturing defects.
26. The supplier shall also be required to submit an undertaking for maintenance support during guarantee period and undertaking for availability of spares for a minimum period for three years.
27. Any damage to the equipment during transit or installing shall be contractor's responsibility.
28. Detailed literature indicating the specification working of the apparatus and installation instructions shall accompany the offer.
29. Tenderer must provide appropriate literature along with the plant clearly specifying.
 - a) Designed dosage at the plant in parts per billion.
 - b) Required dosage at the tail end for effective disinfection in PPB.
30. The tenderer must submit a fresh representative unit of _____ litres per hour capacity of Silver Ionization Plant with Silver electrode and testing kit.
31. The tenderer must provide authority letter of the principal manufactures and signed by the Managing Director, Partner and proprietor of the company.
32. Tenderer should give guarantee with the time line regarding supply of economically viable test kits for testing of residual silver ions.
33. The tenderer shall specify the dimensions of the electrodes clearly. The dimensions of the silver plate/rod along with its weight shall also be indicated clearly.
34. The Department may get the material i.e. SS 304 / Silver etc tested from any suitable lab.

Makes as approved by COS Punjab

BULK FLOW WATER METER

DESIGN REQUIREMENTS FOR ELECTROMAGNETIC FLOW METER

1.0 DESIGN REQUIREMENTS FOR INSTRUMENTS

- (a) All system shall be designed, manufactured, installed and tested to ensure the high standards of operational reliability. Instruments mounted in field and on panels shall be suitable for continuous operation. All electronic components shall be adequately rated and circuits shall be designed so that change of component characteristics shall not affect the operation of meter.
- (b) All equipment shall be new, of proven design, reputed make, and shall be suitable for continuous operation. Unless otherwise specified, all instruments shall be tropicalised. The outdoor equipment shall be tropicalised. The outdoor equipment shall be designed to withstand tropical rain.
- (c) Electronic instruments shall utilize solid state electronic components, integrated circuits, microprocessors, etc. and shall be of proven design.
- (d) No custom made hybrid type lcs [integrated Circuits] shall be used in any circuit in Instrumentation. Any hybrid circuits or sealed modules or devices which do not have alternative manufacturer shall be disclosed in the Bid by Contractor, so that such devices can be included as component spares in sufficient quantity in advance.
- (e) For transmitting instruments, output signal shall be 4-20 MADC linear having two wire system and RS 232 digital output.
- (f) Unless otherwise stated, overall accuracy of all measurement systems shall be $\pm 0.5\%$ of measured value and repeatability.
- (g) Unless otherwise specified, the normal working range of all indicating instruments shall be between 25% and 80% of the full scale range.
- (h) After a power failure, when power supply resumes, the instruments and associated equipment shall start working automatically without affecting the readings.
- (i) The instruments shall be designed to permit maximum interchange ability of parts and ease of access during inspection and maintenance.
- (j) The field instruments i.e. the instruments mounted outside the control panel shall be mounted conveniently on platform preferably 300mm height.
- (k) Unless otherwise stated, field mounted electrical and electronic instruments shall be weatherproof to IP-65.
- (l) The instruments shall be designed to work at the ambient conditions of temperature 0 to 50^o C, humidity (maximum 95%), and chlorine contamination that may prevail. The instruments shall be given enough protection against corrosion.

- (m) Lockable enclosure shall be provided for all the field mounted instruments for proper protection.
- (n) All field instruments and cabinets/panel mounted instruments shall have tag plates/name plates permanently attached to them.
- (o) The performance of all instruments shall be unaffected for the $\pm 10\%$ variation in supply voltage and $\pm 5\%$ variation in frequency.
- (p) Unless otherwise specified, double compression glands shall be used for gladding the cable in field instruments and instrument control panel.
- (q) Flow transmitters shall be provided with test and diagnostic facilities.
- (r) All wetted parts of the flow meter shall be as per specification suitable for potable water with presence of chlorine.
- (s) The flow meters and flow indicators integrators associated with the flow meters shall be microprocessor based. The Bidder shall ensure the straight length requirements of pipeline at the place of installation of flow meters as per manufacturer recommendations and relevant ISO.

2 TECHNICAL DETAILS

The flow meters shall be suitable for water application having chlorine content. For the flow meters on pipelines the design maximum line pressure shall be 10 Kg/cm². The maximum ambient temperature shall be upto 50°C.

3. Full Bore Electromagnetic Flow meter

- (a) Full bore electromagnetic flow meter shall consist of flow sensor i.e. flow tube and flow transmitter. To ensure full electromagnetic compatibility the flow tube flanges and transmitter housing shall be property earthed with grounding rings.
- (b) The flow transmitter indicator cum integrator shall be mounted in a suitable local control panel to be located in the pump house or near by building as required by MCC near the meter as per the site feasibility.
- (c) Flow meter shall be designed, manufactured and calibrated as per relevant ISO 9104 standards. The full bore electromagnetic flow meter shall have bi-directional measurement and with accuracy better or equal to $\pm 0.5\%$ of measured value inclusive of linearity repeatability, pressure effect. Etc.
- (d) Flow transmitter should be microprocessor based having 2 or 3 lines digital display with rate in indications and totalized values with the configuration facility from the front facia.
- (e) Life of the full bore electromagnetic flow meter is desired to be not less than 20 years.
- (f) Material of construction of the various inserts of flow meters shall be as per detail given below. The flow meter shall be suitable for functioning for potable water and chlorinated water applications.

(g) For applicant details such as line size, pipe material, maximum flow and flow range refer details below:

- a) Line size _____ b) Pipe material _____
c) Maximum Flow _____ d) Flow Range _____

2. General

- (i) Service : Potable water with chlorine contents
(ii) Temperature : 4deg. to 50 deg. Centigrade
(iii) Overall accuracy : $\pm 0.5\%$ of measured value including of measurement loop linearity repeatability.
(iv) Size of meter : -----mm

3. Flow Tube

- (i) Mounting : In field on horizontal pipe lines
(ii) Material of lining of flow tube : Hard rubber
Meter tube : SS 304
(iii) Coil Housing : Stainless steel (in case of other than S.S. coil housing separate SS. Cladding of 2.0 mm thick sheet is required) Fully welded construction.
(iv) Grounding rings : Stainless steel
(v) Process connection : Flanged PN 10 bar upto 1200 mm size for Chandigarh and PN 15 bar for Kajauli
(vi) Weather protection for flow sensor (flow tube) : IP 68
(vii) Bi-directional flow measurement : Required

(j) Flow indicator cum Integrator (signal converter)

- (i) Type : Microprocessor based
(ii) Weather protection class : IP 65

(iii)	Output	:	4-20 MA CD (Isolated)
(iv)	Display on transmitter for flow rate and totalized flow	:	Digital, seven segment back-lit LCD display, minimum 7 digit totalized
(v)	Unit of display	:	Flow rate -m ³ /hr Totalized flow-ML, (Programmable)
	Programming		Fully programmable front the front face plate using keypad.
(vi)	Power supply	:	From the control panel 90-260 V AC, SMPS
(vii)	Battery backup for totalized flow	:	Required
(viii)	Self diagnostic feature	:	Required
(ix)	Empty pipe detection	:	Required
(x)	Language	:	English

Note : MOC of coil housing as been asked for as SS. However in case the tenderer is offering meters with SS Cladding than a certificate from the manufacturer will also be given that performance accuracy of meter will not changed after cladding.

4. Control Panel

The flow signals converter, inverter with battery, LPU MCBs, switches shall be housed in the suitable panel. The panel shall be constructed from sheet of minimum 2.0 mm thick powder coated and approved colour shade. The size of control panels shall be adequate to house the flow transmitters, MCBs and associated accessories at each location but not less than 600 mm x 600 mm x 1000 mm with Epoxy painting the panel shall be having double door for proper weather proofing and should be with lockable arrangement.

Separate dual pole MCBs shall be provided in the power supply line for each equipment such as flow signal converter. The weather protection class for the control panel shall be minimum IP 54.

5. Signal and Power Supply Cables

The specifications for cables for power supply and signal of flow measuring system shall be as given below:

(a) **Signal Cables**

Cables of 660 V/1100 V grade, twisted two pair cable, annealed, tinned, high conductivity 1.0 sq. mm stranded copper conductor extruded PVC insulated two cores twisted into pair, laid up collectively, individual pair shielded and overall shielded with aluminium mylar tape, ATC drain wire run continuously in contact with aluminium side of the tape, inner sheath with extruded PVC, armored with galvanized steel wire and overall sheathed with extruded FRLS PVC conforming to ISO standard. The cable shall be capable of transmitting low voltage signal from the primary head to the signal converter. The cable should be resistance to interference from external magnetic fields and India interference signal. The cable should be suitable for direct burial installation and for operation in submerged situation. The sensor cable from sensor to the transmitter is to be provided as per site requirement. However for coating purpose 50 meters length may be considered with each flow meters. However unit rate also given be adjustment if any.

b) **Power Supply Cables:**

Cables of 660 V / 1100 V grade, multicore cable, annealed, tinned, high conductivity .5 sq. mm standard copper conductor extruded PVC insulated, inner sheath with extruded PVC, armored with galvanized steel wire and outer sheath with extruded FRLS PVC conforming to BIS : 1554.

The incoming power supply cables for inverter and control panels shall be adequately sized by the contractor as per the load requirement.

(c) **Special Cables**

In case any special cable is required between the flow sensor and flow transmitter the same shall be supplied as recommended by the flow meter manufacturer. However, the same shall also be armored with galvanized steel wire.

The cables which are laid outdoor shall be laid buried under ground and inside the building the cables shall be laid in the cable trays/GI conduit. Contractor shall follow standard engineering practice for laying of cables.

All installation hardware such as cable glands, lugs, cable trays, GI conduits, flexible GI conduits, sleeves, ferrules, steel supports, clamps, etc. shall be in the scope of vendor.

At few sites the estimated maximum distance between the location of flow sensors and control panels may be around 300 meters. The bidders shall take a note of it and quote accordingly.

6. **Lightning Protection Units**

2 nos. Lightning Protection Units (LPUs) shall be provided for each unit. The LPUs shall be connected to earth. The LPUs shall be suitable for arresting the surge arising out of high energy static discharge/lightning strikes and protect the instrument from any damage. LPUs shall provide three stage of protection through a gas discharge tube,

quick acting semiconductor like transorb, zener diodes, varistors and an automatic discharge and reset circuit. LPUs shall be a passive unit and shall require no power for its operation. During a lightning strike it shall clamp on the allowable voltage and pass the resultant current to the ground. The LPU shall operate without in any way affecting normal operation i.e. they should pass signals without attenuation while diverting surge currents safely to earth and clamping output voltages to specific levels. LPUs shall be of self resetting type to minimize the downtime of the measurement loop. LPUs shall have a weatherproof casing and shall be suitable for connecting in 4 to 20 mA. DC signal lines and power supply lines. There should be total isolation between input, output and ground terminals. LPUs shall have a minimum surge rating of 10 kA.

7. Dismantling Joint (if required ; to be quoted separately)

- (a) Dismantling joint shall be designed such that adequate space can be created by collapsing the dismantling joints, for removal and for reinstallation of adjacent equipment. The size of dismantling joint shall be equal to the size of flow meter.
- (b) Dismantling joints shall have end, thrust and follower flanges and rubber sealing ring. Tie rods shall be provided for right fixing after installation to enable transmission of thrust.
- (c) Tie rods shall be provided for at least 25% to 30% of the number of bolt holes.
- (d) With the use of dismantling joints it shall be possible to have a clearance of at least 25mm with the adjoining fitting.
- (e) The body and flanges shall be as per BIS 2062 and seal shall be of EPDM rubber. Tie rods, bolts, nuts and washers shall be of SS 316.
- (f) The number of dismantling joint shall be equal to the nos. of flow meter.
- (g) Sample of dismantling joints shall be offered for visual inspection before shipment at site.
- (h) Thickness of the flange shall be as per BIS-6392 or as per manufacturer standard matching 10 Bar rating
- (i) All dismantling joints shall be checked for correctness in respect of face to face dimensions (installation length), flange details and weld end preparations details.
- (j) Flanges of the size of existing pipe line shall be provided for mounting of all full bore electromagnetic flow meters.

7. UPS

UPS of adequate capacity with 8 hour backup as under

Micro controller based digital inverter

Out put voltage : 220 ± 5

Output form : Pure sine wave

Charger : 1 Amp.

Peak load : 30 VA

Batteries : Should be sealed maintenance free app. 26/28 Amp House suitable for 8 hours backup

8. EARTHING

The contractor shall make suitable grounding pits for earthing for each meter as required. Two nos of grounding rings shall be provided in lined pipes are otherwise grounding electrodes may be provided. However the responsibility of proper earthing system for the instruments/equipments will be of contractor only.

9. NUTS AND BOLTS

Nuts, bolts & washers shall be of best quality carbon steel of SS-316, machined on the shank and under the head shall be accurate length so that only one thread shall show through the nut in the fully tightened condition MOC will be as under.

Bolts : SS 316

Nuts : SS 304

Washers : SS 304

10. RUBBER GASKET

The flat rubber gasket shall be 3.6 mm dual thickness of SBR material and shall be suitable for making flange joints. The qualities of flat rubber gasket shall be as per BIS : 5382.

11. GI PIPE

The galvanized iron pipes and fitting (tees, sockets, elbows, union, end plug) shall be supplied as per requirement in accordance with BIS : 1239 part – I and part-II . The GI pipes class B shall be used as a conduit pipe for signal/power between primary head and signal converter. The nominal dia may be 20 mm or 25 mm as per requirement.

12. SPECIAL AND FITTINGS

It is proposed to install the meters on the exiting trunk /rising mains of various pipe material such as Pre-stressed concrete pipes (PSC), Cast iron (CI), Ductile iron (DI) Mild steel (MS) etc. All the meters shall be installed using MS fittings only, with proper protection from corrosion by applying two coats of epoxy paints followed by primer coat.

The total thickness of the paint shall not be less than 400 micron. All the flange fittings shall be installed with a proper rubber gasket for water tight joints. Tapers to be provided may be centric or eccentric as per site requirement. The angle of tapers should not be more than 4 degrees on each side. Minimum of thickness of MS pipe and tapers will be as specified in schedule of quantity of DNIT.

13. INSTALLATION

The contractor is to plan the final location for installation of the meters on individuals sites. As per the recommendation of the manufacturer. He shall prepare the proposal in accordance to the specifications of the equipment and submit the details to the Engineer in charge for written approval. This should include the details of the proposed fittings required, the proposed layout and the time required for completing the work and the shutdown required or not. The installation shall take into account the following :

1. The effect of eddies created in the flow due to pumping and valves are very pronounced and do not settle down in the short distances. It is desirable to locate the meters as far away from a pumping station as possible preferably over 50 Diameter away. The distance from an interfering valve also be kept as far as possible more than 10 D or as decided by engineer in charge.
2. The meter should always be full of water Therefore if a meter is to be installed on a tank outlet, the meter should be before the control valve. It should also be ensured that the pipe flows full at meter site. In case of meters on tanks on hills, it would be best to find a site downstream in plain ground. The downstream pipe should be ascending up to keep the meter full all the time. Suitable site to house the flow recorder should be selected in consultation with engineer in charge.
3. During the site investigation if any pipe is found to be empty or half filled then suitable arrangement is to be provided by the contractor to have full flow in the pipe.
4. It is describe and advantageous to prepare the assembly of meter and pipe fittings in advance which shall be inserted at pre-selected locations in the system to minimized disturbance of supplied and also to ensure high degree of workmanship and fast installation
5. The shut down for installation of flow meter will be given as per convenience of the deptt. Timely completion of the work will be essence of the work. As such schedule of installation and testing, which is required for shut down shall be drawn in such a way that the work is completed in time. Please note that no shut down will be given in summer month i.e. April to June.

14. ELECTRICAL INSTALLATION

The signal converter shall be installed remotely and mounted on the panel in a suitable location directed by the engineer-in-charge.

Single phase AC connection shall be made available, for power supply to the signal converter and the sensor. All other necessary fixtures including wiring signal with proper cable conduit safety fuses and other items necessary for the installation of EMF shall be provided by the Bidder to the entire satisfaction of the engineer-in-charge and no payment shall be made on this account.

GI pipes shall be used as a conduit for connecting cables between signal converter and the sensor. First few feet of the conduit must be run in flexible conduit near sensor terminal box and at the signal converter. The signal converter be fitted with face sealing cable glands. Only 15mm NPT glands and double compression adapters may be used.

Only the specified signal cable recommended by the manufacturers shall be fitted. The conduit entry shall be sealed to prevent moisture entering the terminal box via the conduit.

15. PROTECTION OF METER

The flow meters if buried under ground should have proper protection of terminal box and signal cable. The Bidder shall ensure protection of meter from damages due to over burden etc. as the case may be..

16. LAYING OF METER ASSEMBLY

Cutting of pipes shall be necessary for laying and fixing of meter assembly on the existing pipes. For this purpose, a trench of sufficient width, depth and length shall be excavated for the underground pipe lines which may be under the roads.. After cutting the road the same has to be made good in original shape.

In case the permission is required from any Deptt. it shall be the responsibility of the contractor to get the same however the department will assist the contractor. Any amount, if to required may be deposited by the contractor and the same shall be reimbursed by the department in next running bill.

The existing pipe shall be cut and dismantled as per the requirement without damaging the extra length of the pipes. In case the extra length of pipe has been damaged by the bidder has to replace the same to make it operative with extra cost.

Prior to lowering the meter assembly in the trench, the bottom of the trench shall be rammed and a sand bedding of 150 mm shall be prepared. The meter assembly shall fully rest on the firm and flat bed. After this installation the trench shall be filled with excavated soil in layer with proper compaction to the entire satisfaction of the engineer-in-charge. The laying of extra pipe and fixing of meter assembly shall be done as per the relevant code of practice for laying and fixing of joints for respective pipe material.

17. REFILLING

Refilling of the trenches shall proceed with the soft material free from stone and hard substance, compaction of the same shall be done as per PWD specification. Soft material free from stones or hard substances shall first be used and hand pressed under and around the pipes to half of their height. Similar soft material shall then be put in to a height of 30 cm above the top of the pipe and this will be moistened with water and well rammed. Filling in the remainder of the trench shall be done with excavated earth. All lumps and clods exceeding 8 cm in any direction shall be broken. Before and during the back filling of a trench, precautions shall be taken against the floatation of the pipeline due the entry of large quantities of water in to the trench causing on uplift of the empty or the partly filled pipeline. Upon completion of the backfill, the surface shall be restored fully to the level decided by Engineer-in charge.

18. TESTING AND COMMISSIONING

On completion of the installation of the meter, the field tested meters shall be carried out to commission at the earliest without the loss of time. The contractor should submit certificate after completing the field testing stated as under the duly signed by the engineer-in-charge. The date of receipt of commissioning certificate shall be treated for commencement of warranty period.

- i. Check converter and display
- ii. Check on current and frequency outputs.

19. TRAINING

As a part of Training and operation the contractor should impart training to the operation staff of the concerned department/authority as and when deputed by the department.

20. OPERATION & MAINTANCE MANUAL

The firm shall submit six sets of operation & maintenance manual of the meter and the other equipment installed in proper binding.

21. HANDING OVER

The contractor shall handover, the meters in working order to DWSS/GPWSC after completion. The firm will also Train personnel nominated by the DWSS/GPWSC.

Sr. No.	Brief Description	Relevant Code reference (with latest amendment)	Sr. No.	Brief Description
21.	Water meter (Bulk Type Electromagnetic)	2373-1981		CRONE MARSHAL/ ABB/ SIEMENS MAKE

NOTE: All the material shall be ISI Marked unless otherwise the make some other better make has been approved in these specifications.