

**DATA SHEET FOR GLOBE VALVES**


1. Valve Manufacturer : \_\_\_\_\_
2. Size : \_\_\_\_\_ Rating : **ANSI 600#** Design Standard : **BS:1873**
3. Purchaser's Specification : **Refer Technical notes for Gate & Globe Valves**
4. Design Pressure : **92 kg/cm<sup>2</sup>(g)** Design Temperature : **-45°C to + 65°C**
5. Corrosion Allowance : **1.5mm** Service : \_\_\_\_\_
6. End Connections : Flanged both ends as per ASME B 16.5   
 Butt Weld both ends   
 Flanged one end butt weld other end
7. Flanges (where applicable) : a) RF  FF  RJJ   
 b) Serrated  Smooth (125 to 200 AARH)
8. Pipe Specification : \_\_\_\_\_
9. Valve Material Specification (or Equivalent/ Superior) :

	Part	Material	Material Offered (Equivalent or Superior)
9.1	Body	ASTM A352 Gr. LCB/ A 350 GR. LF2	
9.2	Bonnet (Bolted)	ASTM A352 Gr. LCB/ A 350 GR. LF2	
9.3	Stem (Rising)	SS316 (No casting) / A 350 GR. LF2	
9.4	Disc(Loose Plug/Ball Type)	SS316/ ASTM A352 Gr. LCB / A 350 GR. LF2 + Stellited	
9.5	Body Seat Ring	SS316/ ASTM A352 Gr. LCB / A 350 GR. LF2 + Stellited	
9.6	Stem Packing (Renewable with valve open on stream)	Corrosion inhibited die formed flexible graphite with braided anti extrusion rings	
9.7	Hand Wheel (Rising)	Malleable Iron/ Cast Steel/ Fab. Steel	
9.8	Bonnet Bolts	ASTM A320 Gr.L7	
9.9	Bonnet Nuts	ASTM A194 Gr.4	
9.10	Bonnet Gasket	Spiral Wound SS 316 with Grafoil	

10. Hydrostatic Test Pressure  
 a) Body : **157 kg/cm<sup>2</sup>(g)**  
 b) Seat : **114 kg/cm<sup>2</sup>(g)**
11. Test Pressure with Air : **5.6 - 7.0 kg/cm<sup>2</sup>(g)**
12. Painting Specifications:  
 i) Surface preparation by Short Blasting as per grade SA 2 1/2, Swedish Standard SIS-055 909.  
 ii) For above ground installation-Three coats of corrosion resistant paint shall be applied with minimum thickness of 300 micron ( Permissible thickness in each coat shall be within 80 to 120 micron).

**Notes:**

- Valve specification sheet shall be read in conjunction with technical notes for Gate and Globe valves.
- Valve shall be designed for intrinsically fire safe. Min. Body & Bonnet Thickness as per BS 1873 .
- Testing shall be as per BS EN 12266-1,approved QAP,this specification and other relevant standards.
- Bidder shall clearly write all/ any deviation against each part/ material of valve in the space provided for .  
Wherever bidder agrees with MECON's data sheet, bidder shall clearly indicate "agreed".
- Charpy 'V' notch test on each heat of base material shall be conducted as per relevant material code.
- Hardness test shall be carried out as per relevant material code.
- Stem packing shall be renewable with valve open on stream .
- Painting procedure of the valves shall be as per Manufacturer's Standard.
- Material Test Certificates and Hydro Test Reports shall be furnished prior to dispatch.

REV. NO.	DATE	ZONE	DESCRIPTIONS	BY	APPRD	REFERENCES	DRG. NO.
SECTION PROCESS & PIPING							MECON LIMITED
CLIENT :							
DSGN	PM	25.04.12	AKJ	25.04.12	PROJECT :		
APPROVED O.P. JAIN						SCALE :	REV
DATA SHEET FOR GLOBE VALVES (NB≥2")						DATA SHEET NO.: MEC/WINO/05/28/M/001/DS/GV/81	0

**DATA SHEET FOR GLOBE VALVES**


1. Valve Manufacturer :
2. Size : Rating : ANSI 800# Design Standard : ISO 15761 / BS:5352
3. Purchaser's Specification : Refer Technical notes for Gate & Globe Valves
4. Design Pressure : Design Temperature : -29°C to + 65°C
5. Corrosion Allowance : 1.5mm Service :
6. End Connections : Flanged both ends as per ASME B 16.5   
 Butt Weld both ends as A-16.25   
 Flanged one end butt weld other end   
 Socket weld both ends as per ASME B16.11  with 100mm pup pieces of A106 Gr. B Sch160
7. Flanges (where applicable) : a) RF  FF  RTJ   
 b) Serrated  Smooth (125 to 200 AARH)
8. Connecting Pipe Specification : N. A.
9. Valve Material Specification :

	Part	Material	Material Offered (Equivalent or Superior)
9.1	Body	ASTM A 105	
9.2	Bonnet (Bolted)	ASTM A 105	
9.3	Stem (Rising)	13% Cr. Steel (No Casting)	
9.4	Disc(Loose Plug/Ball Type)	SS 316 + Stellite	
9.5	Body Seat Ring	SS 316 + Stellite	
9.6	Stem Packing (Renewable with valve open on stream)	Corrosion inhibited die formed flexible graphite with braided anti extrusion rings	
9.7	Hand Wheel (Rising)	Malleable Iron/ Cast Steel/ Fab. Steel	
9.8	Bonnet Bolts	A 193 Gr. B7	
9.9	Bonnet Nuts	A194 Gr. 2H	
9.10	Bonnet Gasket	Spiral Wound SS 316 + Grafoil	

10. Hydrostatic Test Pressure  
 a) Body : 210 kg/cm<sup>2</sup>(g)  
 b) Seat : 155 kg/cm<sup>2</sup>(g)
11. PnuematicTest Pressure with Air : 5.6-7 kg/cm2 (g).
12. Painting Specifications:  
 i) Surface preparation by Short Blasting as per grade SA 2 1/2, Swedish Standard SIS-055 909.  
 ii) For above ground installation-Three coats of corrosion resistant paint shall be applied with minimum thickness of 300 micron ( Permissible thickness in each coat shall be within 80 to 120 micron).

**Notes:**

- Valve specification sheet shall be read in conjunction with technical notes for Gate and Globe valves.
- Valve shall be designed for intrinsically fire safe, Dimensions including thickness as per ISO 15761 .
- Testing shall be as per BS EN 12266-1, approved QAP, this specification and other relevant standards.
- Bidder shall clearly write all/ any deviation against each part/ material of valve in the space provided for . Wherever bidder agrees with MECON's data sheet, bidder shall clearly indicate "agreed".
- Charpy 'V' notch test on each heat of base material shall be conducted for all pressure containing parts such as body, end flange, welding ends as well as the bolting material as per ASTM A370. The test shall be conducted at 0°C. The minimum average absorbed energy per set of three specimen shall be 27 J with an individual minimum per specimen of 22 J.
- Hardness test shall be carried out on each heat of base material for all pressure containing parts of the valve. A full thickness cross section shall be taken for this purpose and the maximum hardness shall not exceed 248 HV10 based on minimum four measurements representing the entire thickness.
- Stem packing shall be renewable with valve open on stream .
- Painting procedure of the valves shall be as per Manufacturer's Standard.
- Material Test Certificates and Hydro Test Reports shall be furnished prior to dispatch.

REV. NO.	DATE	ZONE	DESCRIPTIONS	BY	APPRD	REFERENCES	DRG. NO.
SECTION PROCESS & PIPING							MECON LIMITED
CLIENT :							
NAME	DATE	CHKD	DATE	PROJECT :			
DSGN	PM	25.04.12	AKJ	25.04.12			
DRWN							
APPROVED						SCALE :	REV
O. P. JAIN						DATA SHEET NO.: MEC/WINO/05/28/M/001/DS/GV/82	0
DATA SHEET FOR GLOBE VALVES							

**DATA SHEET FOR GLOBE VALVES**


1. Valve Manufacturer :
2. Size : Rating : ANSI **800#** Design Standard : **ISO 15761 / BS:5352**
3. Purchaser's Specification : **Refer Technical notes for Gate & Globe Valves**
4. Design Pressure : Design Temperature : **-45°C to + 65°C**
5. Corrosion Allowance : **1.5mm** Service :
6. End Connections : Flanged both ends as per ASME B 16.5   
 Butt Weld both ends as A-16.25   
 Flanged one end butt weld other end   
 Socket weld both ends as per ASME B16.11  with 100mm pup pieces of A106 Gr. B Sch160
7. Flanges (where applicable) : a) RF  FF  RTJ   
 b) Serrated  Smooth (125 to 200 AARH)
8. Connecting Pipe Specification : **N. A.**
9. Valve Material Specification :

	Part	Material	Material Offered (Equivalent or Superior)
9.1	Body	ASTM A350 Gr. LF2	
9.2	Bonnet (Bolted)	ASTM A350 Gr. LF2	
9.3	Stem (Rising)	SS316 (No Casting) /ASTM A350 Gr. LF2	
9.4	Disc(Loose Plug/Ball Type)	SS316 /ASTM A350 Gr. LF2 + Stellite	
9.5	Body Seat Ring	SS316/ASTM A350 Gr. LF2 + Stellite	
9.6	Stem Packing (Renewable with valve open on stream)	Corrosion inhibited die formed flexible graphite with braided anti extrusion rings	
9.7	Hand Wheel (Rising)	Malleable Iron/ Cast Steel/ Fab. Steel	
9.8	Bonnet Bolts	ASTM A320 Gr.L7	
9.9	Bonnet Nuts	ASTM A194 Gr.4	
9.10	Bonnet Gasket	Spiral Wound SS 316 + Grafoil	

10. Hydrostatic Test Pressure  
 a) Body : **210 kg/cm<sup>2</sup>(g)**  
 b) Seat : **155 kg/cm<sup>2</sup>(g)**
11. Pneumatic Test Pressure with Air : **5.6-7 kg/cm<sup>2</sup> (g).**
12. Painting Specifications:  
 i) Surface preparation by Short Blasting as per grade SA 2 1/2, Swedish Standard SIS-055 909.  
 ii) For above ground installation-Three coats of corrosion resistant paint shall be applied with minimum thickness of 300 micron ( Permissible thickness in each coat shall be within 80 to 120 micron).

**Notes:**

- Valve specification sheet shall be read in conjunction with technical notes for Gate and Globe valves.
- Valve shall be designed for intrinsically fire safe. Dimensions including thickness as per ISO 15761 .
- Testing shall be as per BS EN 12266-1, approved QAP, this specification and other relevant standards.
- Bidder shall clearly write all/ any deviation against each part/ material of valve in the space provided for . Wherever bidder agrees with MECON's data sheet, bidder shall clearly indicate "agreed".
- Charpy 'V' notch test on each heat of base material shall be conducted as per relevant material code.
- Hardness test shall be carried out on each heat of base material for all pressure containing parts of the valve as per relevant material code.
- Stem packing shall be renewable with valve open on stream .
- Painting procedure of the valves shall be as per Manufacturer's Standard.
- Material Test Certificates and Hydro Test Reports shall be furnished prior to dispatch.

REV. NO.	DATE	ZONE	DESCRIPTIONS	BY	APPRD	REFERENCES	DRG. NO.
SECTION PROCESS & PIPING							MECON LIMITED
	NAME	DATE	CHKD	DATE	CLIENT :		
DSGN	PM	25.04.12	AKJ	25.04.12	PROJECT :		
DRWN							
APPROVED			O. P. JAIN	<b>DATA SHEET FOR GLOBE VALVES (NB≥2")</b>		SCALE :	REV
						DATA SHEET NO.: MEC/WINO/05/28/M/001/DS/GV/83	0

**DATA SHEET FOR CARTRIDGE FILTER**

**1.0 PROJECT :**

**CLIENT :**

**2.0 JOB NO. :**

**ITEM TAG NO. : CF-**

**3.0 VENDOR : \***

**QUANTITY : 02 PER SKID**

**4.0 OPERATING CONDITIONS :**

**4.1 FILTER : CARTRIDGE**

TYPE : HORIZONTAL

**4.2 FLUID HANDLED : NATURAL GAS VAPOUR/RLNG GAS**

FLUID DENSITY(@ P&T) Kg/m3 : \*\*

**4.3 MOLECULAR WEIGHT : \*\***

FLOW RATE (MMSCMD) : Refer P&ID

**4.4 Cp/Cv : \*\***

FLUID VISC. CENTI-POISE : \*\*

**4.5 INLET SIZE (NB) : Refer P&ID**

COMPRESSIBILITY FACTOR (Z) : \*\*

**4.6 OPER. PR., KG/CM<sup>2</sup>G : Refer P&ID**

OUTLET SIZE (NB) : Refer P&ID

**4.7 PARTICLE/ MESH SIZE, MICRON ≥ 3 MICRON**

OPER. TEMP., °C : 0- 55

**4.8 PR. DROP KG/CM<sup>2</sup>, CLEAN/ DIRTY : 0.2/ 0.5 Max. (SEE NOTE-2)**

FILTRATION EFF. % : 98

**4.9 CORROSION ALLOWANCE, MM : 3.0 For Carbon Steel Parts**

DUST CONC : 0 - 0.2 mg/SM<sup>3</sup> OF GAS

CORROSIVE/ TOXIC COMPONENT : Tot sulphur incl. H2S (max.)-10 PPM (by wt)  
H2S content (max)- 5PPM (by wt.)

**5.0 MATERIAL OF CONSTRUCTION**

**5.1 SHELL : SA-515/SA-516 Gr. 60/70**

SHELL FLANGE : SA - 105

**5.2 HEAD : \***

HEAD FLANGE : SA -105

**5.3 BOTTOM : SA515/ SA-516 Gr. 60/70, SA 234 Gr.WPB**

PERFORATED SHEET :

**5.4 NOZZLES : SA-106 GR. B**

NOZZLE FLANGES : SA - 105

**5.5 GASKET : SS-304/316 SPIRAL WOUND WITH GRAFOIL**

FASTENER : SA-193 Gr. B7, SA-194 Gr. 2H

**5.6 OTHER INTERNALS : \***

SUPPORT : SA516Gr.60/ SA 283 Gr. C/ IS:2062

FITTING: SA 234 Gr. WPB

**5.7 FILTER ELEMENT : FIBRE GLASS MEDIA TO SUIT GAS QUALITY.**

**6.0 DESIGN AND CONSTRUCTION**

**6.1 DESIGN CODE : ASME SEC-VIII DIV-1 (LATEST EDITION)**

DESIGN TEMP., °C : (-)29 to (+) 65

**6.2 DESIGN PR., KG/CM<sup>2</sup>G : As per P&ID**

O.D. (MM) X LENGTH (MM) X THICKNESS(MM): \*

**6.3 NO. OF CARTRIDGE ELEMENT : (SEE NOTE-2)**

FILTER PR. DROP, KG/CM<sup>2</sup> : \* (SEE NOTE-2)

**6.4 MAKE (ELEMENT) : AS PER VENDOR LIST IN MECON T.S.**

DUST/DIRT HOLDING CAPACITY OF EACH CARTRIDGE ELEMENT: \*

**6.5 FIXING DETAILS : NUTS & BOLTS**

TOTAL GROSS FILTERING AREA OF CARTRIDGE ELEMENTS: \*

**6.6 NAME OF VESSEL MANUFACTURER : \***

FLANGE FINISH : \*

**6.7 FLANGE RATING : 600#**

PSV SIZE : \* DPT SIZE : \*

**6.8 FLANGE TYPE : WNRF**

FLUSHING CONNECTION : \*

**6.9 VENT SIZE : Refer P&ID, DRAIN SIZE : Refer P&ID, UC SIZE : NR**

**6.10 HEAD(TOP COVER) CONNECTION : NOTE (13)**

**6.11 QOC REQUIRED : YES**

**7.0 OVERALL DIMENSION & WEIGHT:**

**7.1 OVERALL LENGTH, MM : \***

INLET FLANGE TO OUTLET FLANGE: \*

**7.2 OVERALL HEIGHT, MM : \***

SHELL DIA, MM : \*

**7.3 EMPTY WEIGHT, KGS : \***

OPERATING WT., KGS : \*

**7.4 HYDROTESTWEIGHT : \***

**8.0 ACCESSORIES**

**8.1 DAVIT : YES**

**8.2 LIFTING LUGS: YES**

**8.3 ANCHOR BOLTS& NUTS YES**

**8.4 BLIND FLANGE,GASKET,BOLTS&NUTS FOR VENTS&DRAINS : YES**

**8.5 LADDER&PLATEFORM: ---**

**9.0 PAINTING : SUITABLE TO CORROSIVE INDUSTRIAL ENVIRONMENT REF. MECON T.S.**


**10.0 INSPECTION & TESTING : AS PER MECON T.S.**

\* VENDOR TO SPECIFY/ CONFIRM

\*\* GAS COMPOSITION & OTHER PROPERTIES WILL BE PROVIDED TO SUCCESSFUL BIDDER.

**NOTES :-**

- 1) THE TOTAL INTERNAL CROSS SECTIONAL AREA OF MOUNTED CARTRIDGE SHALL NOT BE LESS THAN INLET NOZZLE AREA.
- 2) SUCCESSFUL BIDDER SHALL SUBMIT MECHANICAL DESIGN CALCULATION FOR FILTER & PROCESS CALCULATION (ALONG WITH DETAILED PRESSURE DROP CALCULATION) OF CARTRIDGE FILTER & CARTRIDGE ELEMENT (INCLUDING RELEVANT GRAPH, CATALOGUE ETC.) FOR MECON CLEARANCE.
- 3) BIDDER SHALL SUBMIT SAMPLE CALCULATIONS ( FOR CATRIDGE ELEMENT SIZING & PRESSURE DROP ACROSS THE FILTER ) ALONG WITH OFFER.
- 4)VENDOR TO SELECT/CONFIRM THE MATERIAL CONSIDERING "-29 °C TO 65 °C" TEMPERATURE . A CHARPY V-NOTCH TEST SHALL BE CONDUCTED ON 3 SAMPLE HAVING ENERGY VALUE OF 27 J AVERAGE AND MINIMUM 22 J AT 0°C.
- 5) FILTER ELEMENT MUST WITHSTAND A DIFFERENTIAL PRESSURE OF 1.0 KG/CM2(g) WITHOUT CRACKING AND FAILING.
- 6)MANDATORY SPARES SHALL BE AS PER RELEVANT CLAUSE SPECIFIED IN TENDER DOCUMENT.
- 7)FILTER ELEMENT SHALL BE OF SINGLE PIECE CONSTRUCTION WITH NO JOINTS IN THE ELEMENT. STACKING OF FILTER ELEMENT IS NOT ALLOWED.
- 8)ALL CS MATERIALS SHALL BE OF FULLY KILLED QUALITY.
- 9) FLANGE SHALL CONFIRM TO ASME B 16.5.
- 10)GASKETS SHALL CONFORM TO ASME B 16.20
- 11) FREQUENCY OF CLEANING SHALL BE MINIMUM 30 DAYS FOR FILTER ELEMENT DESIGN.
- 12) PWHT REQUIRED AS PER ASME SEC-VIII (DIV-I)
- 13) FILTER COVER SHALL BE OF PRESSURE CLOSURE TYPE AND SHALL NOT OPEN UNLESS THE FILTER IS DEPRESSURIZED.END COVER SHALL BE OF QUICK OPENING TYPE WITH SAFETY DEVICE.

REV.	DATE	ZONE	DESCRIPTIONS	BY	APPRD	REFERENCES	DRG. NO.
REVISIONS							<b>MECON LIMITED</b>
SECTION : OIL & GAS			CLIENT :				
PROJECT :			<b>CARTRIDGE FILTER</b>				
DSGN						SCALE :	REV
DRWN						DATA SHEET NO.:	0
APPROVED							

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**PRESSURE SAFETY VALVE/CREEP RELIEF VALVE**

UNITS : Flow > Liquid - m<sup>3</sup>/hr , Gas-Sm<sup>3</sup>/day, Steam - kg/hr. Pressure -> kg/cm<sup>2</sup>g, Temperature-°C, Level/ Length-> mm

General	01	Tag No.	<b>PSV-</b>		<b>CRV-</b>	
	02	Line No./ Size	As per P&ID		As per P&ID	
	03	Vessel Protected	<b>Cartridge Filter</b>		-	
	04	Quantity	As per P&ID		As per P&ID	
	05	Safety/ Relief	Safety Relief		Creep Relief	
	06	Vendor	♠		♠	
Valve	07	Type	Standard		Standard	
	08	Full Nozzle Full Lift Mod. Nozzle	Full Nozzle Full Lift		Full Nozzle Full Lift	
	09	Bonnet Type	Closed		Closed	
	10	Conv./ Bellows/ Pilot Operated	Conventional		Conventional	
	11	Inlet Conn. : Size & Rating	♠		♠	
	12	Inlet Conn. : Facing & Finish	RF, ♠		RF, ♠	
	13	Outlet Conn. : Size & Rating	♠		♠	
	14	Outlet Conn. : Facing & Finish	RF, ♠		RF, ♠	
	15	Cap Over Adj. Bolt :	Required		Required	
	16	Screwed   Bolted	Bolted		Bolted	
	17	Lifting Gear - Type	-		-	
	18	Test Gag	Required		Required	
Material	19	Body and Bonnet	ASTM A216 Gr. WCB		ASTM A216 Gr. WCB	
	20	Nozzle and Disc	SS 316		SS 316	
	21	Spring	SS 316		SS 316	
	22	Bellows				
Options	23	Resilient Seat Seal				
Basis	24	Code	API 520, 521 & 526		API 520, 521 & 526 / As per Manufacturer's Standard	
	25	Basis of Selection	Vessel Under Ext. Fire Case		CREEP RELIEF (1% flow)	
Service Conditions	26	Fluid and State	Natural Gas Vapour		Natural Gas Vapour	
	27	Corrosive Constituent	Tot sulphur incl. H2S (max)-10 PPM(by wt)		Tot sulphur incl. H2S (max)-10 PPM(by wt)	
			H2S content (max)- 5PPM (by wt.)		H2S content (max)- 5PPM (by wt.)	
	28	Corr. Allowance	2 mm		2 mm	
	29	Required Flow Capacity	♠		♠	
	30	Mol. Wgt.   S.G. at Rel. Temp.	♠♠		♠♠	
	31	Oper. Pressure, kg/cm <sup>2</sup> g	As per P&ID		As per P&ID	
	32	Oper. Temp. °C   Rel. Temp. °C	0-55   ♠		0-55   ♠	
	33	Valve Discharges to	Atm.		Atm.	
	34	Back Press. Const. Or Variable	Atm.   Constant		Atm.   Constant	
	35	Set Pressure, Kg/cm2(g)	- (Note-7)		- (Note-7)	
	36	Cold Bench Test Pressure	♠		♠	
	37	% Over Pressure   % Blow Down	20   ♠		10   ♠	
	38	Cp/Cv   Compressibility Factor	♠♠   ♠♠		♠♠   ♠♠	
39	Viscosity at Rel. Temp. (cP)	♠♠		♠♠		
40	Vessel Wall Temp., °C   Surf. Area-m <sup>2</sup>	593   ♠		-   -		
Orifice	41	Calculated Area-inch <sup>2</sup>	♠		♠	
	42	Sel. Area-inch <sup>2</sup>   Orifice Design	♠   ♠		♠   ♠	
	43	No. of Valves Req'd. for capacity	♠		♠	
	44	Total Area-inch <sup>2</sup>	♠		♠	
	45	Actual Flow Capacity, SCFM	-		-	
	46	Relief Load	♠		♠	
	47	Model No.	♠		♠	
	48	Radiography & Charpy Test	Req'd. (100%)		Req'd. (100%)	
	49	IBR Certification	Not Required		Not Required	

**Notes:**

- ♠ VENDOR TO SPECIFY/ CONFIRM.
- ♠♠ GAS COMPOSITION & OTHER PROPERTIES WILL BE PROVIDED TO SUCCESSFUL BIDDER.
- 1. VENDOR SHALL FURNISH SIZING CALCULATIONS TO SUPPORT HIS VALVE SELECTION.
- 2. VALVES SHALL BE 100% RADIOGRAPHED.
- 3. VENDOR TO CONSIDER COEFFICIENT OF DISCHARGE AS PER ASME-SEC-VIII (Latest).
- 4. FOR SAFETY VALVE SIZING, FURNISH CERTIFIED CAPACITIES AS PER API-520.
- 5. DESIGNATION, NO. & RATING OF PSV's & CRV's SHALL BE DECIDED DURING DETAIL ENGINEERING.
- 6. PSV's & CRV's SHALL BE SUPPLIED WITH INLET AND OUTLET COMPANION FLANGE.
- 7. PSV's & CRV's SET PRESSURE SHALL BE FINALISED DURING DETAILED ENGINEERING.

REV. NO.	DATE	ZONE	DESCRIPTIONS	BY	DRG. NO.
REVISIONS					CLIENT :
SECTION : OIL & GAS					 <b>MECON LIMITED</b>
NAME	DATE	CHKD	DATE	PROJECT :	
DSGN					
DRWN					
APPROVED				<b>PSV/CRV</b>	DATASHEET NO: REV-0

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**DATASHEET OF PRESSURE GAUGE**

**Project :- \***

**Client :- \***

**Contractor :- \***

**FOA No. :- \***

1	Type	Direct		Wetted parts material	---		
2	Mounting	Local		Element	---		
3	Dial size	150 mm		Lower body	---		
	Colour	White (Non rusting plastic with black engraving)		Non wetted parts	---		
4	Case material	DIE CAST ALUMINIUM / SS		Process connection	---		
5	Bezel ring	Screwed / Bayonet		Size	---		
6	Window material	Shatter proof glass		Rating	---		
7	Enclosure	Min. IP 55 / NEMA 4		Facing & Finish	---		
8	Pressure element	Bourdon tube		Capillary material	---		
9	Element material	SS 316		Capillary length	---		
10	Socket material	SS 316		Flushing & Filling	---		
11	Accuracy	± 1% FSD	16	Over range protection	130% of range		
12	Zero adjustment	Micrometer pointer (Internal)	17	Blow out protection	Required		
			18	Options			
13	Connections	½" NPT (M)		a)	Snubber		
	Conn. Location	Bottom		b)	Syphon		
14	Movement	SS 304		c)	Gauge saver		
15	Diaphragm seal	---		d)	Liquid filled casing		
	Type	---	19	2-valve, 3-way manifold	Required		
			20	<b>Make &amp; Model</b>	*		
Tag No.	Range	Pressure		Design Temp.	Fluid	Location	Options
		Operating	Design				

**Refer P&ID**

**NOTES:**

- 1) ‘\*’ Information to be supplied by the Vendor / Contractor.
- 2) Make of the PG shall be from approved vendor list of Mecon /Client.
- 3) Detailed technical catalogue for offered model to be submitted by vendor/contractor during approval.
- 4) Offered Model shall meet the tender requirement.

0	NB	VJ	RKS	<b>INSTRUMENTATION DATASHEETS</b>	 <b>MECON LTD. DELHI</b> DS No: MEC/STD./ 05/E/5806/626
Rev.	Prpd. By :	Chkd. By :	Appd. By :		

**DATASHEET OF TEMPERATURE GAUGE (with Thermowell)**

**Project :- \***

**Client :- \***

**Contractor :- \***

**FOA No. :- \***

GENERAL				FILLED SYSTEM		
1	Type	FILLED SYSTEM / BIMETALLIC		15	SAMA Class	V B
2	Well	REQUIRED			Compensation	CASE
3	Mounting	LOCAL		16	Bulb type	ADJUSTABLE UNION
4	Dial size	150 mm			Bulb material	316SS
5	Colour	WHITE (Non rusting plastic with black figs.)		17	Bulb union threaded to	½” NPT(M)
6	Case material	DIE CAST ALUMINIUM / SS		18	Extension type	RIGID
7	Window material	SHATTER PROOF GLASS		19	Bulb dia	8 mm (Min)
8	Conn. Location	BOTTOM		20	Capillary material	
9	Accuracy	±1% FSD			Armour Flexible	
10	Enclosure	WEATHER PROOF TO IS2147			Armour material	
	Enclosure class	IP 55 / NEMA 4			Capillary length	
11	Zero adj. Screw	MICROMETER POINTER (Internal)		21	Overrange protection	130% OF RANGE
BIMETAL				THERMOWELL		
12	Stem:			22	Material	SS 316
	Type			23	Construction	DRILLED BAR STOCK
	Material			24	Process connection	1 ½” FLANGED
	Size			25	Gauge connection	½” NPT (F)
13	Stem diameter			26	Thermowell as per drg	Drg enclosed
14				27	Options a)	LIQUID FILLED
				28	<b>Make &amp; Model</b>	*

Tag No.	Range	Temperature (°C)		Well Dimensions		Flange rating	Location	Remarks
		Operating	Design	U	T			

**Refer P&ID**

**Note:**

1. ‘\*’ Information to be supplied by the Vendor / Contractor.
2. Make of the TG shall be from approved vendor list of Mecon /Client.
3. Wake frequency calculation of offered Thermowell to be submitted by the Vendor / Contractor during approval.
4. Detailed technical catalogue for offered model to be submitted by vendor/contractor during approval.
5. Offered Model shall meet the tender requirement.

0	NB	VJ	RKS	INSTRUMENTATION DATASHEETS	 <b>MECON LTD. DELHI</b> <b>DS No: MEC/STD./</b> <b>05/E/53908/626</b>
Rev.	Prpd. By :	Chkd. By :	Appd. By :		

**DATASHEET OF PRESSURE TRANSMITTER**

**Project :- \***

**Client :- \***

**Contractor :- \***

**FOA No. :- \***

GENERAL			MEASURING UNIT		
1	Function	Transmit & Indicate	15	Service	Pressure
2	Type	Electronic Smart $\mu$ P Based	16	Element	Diaphragm
3	Case	Mfg. Std.	17	Body Material	Carbon Steel or better
4	Mounting	Yoke	18	Element Material	SS 316L
5	Enclosure	Weather proof to IS2147 Explosion proof to IS2148	19	Process Connections	1/2" NPT(F)
	Enclosure class	NEMA 4 & NEMA 7		Process Conn. Locn.	Mfg. Std.
6	Elec. Area Class.	Zone-I, Gr.IIA & IIB, T3, CCOE certified	20	Over Range Protection	130% of Range
7	Intrinsically safe & Flameproof	Required			
8	Air supply	N.A	21	Output Meter	Required (W.P. & Intr. Safe )
9	Power supply	24 VDC	22	Mounting Accessories	Required for 2" Pipe Mounting – Material (SS 316)
10	Cable entry	1/2" NPT(F)	23	Zero elevn. & suppression	Required
11	Accuracy	$\pm 0.025\%$ of SPAN	24	2-valve, 3-way manifold	Required
12	Repeatability	$\pm 0.05\%$	25	<b>Make &amp; Model</b>	*
TRANSMITTER					
13	Output	4 – 20 mA DC, Two wire			
14	Trans. Power supply	0 - 24 V DC			

Tag No.	Operating Pressure	Design Press.	Design Temp.	Range	Fluid	Options
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**Refer P&ID**

**NOTES:**

1. ‘\*’ Information to be supplied by the Vendor / Contractor.
2. Make of the PT shall be from approved vendor list of Mecon /Client.
3. CCOE Certificate for offered transmitter to be submitted by the Vendor / Contractor during approval.
4. Detailed technical catalogue for offered model to be submitted by vendor/contractor during approval.
5. Offered Model shall meet the tender requirement.
6. Environmental Enclosure with locking arrangement shall be provided for metering transmitters.

0	NB	VJ	RKS	<b>INSTRUMENTATION DATASHEETS</b>	 <b>MECON LTD. DELHI</b> DS No: MEC/STD./ 05/E/54008/626
Rev.	Prpd. By :	Chkd. By :	Appd. By :		



**DATASHEET OF RTD (with Thermowell)**

**Project :- \***

**Client :- \***

**Contractor :- \***

**FOA No. :- \***

GENERAL			13	Cable entry	½” NPT (F)
1	Assembly as per drg.	Drg. enclosed	14	No. of entries	Single
			15	Enclosure type	Weather proof to IP55, Ex-proof (CCOE certified)
2	Type	RTD Class A	THERMOWELL		
ELEMENT					
3	No. of elements	Simplex	16	Material	SS 316
4	Calibration	As per DIN 43760	17	Construction	Drilled bar stock
5	Element material	Platinum (Pt 100)	18	Process connection	1 ½” Flanged
6	Resistance at 0°C	100 ohms	19	Inst. connection	½” NPT (F)
7	Leads	Standard	20	Thermowell as per drg	Drg. Enclosed
8	Sheath				
	O.D.	8 mm	TRANSMITTER		
	Material	SS 316			
9	Nipple & Union Material	SS 316	21	Quantity	
			22	Input	
10	No. Of wires	4 Wire	23	Output	
HEAD			24	Power Supply	
11	Head Cover type	Screwed cap & SS chain	25	Mounting	
12	Material	Cast Aluminium	26	Enclosure class	
			27	SS Tag Plate	Required
			28	<b>Make &amp; Model No.</b>	*

Tag No.	Range	Temperature		Well Dimensions		Flange		Fluid
		Nor	Design	U	T	Material	Rating/Face/Finish	

**Refer P&ID**

**NOTES:**

1. ‘\*’ Information to be supplied by the Vendor / Contractor.
2. Make of the RTD shall be from approved vendor list of Mecon /Client.
3. Detailed technical catalogue for offered model to be submitted by vendor/contractor during approval.
4. Wake frequency calculation of offered Thermowell to be submitted by the Vendor / Contractor during approval.
5. CCOE Certificate for offered RTD to be submitted by the Vendor / Contractor during approval.
6. Offered Model shall meet the tender requirement.

0	NB	VJ	RKS	INSTRUMENTATION DATASHEETS	 <b>MECON LTD. DELHI</b> DS No: MEC/STD./ 05/E541D6 626
Rev.	Prpd. By :	Chkd. By :	Appd. By :		


## TEMPERATURE TRANSMITTERS

Units:- Flow :Liquid-m<sup>3</sup>/hr, Gas-MMSCMD, Steam- kg/hr, Pressure-Kg/cm<sup>2</sup> (G), Temperature- °C, Level/Length-mm

1	FUNCTION	TRANSMIT <input checked="" type="checkbox"/> INDICATE <input checked="" type="checkbox"/> BLIND <input type="checkbox"/>	11	POWER SUPPLY 24 V DC		
2	TYPE	ELECTRONIC (SMART) <input checked="" type="checkbox"/>	12	CONDUIT CONN. 1/2" NP TF		
3	CASE	MFR STD.	13	LINEARISATION UPSCALE <input checked="" type="checkbox"/> DOWNSCALE <input type="checkbox"/>		
4	MOUNTING	DIRECT ON RTD/TC <input type="checkbox"/> YOKE <input checked="" type="checkbox"/> OTHER	14	ACCURACY +/- 0.1% FSD		
5	ENCLOSURE	Dual Chamber <input checked="" type="checkbox"/> EX. PROOF <input type="checkbox"/> W. PROOF CLASS : IP - 65 INTRINSICALLY SAFE <input checked="" type="checkbox"/>	15	RFI / EMI REQD. <input checked="" type="checkbox"/> PROTECTION		
			16	LOAD 600 OHMS DRIVING CAPABILITY 24 V DC		
6	AREA CLASSIFICATION	NEC, CLASS-1, DIVL.-1, GROUP C&D	17	MAKE *		
7	INPUT	FROM RTD	18	MODEL NO. *		
8	OUTPUT	4-20 mA	19	OPTIONS		
			a)	Output Meter WP & INTR SAFE		
9	COLD JUNCTION COMPENSATION		b)	Mounting For 2" Pipe		
			c)	Accessories		
10	BURN OUT PROTECTION		c)	SS Tag Plate		
TAG NO.	Temperature	RANGE		Temp.	SERVICE	OPTION
	Nor.	SPAN	SET	Design		
TT-**	**	*	*	**	RTD (4 wire)	a, b, c

**NOTES:**

- 1 \*\*\* As per P & ID
- 2 \*\* INFORMATION TO BE SUPPLIED BY VENDOR/ CONTRACTOR.
- 3 THE DIGITAL OUTPUT METER SHOULD INDICATE THE TEMPERATURE IN DEG. C.
- 4 ENVIRONMENTAL COVER TO BE PROVIDED FOR EACH TRANSMITTER (DRAWING ENCLOSED ELSEWHERE IN BID DOC.) & WITH LOCKING ARRANGEMENT FOR METERING TRANSMITTERS.
- 5 DUAL CHAMBER ENCLOSURE SHALL BE PROVIDED
- 6 MAKE OF TT SHALL BE AS PER VENDOR LIST ATTACHED WITH BID DOCUMENTS.

1	DATA SHEET OF TEMPERATURE TRANSMITTERS	 <b>MECON LTD. DELHI</b>
REV		DS No: MEC/ 05/E5/DS-TT

DATASHEET OF DIFFERENTIAL PRESSURE GAUGE						
Project :- *						
Client :- *						
Contractor :- *						
FOA No. :- *						
Type				Direct		
Mounting				Local/ Surface		
Dial Size				150mm		
Colour				White with Black Numerals		
Case Material				SS 316		
Bezel Ring				Screwed		
Window Material				Shatterproof Glass		
Enclosure				Weatherproof to IP55		
Pressure Element				Diaphragm		
Element Material				SS 316		
Socket Material				SS 316		
Accuracy				± 1.5% of FSD or Better		
Zero Adjustment				Micrometer Pointer		
Connection				½" NPTF		
Connection Location				Side/ Bottom		
Movement				SS 304		
Over range protection				Maximum static pressure		
Blow out protection				Required		
5-way manifold				Required		
Make & Model				*		
Tag No.	Range	Operating Pressure	Design Pressure	Design Temperature	Fluid	Location
<b>Refer P&amp;ID</b>						
<b>NOTES:</b>						
1) '**' Information to be supplied by the Vendor / Contractor. 2) Make of the DPG shall be from approved vendor list of Mecon /Client. 3) Detailed technical catalogue for offered model to be submitted by vendor/contractor during approval. 4) Differential Pressure Gauge shall be suitable for the maximum static pressure in both the legs. 5) Tapings (3/4" sw) for the DPG connections shall be provided on the inlet and the outlet nozzle of the gas filters. 6) Offered Model shall meet the tender requirement.						

0	NB	VJ	RKS	INSTRUMENTATION DATASHEETS	 <b>MECON LTD. DELHI</b> DS No: MEC/STD./ 05/E/4306/626
Rev.	Prpd. By :	Chkd. By :	Appd. By :		

## DIFFERENTIAL PRESSURE TRANSMITTERS WITH LOCAL DISPLAY


Units:- Flow : Liquid-m<sup>3</sup>/hr Gas- MMSCMD Steam- kg/hr Pressure- Kg/cm<sup>2</sup>(G) Temperature- °C Level/Length-mm

GENERAL			MEASURING UNIT		
1	Function	Transmit & Indicate with Local Display	24	Service	Diff. Pressure
2	Type	Electronic Smart $\mu$ P Based	25	Element	Diaphragm
3	Case	Mfg. Std.	26	Body Material	Carbon Steel
4	Mounting	Yoke	27	Element Material	SS 316L
5	Enclosure	Weather proof to IS2147 Explosion proof to IS2148	28	Process Connections	½" NPT(F)
	Enclosure class	NEMA 4 & NEMA 7		Process Conn. Locn.	Bottom
6	Elec. Area Class.	Zone-I, Gr.IIA & IIB, T3	29	Diaphragm Seal:-	Not Required
7	Intrinsically safe & Flameproof	Required		Type	---
8	Air supply	N.A		Wetted Parts Matl.	---
9	Power supply	24 VDC		Other Material	---
10	Cable entry	½" NPT(F)		Process Conn.:-	
11	Accuracy	$\pm 0.075\%$ of SPAN		Size and Rating	---
12	Self Diagnostics Facility	Required		Facing and Finish	---
TRANSMITTER				Capillary Material:-	
13	Output	4 – 20 mA DC, Two wire		Armour Flexible	---
14	Trans. Power supply	24 V DC		Armour Flexible Matl.	---
CONTROLLER				Capillary length, mm	---
15	Output			Flush / Filling Conn. with plug	---
16	A/M switch			MISCELLANEOUS	
	No. of positions		30	Over Range Protection	130% of Range
17	Set Point Adj.		31	Options	
18	Manual Regulator			a)	Intrinsically safe digital Output meter
19	Mode			b)	5-way manifold-SS316 Body & Trim
RECORDER				c)	Mounting accessories for 2" Pipe Mounting – Material (SS 316)
20	Chart			d)	Local display in Kg/cm <sup>2</sup> g
21	Chart Drive			e)	SS Tag Plate
22	Moving Parts Matl.		32	Load Driving Capability	Not less than 600 ohms
23	Chart speed		33	Make & Model	*

Tag No.	Diff Range Kg/Cm <sup>2</sup> g		Zero Elev. mm H <sub>2</sub> O	Zero Supp. mm H <sub>2</sub> O	Design Press.	Design Temp.	Control Action	Fluid	Options
	Span	Set							
DPT-**	*	0 - 2	*	*	**	**		**	a, b, c, d, e

**NOTES:**

- 1) '\*\*' – Information to be furnished by bidder.
- 2) '\*\*' As per P& ID
- 3) Make of DPT shall be as per vendor list attached with bid documents.
- 4) For installation refer MECON's installation standards.
- 5) Environmental cover to be provided for each transmitter.
- 6) 5-Way Manifold shall be provided.

1	DATASHEET OF DIFFERENTIAL PRESSURE TRANSMITTERS WITH LOCAL DISPLAY	 MECON LTD. DELHI
Rev.		DS No: MEC/ 05/E5/DS-DPT 144 of 626

## LIMIT SWITCHES

UNIT : Flow-> Liquid-M<sup>3</sup>/hr Gas-MMSCMD steam-kg/hr Pressure-> kg/cm<sup>2</sup>g Tempreture-><sup>0</sup>C Level/Length-> mm

S.No.	DESCRIPTION	TECHNICAL REQUIREMENT
1	TYPE	Snap Action Micro
2	Area class	IEC Zone-1, IIA, IIB, T3
3	Limit Switch & Enclosure	Weather Proof (IP65) and Flame proof (Exd)
4	Conduit	1/2" NPTF (NOTE -3)
5	Rating	1A @ 24 V DC
6	Form	SPDT
7	Quantity	One each for open & close status of SDV, valves across the USM (Quantity as per P& ID)
8	Model No.	BY VENDOR
9	Junction Box(Ex-Proof)	One no. per SDV be provided. Limit switches duly terminated with 1/2" NPT as conduit connection. All connection shall be provided with ex-proof cable gland.

**NOTES :**

- 1 Vendor to furnish model No. and decoding details of limit Switch accompanied with relevant catalogues (in English) literatures.
- 2 Hazardous Certificates with model No. shall be furnished along with offer
- 3 Flying leads are not acceptable. Cable shall be terminated upto JB

<b>1</b>	<b>DATA SHEET OF LIMIT SWITCHES</b>	 <b>MECON LTD. DELHI</b>
<b>Rev.</b>		<b>DS No: MEC/ 05/E5/DS- LS</b>


**PRESSURE CONTROL VALVES**

UNITS : Flow > Liquid - m<sup>3</sup>/hr , Gas-MMSCMD, Steam - kg/hr. Pressure -> kg/cm<sup>2</sup>(g), Temperature-°C, Level/ Length-> mm

General	01	Tag No.		PCV- ** (Quantity as per P& ID)	PCV - ** (Quantity as per P& ID)		
	02	Inlet Line No.					
	03	Outlet Line No.					
Valve	04	Line Size	Schedule	**	S40	**	S40
	05	Inlet Line I.D.	Outlet Line ID	*	*	*	*
	06	Service		PR. REDUCTION (ACTIVE)	PR. REDUCTION (MONITOR)		
	07	Regulation		DOWN STREAM	DOWN STREAM		
	08	Type of Regulator : STD	Pilot Op.	Globe /Axial	PILOT	Globe /Axial	PILOT
	09	Body Size	Port Size	*	*	*	*
	10	End Conn : Flgd. Size & Rating		*	SAME AS SDV UPSTREAM PIPE RATING	*	SAME AS SDV UPSTREAM PIPE RATING
	11	Facing & Finish		RF 125 AARH	RF 125 AARH		
	12	Body Material		ASTM A350 LF2 / A216 WCB	ASTM A350 LF2 / A216 WCB		
	13	Trim Material		SS 316	SS 316		
Options	14	Bonnet Type					
	15	Impulse Connecn. Int.	Ext.	EXTERNAL	EXTERNAL		
	16	Connection Size & Type if External		*	3/8" NPTF	*	3/8" NPTF
	17	Material of Diaphragm		*	Nitrile	*	Nitrile
	18	Other Wetted Parts		*	SS 316	*	SS 316
	19	Soft Seating	Material				
	20	ANSI Leakage Class		CLASS VI	CLASS VI		
	21	Failure Position		FO	FC		
	22	Solenoid Valve					
	23	IP Converter					
Service Conditions	24	Filter With Gauge					
	25	Limit Switch/ Proximity Switch		Not Required	Not Required		
	26	Fluid	State	**	VAPOUR	**	VAPOUR
	27	Flow Liquid_Min	Normal / Max				
	28	Flow Vapour_Min	Normal / Max	**	**	**	**
	29	Flow Water_Min	Normal / Max				
	30	Inlet Pr. Min	Normal / Desn.		**	**	**
	31	Outlet Pr. Min	Normal / Max		**	**	**
	32	Delta Pr. Shut Off		**	**	**	**
	33	Temp. °C Oper.	Max	**	**	**	**
Valve Data	34	Oper. S.G.	Mol. Wt.	#	#	#	#
	35	CP/ CV	Compressibility Factor	#	#	#	#
	36	Flash %	Visc. (cP)		#		#
	37	Maximum Flow Capacity			*		*
	38	PCV Set Point		Decided during detail engg.	Decided during detail engg.		
	39						
	40	Cv. Min.	Cv. Max.	*	*	*	*
Model Nos.	41	Cv. Nor.	Selected Cv.	*	*	*	*
	42	Predicted Sound Level DBA		< 85dBA	< 85dBA		
	43	Inlet Velocity M/S		*	*		
Model Nos.	44	Valve	Actuator	*	*	*	*
	45	Positioner	Limit Switch	*	--	*	--
	46	100% Radiography		*		*	


Notes: \*\*\* As per P& ID, # Refer Gas Composition attached with bid documents.

- \* - TO BE FURNISHED BY THE VENDOR.
- SPRING SHALL BE SUITABLE TO ADJUST COMPLETE OUTLET PRESSURE RANGE (i.e. if downstream of PCV is 300#, then spring range shall be upto 49 Kg/cm<sup>2</sup>) OF SKID. IF SINGLE SPRING DOESN'T COVER THE ENTIRE RANGE, THEN LOOSE SPRINGS TO BE SUPPLIED.
- VENDOR SHALL FURNISH A SCHEMATIC INCLUDING ALL THE IMPULSE LINE CONNECTIONS. LOCATION AND SIZES TO THE MAIN VALVE AND TO THE PILOT INLET/OUTLET VALVE.
- ACCURACY OF REGULATION SHALL BE BETTER THAN ± 1% OF THE SET PRESSURE.
- VENDOR SHALL FURNISH THE SIZING CALCULATIONS ALONG WITH THE QUOTE.
- VENDOR SHALL FURNISH SPRING RANGES ALONG WITH OFFER
- THE SELECTED SIZE & MODEL SHALL BE SUCH THAT THE PRESSURE CONTROL VALVE MUST OPERATE AND CONTROL AT BOTH MIN. AND MAX. FLOW RATE AS INDICATED WITH THE GIVEN PRESSURE CONDITIONS.
- THE SELECTED MODEL SHALL BE OF PILOT OPERATED WITH EN 334 APPROVAL..

1			 MECON LTD. DELHI
Rev.		DATA SHEET OF PRESSURE CONTROL VALVES	DS No: MEC/ 05/E5/DS- PCV

## SLAM SHUT VALVES


UNITS : Flow > Liquid - m<sup>3</sup>/hr , Gas-MMSCMD, Steam - kg/hr. Pressure -> kg/cm<sup>2</sup>(g), Temperature-°C, Level/ Length-> mm

Sl. No.	DESCRIPTION	TECHNICAL REQUIREMENTS
1	Tag No.	SDV -** (Quantity as per P& ID)
2	Line Size & Sch.	** , S40
3	Services	**
4	Type of Valve	*
5	Body Size	*
6	End connection	FLANGED * , SAME AS UPSTREAM PIPE RATING, RF 125 AAR H
7	Body Material	ASTM A350 LF2 / A216 WCB
8	Trim Material	SS 316
9	Impulse Connection	*
10	Spring Range	NOTE - 5
11	Accuracy	1% OF SET PRESSURE OVER WHOLE RANGE
12	Pressure Drop	Suitable to meet the overall pressure drop across the skid
13	Type of Actuator:                      STD                      PILOT	PILOT
14	Limit Switches	YES REQUIRE , ONE EACH FOR OPEN & CLOSE POSITION
15	Manual Reset	Yes , Required
16	Failure Position	CLOSE , TIGHT SHUT OFF
17	Position Indicator	YES , REQUIRED
18	Closing Time	LESS THAN 2 SEC
19	Fluid & State	**
20	Temperature °C                      Working                      Design	**
21	Inlet Pressure : MIN / NORMAL / MAXIMUM	**
22	FLOW : MIN / NORMAL / MAXIMUM	**
23	Design Pressure	**
24	Operating S.G	#
25	Molecular Weight	#
26	Cp/CV	#
27	Compressibility Factor	#
28	Shut Off Pressure	SET POINT :- During detail engg.
29	RADIOGRAPHY ( 100%)	*
<p>NOTES: **** As per P &amp; ID, *** - By vendor, #Refer Gas Composition attached with bid documents.</p> <p>1. VENDOR SHALL FURNISH A SCHEMATIC INDICATING ALL THE IMPULSE LINE CONNECTIONS, LOCATIONS ,MIN. DISTANCE AND SIZES TO THE MAIN VALVE AND TO THE SLAM SHUT VALVES.</p> <p>2. VENDOR SHALL FURNISH SIZING CALCULATIONS ALONGWITH OFFER.</p> <p>3. FOR TECHNICAL SPECIFICATIONS AND QUANTITY FOR LIMIT SWITCHES REFER Datasheet of Limit Switch</p> <p>4. SDV SHALL BE AS PER EN /EQVT STD.</p> <p>5. SPRING SHALL BE SUITABLE TO ADJUST COMPLETE OUTLET PRESSURE RANGE (i.e. if downstream of PCV is 300#, then spring range shall be upto 49 Kg/cm<sup>2</sup>) OF SKID. IF SINGLE SPRING DOESN'T COVER THE ENTIRE RANGE, THEN LOOSE SPRINGS TO BE SUPPLIED.</p>		
1	DATA SHEET OF SLAM SHUT VALVES	 MECON LTD. DELHI
Rev.		DS No: MEC/ 05/E5/DS- SDV

## SPECIAL INSTRUCTIONS TO VENDOR FOR CONTROL VALVES (FCV)

The purpose of this specification is to define the requirements of 'Control Valves' part of METERING SKID.

- 1) Vendor shall furnish the following documentation along with the offer
  - a) Sizing, noise calculation and inlet velocity calculation for each valve
  - b) A list of all control valves tag number wise, giving percentage openings along with graph for minimum, normal and maximum flow conditions.
  - c) Technical catalogues model no. Decoding procedure, CV tables, actuator sizing information etc.
- 2)
  - a) Offer shall be clear, unambiguous (with minimum of alternatives) and complete with all data sheets, sizing calculations, catalogues etc.
  - b) Make and Model Nos. of the Actuators, Positioners, I/P Converters are subject to the Approval of the Purchaser/Consultant.
- 4) Commissioning spares if any shall be included.
- 5) Vendor shall include inspection by CLIENT/MECON personnel at vendor's shop. For this inspection, labor, consumables, equipment and utilities as required shall be in vendor's scope.
- 6) Noise level measured from 3 ft from the valve shall be less than 85dB (A). Suitable low noise trim shall be provided wherever necessary. Vendor to furnish through literature and calculations on how noise levels are being kept below 85dB (A) in the cases where low noise trims are specified.
- 7) For every tag vendor to furnish the maximum differential pressure met by the actuator model quoted for that tag in a tabular form. Table shall be maximum diff. Press. in Kg/cm<sup>2</sup> against tag no.
- 8) Natural Gas to be use for the regulation of the valve since no air is available. The natural gas used for actuation shall be tapped from metering skid and suitable regulator to be used for pressure reduction if required. All necessary accessories and certificate shall be provided to use the valve in hazardous area class 1 div 1.
- 9) All Electro pneumatic converters shall be as per data sheet no. MEC/05/E5/DS – EPT. EPT shall be low bleed type and suitable for Natural Gas application and shall have certification from CCOE
- 10) Sizing of the actuator shall be the responsibility of the Vendor. If the actuator is found to be undersized at stage after the finalization of order / shipment of material to site, vendor shall change the same without any extra cost.
- 11) All items marked "\*" in data sheets shall be furnish by vendor in the offer.
- 12) Leakage classes specified in data sheets are as per ANSI B16.104
- 13) **The radiography shall be required for all valve castings of rating 600 lbs. and above. Radiography procedure, area of casting to be radiographed shall be as per ANSI B 16.34 and acceptance criteria shall be as per ANSI B 16.34 Annexure-B. However, for areas of casting to be radiographed for types of valves not covered in ANSI B 16.34, vendor shall enclose details of areas to be radiographed in line with ANSI B 16.34.**

1	<b>SPECIAL INSTRUCTIONS TO VENDOR FOR CONTROL VALVES (FCV)</b>	 <b>MECON LTD. DELHI</b>
Rev.		<b>Doc. No: MEC/ 05/E5/ECV-SIX</b> 148 of 626



**Control Valves**

UNITS : Flow > Liquid - m<sup>3</sup>/hr , Gas-MMSCMD, Steam - kg/hr. Pressure -> kg/cm<sup>2</sup>(g), Temperature-°C, Level/ Length-> mm

General	1	Tag No.	FCV **		
	2	Inlet Line No.	AFTER METERING		
	3	Outlet Line No.	AFTER METERING		
	4	Service	**		
	5	Line Size	Schedule	**	STD
	6	Inlet Line I.D.	Outlet Line ID	*	*
Body	7	Type of Body	GLOBE		
	8	Body Size	Port Size	same as upstream pipe size	*
	9	Guiding	No. of Ports	*	*
	10	End Conn : Flgd. Size & Rating		*	same as upstream pipe rating
	11	Facing & Finish		RF 125 AARH	
	12	Body Material		ASTM A216 GR. WCB	
	13	Bonnet Type		PLAIN	
	14	Packing Material		TEFLON	
	15	Lubricator	Iso. Valve		
	16	Trim Form		Equal Percentage	
	17	Trim Mat.Plug/Disc/Ball/Seat		SS 316 STELLITED	
	18	Other Wetted Parts		SS 316	
	Actuator	19	Soft Seating	Material	
20		ANSI Leakage Class		CLASS IV	
21		Type		SPRING & DIAPHARGM	
22		Close At	Open At	*	*
23		Failure Position		FO (with Lock Relay)	
24		Handwheel Position		YES(SIDE MOUNTED)	
Positioner	25	Air Supply Pressure		Actuating by Gas	
	26	Input	Output	*	*
	27	Bypass	Gauges	NOTE-1	THREE
Options	28	Solenoid Valve			
	29	I/P Converter		REQUIRED	
	30	Filter With Gauge		REQUIRED,TWO SETS	
	31	Limit Switch/ Proximity Switch			
Service Conditions	32	Fluid	State	**	VAPOUR
	33	Flow Liquid_Min	Normal / Max		
	34	Flow Gas	Normal / Max	**	**
	35	Flow Water_Min	Normal / Max		
	36	Inlet Pressure	Normal Design	**	**
	37	MAX. D.P.@Min. normal & max. Flow.		*	
	38	Delta Pr. Shut Off		**	
	39	Temp. ° C Oper.	Max	**	**
	40	Oper. S.G.	Mol. Wt.	#	#
	41	CP/ CV	Compresibility Factor	#	#
	42	Flash %	Visc.(CP)		#
	43	Deg.of Superheat % Solids			
	44	Vapour Pr.	Critical Pr.		
45	% Opening Min/Nor/Max.		*		
46					
Valve Data	47	Cv. Min.	Cv. Max.	*	*
	48	Cv. Nor.	Selected Cv.	*	*
	49	Predicted Sound Level DBA		<85dBA	
	50	Inlet Velcity M/S			
Model Nos.	51	Valve	Actuator	*	*
	52	Positioner	Solenoid Valve	*	
	53	100% Radiography		Required	

Notes:

- 1.BY PASS IS REQUIRED IF INPUT IS EQUAL TO OUTPUT
2. \* -TO BE FURNISHED BY THE BIDDER.
3. \*\*\* As per P& ID
4. # Refer Gas Composition attached with bid documents.

1

**DATASHEET OF CONTROL VALVES**



**MECON LTD. DELHI**

Rev.

DS No: MEC/ 05/E5/DS-FCV



MECON LIMITED  
DELHI

## DATASHEET OF ELECTRO PNEUMATIC TRANSDUCERS

DATASHEET No.

MEC/05/E5/DS-EPT

### Electro Pneumatic Transducers

UNITS: Flow-> Liquid-M<sup>3</sup>/hr Gas-Nm<sup>3</sup>/hr Steam-kg/hr Pressure-> kg/cm<sup>2</sup>g Temperature-> °C Level/Length-> mm

- |                                 |                              |
|---------------------------------|------------------------------|
| 1. Type:-                       | I/P CONVERTORS               |
| 2. Mounting:-                   | YOKE                         |
| 3. Ambient Temperature:-        | 45                           |
| 4. Air Supply:-                 | 1.4                          |
| 5. Electric Supply:-            | -                            |
| 6. Output:-                     | 0.2-1.0 kg/cm <sup>2</sup> g |
| 7. Pneum. Conn.:-               | 1/4" NPT(F)                  |
| 8. Measuring Circuit:-          | ELECTRONIC                   |
| 9. Cold Junction Compensation:- | -                            |
| 10. Burn-out Feature:-          | -                            |

- |                         |   |
|-------------------------|---|
| 11. Conduit Conn.:      |   |
| Elec:-                  | 1/2" NPT(F)                                     |
| Signal:-                | 1/4" NPT(F)                                     |
| 12. Accuracy:-          | +/- 0.15% OF FS                                 |
| 13. Actuation:-         | FORCE BALANCE                                   |
| 14. Housing Type:-      | WEATHER PROOF TO IP65<br>AND INTRINSICALLY SAFE |
| 15. Accessories:-       | MOUNTING ACCESSORIES<br>FOR 2" NB YOKE MOUNTING |
| 16. Input:-             | 4-20mA, 2 WIRE                                  |
| 17. Area classification | IEC Zone I, Gr IIA,IIB,T3                       |
| 18. Quantity            | **  |


REV.	ITEM NO.	TAG NO.	RANGE	CALIBRATION	ON BURN-OUT OUTPUT	SERVICE	NOTES
0	1	FX-**	*	*	*		

NOTES:

1. ' \* ' TO BE FURNISHED BY THE BIDDER, ' \*\* ' AS PER P & ID.


	1	12.10.09		
	REV.	DATE	BY	APPD
REF :				

<b>ULTRASONIC FLOW METERS</b>				
Units:- <b>Flow</b> : <b>Liquid</b> - m <sup>3</sup> / Hr <b>Gas</b> - MMSCMD <b>Steam</b> - Kg/Hr. <b>Press.</b> - kg/cm <sup>2</sup> g <b>Temp</b> - °C <b>Level/Length</b> - mm				
General	1	Tag no. & QTY.		FE - **
	2	Inlet Line No.		*
		Outlet Line No.		*
	3	Line Size & Sch.		**
	4	Service		**
5	Type		Multipath, (min 4 path) Transit Time	
Meter/ Transducer	6	End Connection: <b>Size &amp; Rating</b>		(NOTE -1)
	7	: Facing & Finish		RF, 125AARH
	8	Pulses / m <sup>3</sup>		*
	9	Flow Range		*
	10	Enclosure		WP to IP55/NEMA 4
	11	Cable Entry		¾" NPTF
	12	Material - Body		ASTM A 216 WCB / ASTM A 352 GR LCC / ASTM A350 Gr.LF2
	13	- End Connection		ASTM A 216 WCB / ASTM A 352 GR LCC / ASTM A350 Gr.LF2, Flanged
	14	Bi-directional		NO
	15	Radiography/Charpy Test		Required
	16	<b>Accuracy in % of reading</b>		<b>±0.3% overall accuracy including lab inaccuracy</b>
	17	Linearity	Repeatability	* ± 0.1 % for q <sub>t</sub> ≤ q <sub>i</sub> ≤ q <sub>max</sub> ± 0.2 % for q <sub>min</sub> ≤ q <sub>i</sub> ≤ q <sub>t</sub>
	18			
Pre-amplifier	19	Type – 2 Wire / 3 Wire		2 WIRE
	20	Pre – amplifier Location		*
	21	Power Supply	Cable Entry	From Transmitter ¾" NPTF
	22	Enclosure		WP to IP55/NEMA 4
	23	Intrinsically Safe/Ex-proof		Intrinsically Safe
	24			
Transmitter	25			
	26	Power Supply	Cable Entry	24 VDC ¾" NPTF
	27	Output		FREQUENCY & RS-485
	28	Enclosure		WP to IP55/NEMA 4
	29	Intrinsically Safe/Ex-proof		FLAME PROOF
30	Mounting		METER MOUNTED	
Options	31			
	32	Meter Runs		Refer Clause No.1.9 of Technical Specification, Note – 3
	33	Flow Conditioner		Refer Clause No.1.9 of Technical Specification, Note – 3
	34	Retractable Probes		Required
	35	Pressure Tap On Meter Body		REQD.- ½" NPTF
	36	Pressure Transmitter ( Including Barrier)		**
	37	RTD ( Including Barrier)		**
Service Condition	38	Fluid & State		** & VAPOUR
	39	Flow Min..	Max. (MMSCMD)	** **
	40	Temp-Working	Design ° C	** **
	41	Press – Design	Min   Max.	** **
	42	Mol. Wt.	Oper. Specific Gravity	# #
	43	Viscosity (Cp)		#
	44	Cp / Cv		#
	45	System Press.Drop, Kg/ cm <sup>2</sup> g		0.1
	46	Compressibility Factor		#
	47	Area Classification		IEC, ZONE 1 GR IIA, IIB T4
	48	Make & Model No. – Meter		*
	49	- Transmitter		*
	50	- Pre-amplifier		*

<b>0</b>	<b>DATASHEET OF ULTRASONIC FLOW METERS</b>	 <b>MECON LTD. DELHI</b>
<b>Rev.</b>		<b>DS No: MEC/ 05/E5/DS-UFM</b> 151 of 626

**Notes:** ‘ \* ‘ - By Bidder, ‘#’ Refer Gas Composition attached with bid documents, ‘\*\*’ As per P& ID,

1. Size & rating of meter shall be of pipeline size & rating where it is to be installed. Meter is designed considering maximum velocity of 20 m/s. Vendor to confirm the Size and Sizing Calculation shall be furnished.
2. US Meter shall be wet calibrated with Natural Gas with Upstream & Down Stream pipes length with profiler.
3. Minimum 10D Upstream before Flow profiler, 10D after Flow profiler & minimum 5D Downstream shall be provided with meter.
4. USM shall have separate serial port (RS 485/RS422) for Flow Computer connectivity and Laptop connectivity and suitable converter (RS: 485 - 232 converter) is required for Laptop connectivity with USM
5. Refer Technical Specification for USM attached with the data sheet for further details.

0	<b>DATASHEET OF ULTRASONIC FLOW METERS</b>	 <b>MECON LTD. DELHI</b>
Rev.		<b>DS No: MEC/ 05/E5/DS-UFM</b> 152 of 626

## **SPECIAL INSTRUCTIONS TO THE VENDOR FOR TURBINE FLOW METER**


The purpose of this specification is to define the requirements of Turbine Flow meter.

### **GENERAL :**

- 1) Vendor shall be responsible for selection of the correct model nos. of instruments to meet the purchaser's specifications. In case of model no required has to be changed at a later date to meet the Purchaser's Specifications, the same has to be done by the vendor without any price and delivery implications.
- 2) Vendor shall note that inspection hasa to be done by Client/MECON Personnel at Vendor's shop. For this inspection, labor, consumables, equipment and utilities as required shall be in vendor's scope.
- 3) Vendor shall submit all Drawings and Documents as per requirements.
- 4) Commissioning spares & consumables will be inclusive in the quoted price. List must be furnished along with offer.

### **TURBINE FLOW METER :**

- 1) Velocity through the Turbine Meter shall be restricted to 20 m/s. Furnish the sizing calculation along with the offer. Meter shall be designed as per AGA-7, OIML recommondation
- 2) The Turbine Flow Meter shall be suitable for the area classification IEC Zone-I, Gr IIA & IIB, T3. Certificates from Statutory Bodies for Hazardous Area Classification shall be submitted along with the offer.
- 3) The meter tube shall be mounted at the upstream side of the Turbine meter. The material of construction and size shall be as per attached data sheet. The meter tube shall be designed as per AGA-7 requirements.

1	SPECIAL INSTRUCTIONS TO THE VENDOR FOR TURBINE FLOW METER	 <b>MECON LIMITED, DELHI</b>
<b>Rev.</b>		<b>DS No: MEC/ 05/E5/TFM- SIV</b>

TURBINE FLOW METERS						
Units:- Flow : Liquid- m <sup>3</sup> / Hr Gas-MMSCMD. Steam- Kg/Hr. Press.- Kg/ cm <sup>2</sup> g Temp- °C Level/Length- mm						
General	1	Tag no.	QTY.	FE – **	As per P & ID	
	2	Inlet Line No./ Outlet Line No.			*	
	3	Line Size & Sch.			** & SCH. BY VENDOR	
	4	Service			**	
Meter	5	End Connection: Size & Rating		(Note-2)		
	6	: Facing & Finish		RF SERR. FINISH		
	7	Pulses / m <sup>3</sup>		*		
	8	Flow Range		*		
	9	Enclosure		NEMA 4 & 7		
	10	Cable Entry		½” NPTF		
	11	Material - Body		ASTM A 216 GR. WCB/WCC		
	12	- End Connection		FLANGED		
	13	- Rotor		*		
	14	- Bearing		SS 316		
	15	- Other Wetted Parts		SS 316		
Pre-amplifier	16	Linearity	Repeatability	±0.5%	± 0.1 %	
	17	Rangeability		1:20		
	18	Type – 2 Wire / 3 Wire		2 WIRE		
	19	Pre – amplifier Location		*		
	20	Power Supply	Cable Entry	*	½” NPTF	
	21	Length of Signal Cable		5 Metre		
	22	Enclosure		NEMA 4 & 7		
	23	Intrinsically Safe		YES		
Pulser	24	Mounting		METER MOUNTED		
	25	Power Supply	Cable Entry	*	½” NPTF	
	26	Output		PULSES SUITABLE TO RESPECTIVE FLOW COMPUTER (No. of HF & LF as per TS No. MEC/05/E5/TS/TFM-030)		
	27	Enclosure		NEMA 4 & 7		
	28	Intrinsically Safe		YES		
Options	29	Mounting		ON METER		
	30	Compensation – Viscosity				
	31	Straightening Vanes – Type		REQD.		
Options (Gas Service)	32	Local Counter (Mechanical)		REQD. (8 DIGIT)		
	33	Air Eliminator	End Connection			
	34	Strainer	Size & Mesh			
Service Condition	35	Pressure Tap On Meter Body		REQD. (*)		
	36	Lubricator With Accessories		YES		
	37	Fluid & State		** / VAPOUR		
	38	Flow Min/Normal	Max.	**	**	**
	39	Temp–Working	Design ° C	**	**	
	40	Press – Design	Min   Max. Kg/ cm <sup>2</sup> g	**	**	**
	41	Mol. Wt.	Oper. Specific Gravity	#	#	
	42	Viscosity (Cp)		#		
	43	Cp / Cv		#		
	44	Max.Allowable Press.Drop, Kg/ cm <sup>2</sup> g		Suitable to meet the overall pressure drop across the skid		
	45	Compressibility Factor		#		
Notes:	46	Area Classification		IEC, ZONE 1 GR IIA, IIB T3		
	47	Model No. – Meter	- Pre-amplifier	*	*	
	48	Make	- Pulser	*	*	

**Notes:**

1. ‘ \* ‘ - By Bidder, ‘#’ Refer Gas Composition attached with bid documents, ‘\*\*’ As per P& ID,
2. Size & rating of meter shall be of pipeline size & rating where it is to be installed. In case, max. flowrate (at min. pressure) to be measured doesn't fall in the measuring range of pipeline size meter then higher size meter shall be provided. Velocity through the Turbine Meter restricted to 20 m/s. Vendor shall confirm the meter size. Also furnish sizing calculation (Design as per AGA 7 Latest) for the given process conditions. Meter tube shall be as per AGA 7 Latest version.
3. Data sheet shall be prepared for each consumers as per P&Id and submit along with final submission of documents.
4. Turbine Meter shall be wet calibrated with Natural Gas with flow straightener.
5. Minimum 10D Upstream with flow straightener & 5D Downstream shall be provided with meter.
6. Refer Technical Specification for TFM attached with the data sheet for further details.


1	DATASHEET OF TURBINE FLOW METERS	 <b>MECON LIMITED</b> 154 of 626 DS No: MEC/ 05/E5/DS-TFM
Rev.		

## FLOW STRAIGHTNER

1. Flow straightner at the inlet of each turbine meter shall be designed as per AGA Report no.7 (Latest) and shall be supplied along with Turbine meter.
2. Flow straightner shall be a bundle of Stainless steel tubes. The tube shall be fixed to the main pipe rigidly. The profile and the length shall be as per AGA Report no. 7 recommendations.
3. Pipe Material : API 5L Gr.B  
 Size & Schedule : \* (Size must be same as meter size)
4. End Connection Inlet side/Turbine meter side  
 Material : ASTM A 105  
 Size : \* (Size must be same as meter size)  
 Rating / Face : same as upstream pipe rating / RF  
 Finish : \* (Must be same as meter) (As per ANSI B 16.5)
5. Bolt Material : A 193 Gr. B7  
 Nut Material : A 194 Gr. 2H
6. Quantity : As per P& Id.

**Notes:**

1. \* - By Vendor
2. Refer service conditions as per P&ID.
3. Pressure drop across the flow straightner shall be negligible.


1	<b>DATA SHEET FOR INLET FLOW STRAIGHTNER (TYPICAL)</b>	 <b>MECON LTD. DELHI</b>
Rev.		DS No: MEC/ 05/E5/DS/FS -01

**SPECIAL INSTRUCTIONS TO THE VENDOR**

**(FOR FLOW COMPUTERS - FC)**

The purpose of this specification is to define the requirements of 'Panel Mounted Flow Computers' part of the Metering Skid.

- 1) Vendor shall be responsible for selection of the correct model nos. of instruments to meet the purchaser's specifications. In case of model no. required to change at a later date to meet the Purchaser's Specifications, the same shall be done by the vendor without any price and delivery implications.
- 2) FC Vendor shall submit Make, Model No. with decoding details, Technical Literature and Catalogue of Flow Computer
- 3) The Flow computer along with all the accessories including Isolating IS barriers, a separate terminal strip for all SCADA signals to/from CLIENT's RTU shall be fully wired and mounted in Metering panel. (Under supplier scope).
- 4) **GSM Modem** shall be provided with each flow computer for remote data configuration, remote data uploading (previous 35 days data) and remote data monitoring.
- 5) The flow computers shall be microprocessor based, with data entry keypad and alphanumeric display with AGA firmware for natural gas flow measurement. Flow computer electronics shall be protected from industrial interferences and shall be shock and vibration proof.
- 6) Validation of Flow Computer (Flow Computation sheet comparing with standard software) confirming to latest AGA-9 (latest version) / AGA 5 / AGA-8 / GPA 2172 / GPA 2145 / AGA-7 to be submitted for all the flow Computers separately.
- 7) The flow computer shall have a facility for audit trail, web enabled and shall be compatible to calculate compressibility factor as per AGA-8 detailed method, provision for digital communication and pulse / frequency both.
- 8) The flow computer shall be certified for custody transfer applications by laboratory / institutes authorized by weights and measures authority of its country of origin such as NMI, PTB, Pigsar or other reputed International Standard laboratories such as Trans Canada Calibrations (TCC) Canada, Measurement Canada, Colorado Engineering Experiment Station Inc. (CEESI) USA., Calibration Certificates to be submitted for all the Flow Computers separately
- 9) The flow computers shall compute and display the instantaneous and totalized flow rate for each stream corrected for pressure and temperature variations. The flow computers receive data from the Gas chromatograph for calculation of compressibility factor as per AGA-8 detail method. The flow computers shall be linked to the CLIENT's RTU for providing the flow measurements of the individual stream runs and related process variables.
- 10) The flow computers shall have at least serial ports for communication purpose with RTU/SCADA, online GC and Printer, USB port / RS232 with adaptor for laptop connectivity (Port for Laptop connectivity to be provided in front side of the FC).
- 11) The power consumption of Flow Computer and other associated utilities of online system shall be considered for Backup calculation and finalization of Power requirement.
- 12) FC Vendor shall be provided all necessary assistance if required for Software Configuration, Flow Computation Checking & Serial Communication checking with RTU/SCADA, GC, & GSM modem etc.( RTU/SCADA are not in scope of vendor)
- 13) Vendor/ Supplier shall provide all necessary hardware, software, serial communication cables with connectors (for each connection 30 meter) etc. for FC connectivity to RTU/ SCADA, GC and USB port / RS232 with adaptor for Laptop. Other details required for interfacing of their Flow Computers with Purchaser's RTU/SCADA. In addition to this, the communication software shall be supplied in CD / DVD for testing the communication link.
- 14) **The Flow metering parameters shall be available for future SCADA through serial communication on MODBUS. All shall be configured and available on dedicated RS 485 port.**

1	<b>SPECIAL INSTRUCTIONS TO THE VENDOR (FOR FLOW COMPUTERS - FC)</b>	 <b>MECON LTD. DELHI</b> 156 of 626 Doc. No.: MEC/05/E5/FC-SIV
Rev.		




## DATA SHEET OF PANEL MOUNTED FLOW COMPUTER

1. a) Type : Electronic microprocessor based, data entry key board, online user Configurable Flow Computer suitable for USM (flow computations as per AGA 9).
- b) Make : \*
- c) Model No. : \*
2. Inputs :
  - a) Dual frequency signals from Ultrasonic Flow Meter Transmitter (meter mounted electronics).
  - b) 4-20 mA DC (2 Wire) superimposed with digital signal (HART Protocol) from 'SMART' Pressure Transmitters representing line pressure.
  - c) 4-20 mA D.C. (2 wire) superimposed with digital signal (HART protocol) from 'SMART' Temperature Transmitter representing line temperature.
  - d) RS 485/422 MODBUS from ultrasonic flow meter electronics for meter diagnostics and healthiness parameter.
  - e) RS-485/422/232 MODBUS from Gas Chromatograph
  - f) Discrete inputs from ultrasonic meter electronics.
  - g) Additional 5 Nos. 4-20mA DC (2 Wire) (superimposed with digital signal (HART Protocol) from 'SMART' Pressure Transmitters representing inlet line pressure, Temperature Transmitters representing inlet line temperature, Diff. Pressure Transmitters representing DP across filters in both streams, FCV position feedback).(if not available in flowcomputer then PLC with respective parameter indication on panel to be provided for same).
  - h) Digital Inputs from SDV (all streams), all HOV, all Z-Configuration valves. (if not available in flowcomputer then PLC with respective parameter indication on panel to be provided for same).
  - i) Other Standard Inputs available
3. Interfacing Capacity
  - a) Flow computers shall be interfaced with Gas Chromatographs supplied by others for feeding online gas composition to flow computer through RS485/232 MODBUS serial link. Protocol Detail will be provided during detail engineering. Vendor shall be responsible for proper integration of their flow computer with gas chromatograph. Vendor shall provide all necessary hardware, software etc. in vendor's supplied systems and other details required for interfacing of their flow computers.

<b>1</b>	<b>DATASHEET OF PANEL MOUNTED FLOW COMPUTER</b>	 <b>MECON LTD. DELHI</b>
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- b) Flow computers shall be interfaced with RTU for flow metering data as well as temperature and pressure, energy flow rate and total energy, corrected volumetric flow rate and total flow, yesterday's energy total and volume total, today's running volumetric total and energy total, volume and energy integrated at 6 a.m. etc. For RTU, vendor shall finally supply as per Hardware & Protocol Details provided during detail engineering.
4. Keyboard capability : The data entry keyboard shall have the provision to enter the following:
- Pressure and Temperature base factor
  - Specific gravity and scaling factor
  - Mole % or composition of the gas to be metered
  - Report headings, frequency and timing of reports
  - Selection of parameter to be displayed and on-demand printing of reports
  - Calorific Value
  - Flow, Pressure, temperature and density values and give compensated flow for any external conditions
  - Gas compressibility
  - The flow computer shall have provision to enter default values of all inputs (inclusive of gas chromatograph) low/high alarms for all inputs (inclusive of gas chromatograph) and shall be user configurable. The flow computer shall use the default values in case of any input goes beyond low/high limit.
  - Other Standard features available
5. Outputs : a) 4 – 20 mA DC analog output for corrected volumetric flow rate, line pressure, line temperature, energy rate & FCV positioning command (5 Nos.) (if flowcomputer doesn't have inbuilt PID Controller then FCV positioning command can be sent through separate flow controller)
- 4 – 20 mA DC analog output for corrected totalised volume and uncorrected totalised volume (in future).
  - Contact Alarm outputs for unit malfunctioning, process alarm like low pressure etc. (3 Nos.) (In future).
  - RS 485 serial output link for RTU / SCADA for all signals of this data sheet.
  - USB port / RS232 with adaptor for laptop connectivity.
  - RS-232 for Printer.
  - RS-232 for GSM Modem.
  - RS-485 / 232 for Metering supervisory system.
  - Other standard outputs available.
6. Isolation : Power supply shall be galvanically isolated. Analog I/Os and Digital I/Os shall be opto-isolated. (Active isolators, as required, shall be included by the vendor suitable for DIN rail mounting, inside vendor supplied control panel. 24VDC for powering the isolators shall be distributed by vendor inside their cabinet. Isolating relays shall be provided for potential free contact generation from switched inputs)
7. Computations : a) Volume Flow rate at standard, normal or operator specified base conditions (Sm<sup>3</sup>/ hr)

1	<b>DATASHEET OF PANEL MOUNTED FLOW COMPUTER</b>	 <b>MECON LTD. DELHI</b>
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- b) Integrated corrected volume.
- c) Energy flow rate and integrated energy.
- d) Linearisation of temperature input.
- e) Generation of Standard and user defined reports at printer. All reports shall be user configurable.
- f) Co-efficient of deviation from ideal gas law as per AGA-8 on the basis of specific gravity, temperature, pressure and mole % of N<sub>2</sub> and CO<sub>2</sub> and other compositions for flow computers. Flow computer shall have capability for both AGA-8 and AGA-Nx-19 with user selectable upon application requirement.
- g) Previous day's flow/energy (i.e. yesterday's 6.0 a.m. total volume/energy to today's 6.00 a.m. total volume/energy) & current running total for the day (i.e. volume totalizer / integrator value at 6.00 a.m. from first day) to be stored in a separate location (register) and these shall be user configurable.
- h) Today's accumulated flow/energy (running total since morning 6.00 a.m. to current time) and shall be user configurable.
- i) Generation of reports for totalized volume & energy at daily (6 a.m.) weekly, fortnightly & monthly intervals etc. shall be user configurable.
- j) All the above data shall also be made available by vendor in the serial links to RTU

8. Features :

- a) Built in online diagnostics to detect proper functioning.
- b) Parameters and programmed constants to stored in EEPROM/non-volatile memory.
- c) Super capacitor capable of storing data for three months without power.
- d) A minimum memory to log 240 alarms and 240 events for 15 days.
- e) Archival of data for up to 15 history points for 35 days.
- f) Built-in Closed loop Controller (PID) functionality (If not built-in, separate Flow Controller having communication facility between Flow Computer and Flow Controller shall be provided with each Flow Computers including suitable mounting arrangements in the Metering Panel)

9. Database :


- a) Current value of each input and output.
- b) Minimum and maximum values of selected variables for a period of two days.
- c) Values of selected variables by minute for last 60 minutes and by hour for last 30 days.
- d) Daily averages or accumulations of selectable variables for each contract day for up to 30 days.
- e) Event log databases for last 240 parameter changes.
- f) Alarm log database for minimum 15 days alarms set and cleared

10. Calculations standard :

- a) Volume flow rate & Total Flow: AGA Report 9(Latest)
- b) Compressibility: AGA 8 (Latest)

<b>1</b>	<b>DATASHEET OF PANEL MOUNTED FLOW COMPUTER</b>	 <b>MECON LTD. DELHI</b>
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- c) Energy Rate & Integrated Energy: AGA 5 (Latest)
11. Accuracy : Calculation accuracy shall be better than  $\pm 0.05$  % of full scale including linearity, hysteresis, repeatability and resolution. Accuracy for analog inputs to be  $\pm 0.005$  % of FSD at 23°C and Analog O/P accuracy to be  $\pm 0.1$  % at 23°C.
12. Scan Processing Time : a) The interval between computer readings of process variables shall not exceed 1 sec.  
b) The interval between each cycle for computation of instantaneous flow rate and totalized flow shall be less than 1 sec.  
c) Algorithm and rounding off error for computation shall be within  $\pm 0.001$  %
13. Security : Key lock shall be provided for prevention of unauthorized data entry. Two software security levels shall be provided. Multilevel software password protection shall be provided.
14. Display : Alphanumeric LCD with selectable decimal. Displaying all units, messages alarms etc in English. Flow computer shall have the capability of displaying any of the following parameters with Engg. Units.
- a) Uncompensated volumetric flow rate
  - b) Compensated volumetric flow rate
  - c) Totalised corrected flow,
  - d) Totalized uncorrected flow
  - e) Today's flow rate
  - f) Yesterdays flow rate
  - g) Density / Sp. Gravity
  - h) Pressure
  - i) Temperature
  - j) Energy Rate & Total Energy
  - k) Complete Gas Composition
  - l) Calorific value.
  - m) Data entry
  - n) Error codes
  - o) Selected parameter codes
  - p) Alarms (Process and Systems) including diagnostic message (i.e. Pressure out of range, Temp. out of range, Flow over range, Fault in measurement, Battery low etc.)
  - q) Other standard displays available
  - r) Audit Trail for Custody Transfer.
  - s) All the above data shall also be made available by vendor in the serial links to SCADA.
15. Units of display : a) Corrected flow rate: Std. Cubic meter/hr (SCMH)  
b) Corrected totalized volume: Std. Cubic meter.  
c) Pressure: Kg/cm<sup>2</sup>g  
d) Temperature: °C  
e) Energy: Kcal3
16. Power supply : 24 V DC with suitable Memory back up.

1	<b>DATASHEET OF PANEL MOUNTED FLOW COMPUTER</b>	 <b>MECON LTD. DELHI</b>
Rev.		<b>DS No: MEC/ 05/E5/DS-FC/02</b>

17. Configuration setup : Configuration and monitoring of operation of flow computer shall be done through configuration software running on IBM compatible PC.
18. Ambient conditions : Temperature: 0 to 65 ° C.  
Humidity: 5 to 95 % non-condensing.  
Vibration: As per ISA S75-13-1989, sec 4.2 & 5.35  
ECD susceptibility: Should meet IEC 801-2, level 3.  
Base Pressure: 1.0332 Kg/cm<sup>2</sup>  
Base Temperature: 15°C
19. Enclosure : General purpose
20. Mounting : Flush panel mounted.
21. Tag Nos. : FY-\*\*
22. Quantity : \*\*

### GSM MODEM

- a) Dual Band 900/1800 MHz(E 47)
- b) Input Current
- c) 20mA @ 12V Idle
- d) 100 mA @12V Avg.Tx.
- e) 560mA @ 12 V Peak Tx
- f) Operating Temperature: -25 to 55 Deg C.
- g) Input supply voltage: From Battery pack provided along with Flow Computer.
- h) Serial RS232 serial communication cable.
- i) Data Rates: 1200/2400/4800/9600/19200 bps.
- j) Data SIM Card : Mini SIM plug in/ removal
- k) Cellular data Service : Radip Link Protocol/ GPRS / Class BB (4+1)
- l) Antenna: Unity gain blade Antenna affixed directly to the module.
- m) LED indicator to give power and Network status.

### Notes:

1. ‘\*’ Vendor to furnish.
2. ‘\*\*’ As per P& ID
3. Separate communication port shall be provided in the flow computer for laptop & printer connectivity.
4. Original licensed software for retrieving the stored data, programming the Flow Computer using Laptop, software based on Windows 2000/XP shall be offered.
5. 4 sets of Flow Computer documentation including product literature, software/hardware manual, operating manual, maintenance instructions, Modbus addressing etc. shall be supplied.
6. The offered Flow Computer shall meet the requirement for Custody Transfer as mentioned in API Chapter 21.1 for audit & trial. In this regard compliance certificate from competent authority and other relevant documents shall be submitted along with bid.
7. **GSM Modem** shall be provided with each flow computer for remote data configuration, remote data uploading (previous 35 days data) and remote data monitoring.

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8. The Flow Computer shall be approved for Custody Transfer by NMI / PTB / renowned Lab.
9. Flow Computer Validation Software  
Supplier to provide licensed Software in the name of Client for authenticating the algorithm written in the Flow Computer as per AGA-9.
10. All diagnostics available in Ultra sonic Meter shall be replicated on Flow Computer also. For evaluation of measurement performance of Ultra Sonic Meter as per Appendix- C clause no 4 of AGA-9, the Vendor has to select & quote suitable Flow Computer meeting the AGA recommendations.
11. Vendor shall confirm all the instruction given in “**SPECIAL INSTRUCTIONS TO THE VENDOR**” enclosed with these Data sheets.
12. The communication speed of RS485 (for SCADA) serial communication port for flow computer shall be configurable from 2400 to 19,200 bps.
13. The Modbus communication protocol and message structure details to be used on the RS485 serial communication port (for SCADA) for Flow Computer shall be supplied after placement of order. Vendor shall furnish all details like pin configuration and tag number wise MODBUS address mapping list etc. for smooth interfacing of all communication links with RTU (SCADA in future).
14. Vendor/ Supplier shall provide all necessary hardware, software, serial communication cables with connectors etc. in vendor’s supplied systems and other details required for interfacing of their Flow Computers with Purchaser’s RTU (SCADA). In addition to this, the communication software shall be supplied in CD or floppy for testing the communication link.
15. Vendor/ Supplier shall be fully responsible for proper integration of their supplied systems and also integration with purchaser’s SCADA (RTU) systems at site and vendor shall provide all necessary assistance to purchaser’s for establishing all the serial links with SCADA RTU fully functional & Operational.
16. The Flow Computers Terminal shall have minimum one no. for USM connectivity, one No. of RS-485 Communication Ports for SCADA as specified in Data sheet, one no. RS-485/232 communication port for GC (Gas Chromatograph), one USB or 232 with adaptor for Laptop, One no. RS-232 for Printer. The communication protocol shall be MODBUS, the detail will be furnished during details engineering, However it shall support reading & writing as follows:
  - a) For reading function, CODE-3 or CODE-4 is required.
  - b) For writing function, GC data into the flow computer function code to be 6 (Single) and 16 (Multiple) are required.
  - c) As most of GAIL RTU is 16 Bit registers, two registers are used for accommodating one 32-bit floating point no. Hence the flow computer (irrespective of size of the register) should be configured as 16-bit registers so that no-error is encountered in writing.
17. Make of FC shall be as per vendor list attached with bid documents.

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## METERING SUPERVISORY SYSTEM

All the process parameters of the skid including flow computer & GC data shall be provided in the metering supervisory system, which shall be the Human Machine Interface Station Computer. The operating system of HMI of the Metering Supervisory System shall be window based. The computer system for the supervisory control system shall be industrial type IBM compatible, suitable for continuous operation in the non-air-condition environment. It will be mounted in the control panel. The system shall be supplied complete with keyboard, Panel Mounted 17" industrial grade LCD monitor, pointing device, hub, signal converter (RS 485-232 or vice-versa), all accessories, cables, Connectors and laser Printer with 1000 A4 size plain white paper. Licensed version (in name of "CLIENT") of all the required software to be installed and supplied with the supervisory system. The supervisory system shall be capable to provide read only data to consumer through serial communication and shall be web enabled. The computer shall be capable for generating Reports, Audit trail, current and historical trend for the process variables. It should have facility of Process data, Alarm manager, Diagnostic Manager (Automatic Verification), Configuration log, Audit trail etc.

Online validation software with license shall be supplied and shall be installed in HMI. Validation software shall be compatible with supplied front end software of HMI and shall be suitable for the application.

Metering supervisory system shall be designed to work in non air conditioned environment and shall be panel mounted (supplied by bidder). It shall be suitable for environmental conditions mentioned elsewhere.

The computer of metering supervisory system shall have hardware with latest configuration and shall have minimum specification of 1GHZ Pentium IV Processor with high resolution SVGA Monitor with 17" LCD screen, 512 MB RAM, R/W CD ROM Drive. The monitor shall have high speed refresh rates, 1280 X 1024 pixels and 256 basic distinct colours. The monitor shall be anti-glare, anti-reflective and anti-static. No obsolete hardware shall be supplied.

All the signals to be indicated in Metering Supervisory system.

Metering Supervisory system shall be supplied with software development key to make changes in programming in future.


RS-485 port shall be provided for RTU / SCADA.

Min. 6 Nos. of RS – 485 / 232 port (for LEL detection system, GC, printer, laptop & Flow Computer (2 nos.)) shall be provided. Suitable RS 485 to 232 (or vice versa) / RS-232 to USB converter to be provided as per requirement. Otherwise, TCP / IP communication shall be provided & all the above equipments shall be connected through it.

The HMI software shall be a internationally renowned standard Softwares like wonderware, IFIX, Intellution, cimplicity, licensed in the name of CLIENT. The supplied software shall be Full version (not the run time version) so that it can be upgraded and future changes can be made, if required. All the hardware required to meet the functionality shall be installed in a Control panel.

Metering supervisory system as a minimum shall contain the following:

- a) Display of all the major equipments (indicated in P&ID) along with its Status (BV open/close

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indication, SSV open/ close status indication etc.) indication in dynamic body colour (depending on change in the status, body colour of equipments shall change).

- b) Display of all analog parameter-values (like Inlet PT, Inlet TT, Metering PTs, Meter TTs, DPTs, Corrected Volumetric Flow rates, Uncorrected Volumetric Flow rates, GC-DATA (composition), Specific Gravity, SOS-USM-Paths(path-1, Path-2,---, Path-x), SOS-FCs, GCV-FC, GCV, NCV, Compressibility factors, Energy flow rate, mass flow rate, Total energy flow, total Mass flow, Total Volumetric Flow etc. Display of GC parameters (GC-DATA), FC-DATA(FC-configuration Parameters, base conditions, Keypad values, Alarm values, Atmospheric pressure, Error curve, Meter factor, K-factor etc.) shall also be provided.
- c) The screenshots shall also have feature of display of current/ historical trends, History, Audit trail, Reports etc.

LOG Reports (Shift/ Daily/ weekly/ Monthly/ fortnightly Reports) of Metering Supervisory system shall include the following (as a minimum):

**Shift-wise Log Report** (for Morning (A) shift, Evening (B) shift and Night (C) shift) shall be generated at pre-defined 8-hour time interval (say at 06:00 hrs, 14:00 hrs and 22:00 hrs). The report header shall display:

- Report type:** Shift-wise;
- Name of shift:** Morning (A)/ Evening (B)/ Night shift(C) (which ever applicable)
- Date and Time of Report;**
- Report from (---:00 hr.) to (---:00 hr)**


The parameters (Hourly Average value of parameters) to be displayed shall be for the following parameters: Inlet PT, Inlet TT, DPTs, Metering PTs, Metering TTs, Uncorrected volumetric flow rates, Corrected Volumetric Flow Rates, Mass flow rates, Energy Flow rates, NCV, GCV, Specific Gravity, Compressibility factors(base/ line), GC-Data (Gas Composition in %), SOS readings from USM, SOS calculated by FC, Heating values calculated by Flow Computers etc. Parameter name, Parameter description, Unit of Measurement of various parameters should be provided in the Shift Log report.

**Daily Log Report** shall be generated at pre-defined 24-hour time interval (say at 06:00 hrs). The report header shall display:

- Report type:** Daily Log; (which ever applicable)
- Date and Time of taking Report;**
- Report from(---:00 hr. on --/--/--) to (---:00 hr on --/--/--).**

In the static Fields of Daily Log report, column-wise display of Parameter name, Parameter description and Unit of Measurement of various parameters should be provided (Column-A shall display parameter-name, Column-B shall display parameter Description and Column-C shall display Unit of measurement).

The Daily (24 hourly) Log Report shall contain at least 4 columns for display of Parameter-values. The contents of the first 3 columns shall be 8-hourly values (taken at the end of each shift mentioned above) for each Parameters/ Totalized values. For example, 1<sup>st</sup> column shall display 8-hourly average reading for each parameter from 06:00 hrs. to 14:00 hrs of previous day. The 2<sup>nd</sup> column shall display 8-hourly average reading of parameter from 14:00 hrs. to 22:00 hrs of previous day. 3<sup>rd</sup>

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column shall display 8-hourly average of parameter from 22:00 hrs. of previous day to 06:00 hrs of current day. The 4<sup>th</sup> Column shall display Daily average value (average of the last 24 hrs reading, reckoned from 06:00 hrs of previous date to 06:00 hrs. of current date)/ Accumulated value during last 24 hrs. The parameters to be displayed shall be for Inlet PT, Inlet TT, DPTs, Metering PTs, Metering TTs, Uncorrected vol. flow rates, Corrected Volumetric Flow Rates, Mass flow rates, Energy Flow rates, NCV, GCV, Specific Gravity, Total Uncorrected Volumetric Flow (during last 24 hrs), Total Corrected Volumetric Flow (during last 24 hrs), Total Mass Flow (during last 24 hrs), Total Energy Flow (during last 24 hrs), etc.

**Fortnightly/ Monthly report** shall display daily average figures (24-hourly average values) of various parameters mentioned above for the last 15 days/ last month. These reports shall be automatically generated at pre-defined 15/ monthly interval (say on 01.04.2009, 16.04.2009 ----- at 06:05 hrs). The Header of Fortnightly/ Monthly Reports shall be: Fortnightly Report/ Monthly Report (as applicable) with date and time of report and date and time of values displayed (from 06:00 hrs of --/--/-- to 06:00 hrs of --/--/--).

All USM meter should include advanced diagnostics made available as a separate serial output as outlined under AGA 9 Section 4.5.4 as a minimum to allow implementation of a continuous real time meter monitoring and validation system in the Metering Supervisory System using advanced /expert algorithm . The following meter diagnostics as a minimum:

- Average flow velocity through the meter
- Flow velocity for each acoustic path ( or equivalent for evaluation of the flowing velocity profile)
- Average meter speed of sound
- Speed of sound (SOS) along each acoustic path
- Path Automatic Gain Control (AGC), gain level or similar indication of the signal strength
- Indication of accepted / rejected pulses for each acoustic path
- Signal to noise ratio (SNR) or equivalent

Additional diagnostic indicators that shall be provided by the manufacturer are listed in Appendix E of AGA 9 and design must provide expert diagnostics that shall validate meter performance in real time and alarm indicating possible cause and effect and impact of the alarm on meter performance


The System shall monitor the difference, in percent, between the average speed of sound reported by a meter and the speed of sound of the gas being measured, as calculated per AGA Report No. 8, Part I:DET AILED Equation of State or Part 2: GERG-2008 Equation of State.

The Measurement Supervisory System should provide Live Measurement Uncertainty for complete station and include real time Validation Dashboards for installed USM meter(s), Gas Quality analyzer(s), flow computer(s) and Pressure and Temperature transmitters as minimum to prevent undesired bias introduced in measurement due to potential contamination , fouling etc. as outlined under AGA 9 Section 7.2.


The Bidder shall provide a field verification test procedure to the operator that allow the USM Metering Package functionally tested to ensure that the metering station is operating properly. These procedures may include a combination of zero flow verification test, speed of sound measurement analysis, individual part measurement analysis, internal inspection dimensional verification and other mechanical or electrical tests.

The proposed Metering Supervisory System with advanced measurement dashboards should demonstrate that the metering package shall perform in field with

- 1) Minimal Down time


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- 2) Predictive Maintenance rather than PM (Preventive Maintenance) & CM (Corrective Maintenance)
- 3) Reduction on CAPEX and OPEX cost
- 4) lowest Measurement Uncertainty
- 5) Correct Identification of Un-Accounted Gas Flow over period of time

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# SPECIFICATIONS FOR LEL DETECTION SYSTEM

- SERVICE : To detect the presence of Natural Gas in the various locations in Terminal area.
- NO. OF DETECTORS / COMPOSITION : Refer Data Sheet enclosed for quantity requirements.
- ALARMS : To be available in the respective Control Rooms.
- RELAY CONTACT FOR EACH CHANNEL : Required
- RELAY CONTACT FOR GROUPING : Required

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## DATA SHEET

### 1) SENSOR:

TYPE	:	Poison resistant, infrared absorption type for combustible gas or vapours. (Non-selective)
CONSTRUCTION	:	Explosion proof, SS 316 body with stainless steel flame arrestors, dust cover, weather proof as per NEMA 4X or IP 65 <b>(NOTE-1).</b> Sensor element shall be replaceable type / plug in type. Terminal box shall be provided for further cabling. Flying leads shall not be offered. Cable entry shall be ¾” NPT (F) <b>(NOTE-2).</b>
ELECTRICAL AREA CLASSIFICATION	:	Zone -1, Gr. II A & II B, T3
RANGE	:	0 –100 % LEL
ACCURACY	:	± 1 % of gas reading @ ≤50% LEL, ± 5 % of gas reading @ > 50% to 100% LEL
MOUNTING ACCESSORIES	:	Vendor to indicate.


**NOTE 1:** Splash guard & weatherproof cap for protection against dust and rain shall be provided.

**NOTE 2:** The junction box shall be weatherproof to IP 55 and certified to Explosion proof.

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## 2) GAS MONITOR / CONTROLLER:

- TYPE : Solid state electronic, panel mounted plug in modular construction
- NO. OF CHANNELS: No of Channels shall be as per attached sheet with this specification. However, single loop integrity shall be maintained by one monitoring card per sensor. Single Channel Monitors shall be offered.
- POWER SUPPLY : 24 V DC Monitor / Controller shall supply power to sensor.
- RANGE AND METER CALIBRATION : Adjustable between 0-100 % LEL
- INDICATORS : Required 0 –100 % LEL.
- INDICATOR LIGHTS: Power on by a confidence flash for every 2 seconds.  
(Separate for each channel) 20 % LEL  
40 % LEL  
Malfunction (malfunction shall include short cut. line breaking, over range and earth fault.)
- OTHER FEATURES : a) Dual adjustable set points for gas level alarm.  
b) SPDT latching type relay contacts shall be provided for following:  
i) 20 % LEL (each channel)  
-alarm high (adjustable)  
ii) 40 % LEL (each channel)  
-alarm very high (adjustable)  
iii) Malfunction (common)  
iv) 20 % LEL (Common)  
-alarm high (adjustable)  
v) 40 % LEL (Common)  
-alarm very high (adjustable)  
vi) Two spare potential free outputs for future use.  
c) Relay contacts shall be suitably rated for the specified power requirements.  
d) Reset push button (common)  
e) Sensor calibration without alarm outputs shall be achieved by inhibit switch on relevant channel.


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MOUNTING : Monitors / Controllers shall be supplied mounted in 19” racks with screwed terminals at the back. However 19” racks shall be fully wired-up in ready to use condition. Dummy plates shall be provided on spare channel slots wherever required (20 % spare slot shall be provided wherever applicable).

CALIBRATION : Set of fully equipped calibration gas kit consisting of at least a cylinder / bottle of calibration gas for minimum 6 months use (of known mixture of air and gas ) , a pressure regulator with gauge , flexible tube / hose , adapter cap (to fit sensing head ) shall be supplied to enable online calibration of LEL detectors.

NOTE:

1. The Bidder shall indicate distance limitation if any between Sensor and Monitor.
2. RS – 485 port shall be provided in monitor / controller for RTU / SCADA.
3. All the Digital signals from monitor / controller shall be terminated upto RTU / SCADA TB.

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LEL SYSTEM FOR EACH PANEL MOUNTED FLOW COMPUTER  
METERING SKID


- 1) FLAMMABLE GAS DETECTORS.
- 2) EXPLOSION PROOF JUNCTION BOXES.
- 3) WEATHERPROOF CAP.

**For Item No. A.5, B.4 to B.7**

QUANTITY (Sensors) : 7 NOS.  
MONITORS / CONTROLLERS : 1 Set  
NO OF CHANNELS : 8 NOS. (With Common Indicating Meter)  
MONITORING CARDS : 7 NOS.  
CALIBRATION KIT : 1 Set.

**Other than above item nos.**

QUANTITY (Sensors) : 4 NOS.  
MONITORS / CONTROLLERS : 1 Set  
NO OF CHANNELS : 8 NOS. (With Common Indicating Meter)  
MONITORING CARDS : 4 NOS.  
CALIBRATION KIT : 1 Set.


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## SPECIAL INSTRUCTIONS TO VENDOR FOR LEL DETECTION SYSTEM

- 1) Vendor to note that the offered instruments shall be suitable for the following ambient conditions :

Temperature Range : 48°C (Max.)  
Humidity : 99% (Max.)  
Rainfall : 1000mm (Max.)

- 2) Power Supply shall be from the respective control panel to each monitor rack at each terminal, Power distribution is in the Vendor's scope. If conversion to DC level is required, the system shall be based on dual redundant power packs.
- 3) Vendor shall furnish the statutory certificates of explosion proof for both LEL detector and the junction boxes along with offer.
- 4) Vendor to note that the pellister of the detector must be poison resistant to the normally known pollutants present in a hydrocarbon processing industry including sulphides, SO<sub>2</sub>, chlorides, dust etc.
- 5) Mounting details of the LEL detectors shall be furnished.
- 6) Adjustable set points shall be provided at the monitors.
- 7) Calibration gas suitable for the calibration of LEL detectors shall be included in the offer.
- 8) Mute circuits with acknowledge and reset buttons shall be provided.
- 9) Detailed configuration diagram showing connection of monitor etc. along with detailed catalogues, manuals etc. shall be furnished along with offer.
- 10) Time period required between successive calibrations of the LEL detectors shall be furnished in the offer.
- 11) Commissioning Spares for all the items shall be included in the offer. The vendor shall furnish the detailed list of the commissioning spares in the offer

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## SPECIAL INSTRUCTIONS TO THE VENDOR


### 1. Scope

The Gas Chromatograph is a part of the metering skid and shall be supplied along with respective metering skids. The GC Vendor along with skid Vendor shall execute this part.

- a) Technical specification, Data sheets attached in the bid document, covers the minimum requirements for the complete design, engineering, material selection, manufacturing, supply, nameplate marking, inspection, testing, shipping, erection, testing and commissioning of On-Line Gas Chromatographs with all accessories for Metering Skid. Controller along with Zener Barriers/Isolators shall be fully wired and mounted in the same metering Panel to be installed in the Control Room. Printer with stand (if not an integral unit with GC) along with connecting cables, shall be loose supplied. The Sampling System, Gas Analyser, Calibration, and Carrier Gas Cylinders all will be on skid mounted in field and suitable for installation in hazardous area and specified weather condition. For detail scope of work refers Bill of Material (Indicative) mentioned elsewhere in this document.
- b) In the event of any conflict between technical specification, data sheets, related standards, codes etc. the Vendor should refer the matter to the purchaser clarification and only after obtaining the same should proceed with the manufacture of the items in question.
- c) Purchaser's data sheets indicate type, minimum sampling system requirements and material of construction for Gas Chromatograph and its sampling system. However, this does not absolve the Vendor of the responsibility for proper selection with respect to the following:
  - ii. Proper design of the sampling system and gas chromatograph to measure the component of interest to the stated accuracy.
  - iii. Selection of materials for all the parts of the gas chromatograph system so as to be compatible with the process stream and surrounding atmosphere as per purchaser's data sheets.
- d) Vendor shall note that the offered instruments shall be suitable for the following ambient conditions:

Temperature Range: 65 °C (MAX), 5 - 40 °C (operating)  
Humidity : 100 % (max)

- e) Vendor shall be responsible for selection of the correct model no. of instruments to meet the specifications contained in the spec. In case of model no. required to be changed at later date, the same shall be done by the Vendor without any price or delivery implications.
- f) Offer shall be clear, unambiguous (with no alternatives) and complete with all data sheets, catalogues etc.
- g) Gas Chromatograph shall be connected to the Flow Computers (the scope of SKID Vendor). Hence suitable interface & integration with Flow Computer is under Vendor's scope.
- h) Separate Analyser Cabin, necessary Sample Handling System, 20D straight run shall be provided as per the ISO10715. Tubing from main pipeline to Analyser Cabin (approximate distance between Analyser Cabin and Sampling Point on the pipelines will be min. 50 mtr.), Bottles and Skid for mounting are under Vendor's scope.

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- e) Vendor shall provide certificate for all the tests indicated in FAT. In addition, Vendor shall provide the 'Manufacturer's certificate of Conformity' to purchaser's specifications as per clause 2.2. of DIN 50049.

**2. Spare Parts:-**

- a) **Consumable as a part of the offer.**  
 b) **Commissioning spares as a part of the offer.**

3. Special Tools and Tackles for Operation & Maintenance of GC. List must be furnished along with the offer. (if required)
4. All units of measurement for various items in Vendor's specification sheets shall be to the same standards as in purchaser's data sheets. All instruments shall be graduated in the same engineering units as indicated in purchaser's data sheets.
5. All the materials specifications for various parts in the Vendor's specification sheet shall be to the same standards as those in purchaser's data sheets e.g. ASTM, BS etc.
6. Vendor shall not offer any prototype instruments in his bid. All instruments offered should have been proven in refinery or petrochemical plants before bidding.

**7. Drawings & Data**

Vendor shall submit all the datasheets/drawings/documents as indicated below,


a) **Along with the offer**

Vendor's Offer shall include a detailed specification sheet for Gas Chromatograph system which shall contain the following information:-

- i. All the details regarding type, construction, materials, accessories etc. of the On-line Gas Chromatograph along with technical catalogue.
- ii. Detailed sketch showing various components of sampling and sample conditioning system.
- iii. Sample flow rates required achieving response time, the recommended length and size of the sampling tube between process tap and sampling system.
- iv. Any special cabling requirements including shielding and grounding requirements and maximum permissible distances of separation between the field and the control room mounted units etc.
- v. A Copy of the Certificate of intrinsic safety/ flameproof from statutory body like BASEEFA, FM, PTB, CMRI etc. as applicable.
- vi. Consumption figures of electrical power and other utilities for each gas chromatograph system.
- vii. Overall dimensions of major units dimension of the skid to be mounted in field.

b) **After Placement of Order**

Vendor shall submit certified drawings and specification sheets for Gas Chromatograph which shall include the following (\* marked shall be submitted for approval)

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- i. \* Bill of Material of the complete G.C system.
- ii. \* G.A Drg. With overall Dimension of both Sampling unit & Panel.
- iii. Sampling interconnection details identifying each component with make and model number.
- iv. Detailed interconnection diagram for process, piping and tubing. (Hook up Diagram)
- v. Installation drawings.
- vi. Calibration curves as required for each Gas Chromatograph system.
- vii. Cabling details including shielding / grounding requirements.
- viii. Utility consumptions.
- ix. Technical Literatures, Installation & Commissioning Manuals for all supplied items.
- x. Quality Assurance Plan.
- xi. Software required for the systems.
- xii. Wiring Diagram of Panel.
- xiii. Cable Parameters (Capacitance, inductance, L/R ratio) for interconnection cable between field and the control room mounted units for intrinsically safe system.
- xiv. The details of the heat load, humidity particulate / chemical filtration etc. of the system.
- xv. Vendor shall provide certificate for the entire test indicated in FAT. In addition, vender shall provide the “manufacturer’s certificate of Conformity” to purchaser’s specifications as per clause 2.2 of DIN 50049.


## 8. Indicative Bill of Materials for On-Line Gas Chromatograph

### Field Mounted Items:


- a) Analyser for Gas Chromatograph with Necessary Certificate (CENELEC, CE, NMI etc.), 230/110 VAC / 50 Hz, One steam / one Cal., Power and signal cables and all accessories.
- b) Sample probe (SS) (inlet ¾” outlet ¼” - or as recommended) with SS Relief valve and pressure gauge, Thredolet 3000 # material ASTM – A-105 (as per ANSI B 16.5) thread as per ANSI B 1.20.1, necessary assembly consisting of Ball valve, manometer and Relief Valve etc.
- c) Sample line (1/16” or 1/8” SS tubing in protective Hose.) minimum 30 mtr.
- d) Sample Conditioning Cabinet with all accessories, equipments, PRV, Flow meter, PG, filters, Moisture Trap etc. and fittings.
- e) Mounting Skid for of Analyser, sampling conditioning cabinet and the bottle stand with vent system of 3 mtr. An explosion proof Junction Box with Switches for signal & power supply along with necessary power & signal cables and glands.
- f) Bottle (duly filled for Calibration Gas, Carrier Gas) & Bottle Stand with Bottle pressure regulators, Automatic switchover system for Carrier Gas, Heating plate etc.
- g) All Cables, Glands, Terminals, Tubing, structural items, Panel accessories required for installation of the system is in vendor’s scope.
- h) Dedicated earthing terminal has to be provided on the skid.

### Control Room Mounted Items:

- a) Programmable Control Unit with all inputs/outputs and serial / communication ports as mentioned in Technical Specification.

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- b) G.C controller inside metering Panel along with all accessories like Zener Barriers/Isolators, AC/DC Converter, Power Supply unit, etc, as required to be installed in metering Panel.
- c) All required Signal Cables (armored) / Fiber Optic Cables, Power Cables and RS 232 Communication Cable (min 10 -15 Mtr) for each computer and Cable Glands.
- d) Colour Desk Jet Printer with printer table including all the cables (If not the integral part of GC).
- e) The Flow computer and GC communication (on serial port) and further for SCADA if required in the scope of vendor.

<b>1</b>	<b>SPECIAL INSTRUCTIONS TO THE VENDOR (FOR GAS CHROMATOGRAPH - GC)</b>	 <b>MECON LTD. DELHI</b>
<b>Rev.</b>		<b>Doc. No.: MEC/05/E5/GC-SIV</b> 176 of 626


**DATA SHEET OF ON-LINE GAS CHROMATOGRAPH**

1. **SERVICE CONDITIONS**
- Tag Nos. : AE - \*\*
2. Quantity : \*\*
3. Gas Composition : Refer Bid Documents
4. Gas Pressure (Operating) : \*\*
5. Gas pressure (Design) : \*\*
6. Gas Temp ( Normal) : \*\*
7. Gas Temp. (Design) : \*\*
8. Moisture Content : Dry Gas
9. Line Size / Rating / Sch. / Flow : \*\*

Tag No.	Line Size	Rating	Sch.	Max. Flow (MMSCMD)	Remarks
AE -**	**	**	STD	**	


11. Power Supply : 230/110 V, 50 HZ
12. Instrument Air : Not Available

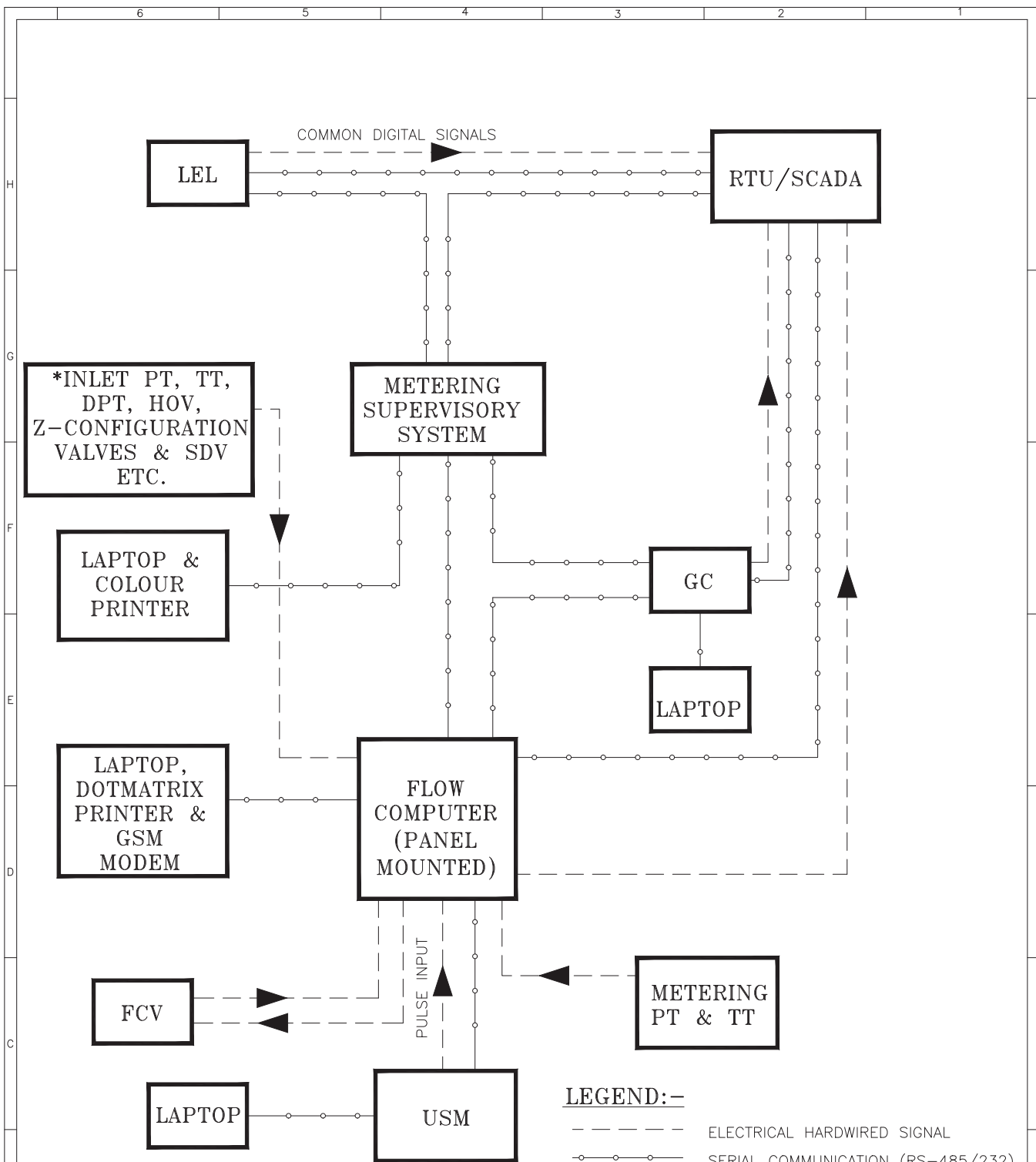
‘\*\*’ As per P& ID

1	DATASHEET OF GAS CHROMATOGRAPH	 <b>MECON LTD. DELHI</b>
Rev.		DS No: MEC/ 05/E5/DS-GC

## DATA SHEET FOR LAPTOP (TYPICAL)

1. All components / peripherals of the Laptop should be from OEM only. Authorised distributors doing local integration are disqualified and rejected.
2. The system offered should be modular in design with reference to both hardware / software to enable future upgradation and expandability. Only latest proven commercial release of the hardware and software should be offered.
3. The Laptop shall be supplied with all necessary power, communication cables with connector of main supplier and suitable to the Indian standards.
4. Technical literatures / Manuals / user instructions.
5. The minimum Specification of the Laptop shall be as follow:
  1. CPU : Intel Dual Core, 2.0 Ghz integrated cache
  2. Memory : RAM 1 GB DDR2 (Min.)
  3. HDD : HDD 160 GB (Min.)
  4. DVD / CD RW COMBO DRIVE
  5. Monitor 15"/ 17" TFT screen
  6. Intel Graphics Media acceierator 900 with up to 128 MB Snaed Video Memory
  7. Integrated wireless Blue tooth
  8. Muultimedia
  9. 56 K modem
  10. OS : WIN XP Professional (Licensed)
  11. Original Lisensed Antivirus Software & MS office
  12. Port required (Min.): 1 serial, RJ 11, 3 USB port, RJ 45 -10/100/1000T Gigabit NIC, 9 Pin D connector serial ports (one male & one female) and 15 pin serial connector.
  13. Laptop Bag with all accessories.
  14. Warranty : 1 year OEM standard
  15. Make : Compaq / Dell / IBM / HP

1	SPECIFICATION FOR LAPTOP	 <b>MECON LTD. DELHI</b>
Rev.		DS No: MEC/ 05/E5/Spec.- Laptop



**NOTE:-**

- ALL SERIAL PORT TO RTU/SCADA SHALL BE RS-485 & PROTOCOL FOR COMMUNICATION SHALL BE MODBUS.
- ALL STREAMS INSTRUMENT SIGNALS TO BE FED TO ALL FLOW COMPUTERS.

REV NO	DATE	ZONE	DESCRIPTIONS	BY	APPRD	REFERENCES	DRG. NO.
REVISIONS							

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SECTION: INSTRUMENTATION		TITLE: -					
DSGN	VIKAS	DATE	CHKD	DATE	<b>PROPOSED SYSTEM ARCHITECTURE FOR USM BASED METERING SKID</b>		
DRWN	SUNIL						
APPROVED				(R. SHUKLA)			
SCALE : NTS		(SH 1 OF 1)				REV 0	
DRG. NO. MEC/SD/05/E5/1/SA-01							



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**MECON LIMITED**

**ANNEXURE - II**

**GAS COMPOSITION PARAMETERS**



<b>S. No.</b>	<b>Component</b>	<b>Composition, Mol%</b>
1	C1	98.34
2	C2	1.50
3	C3	0.02
4	I-C4	0.00
5	N-C4	0.00
6	I-C5	0.00
7	N-C5	0.00
8	C6+	0.00
9	CO2	0.02
10	N2	0.12




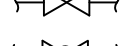
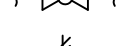

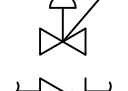

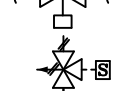
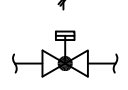

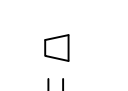
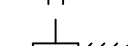
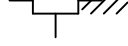
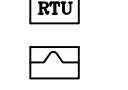


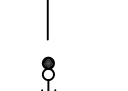
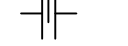
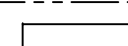
**ANNEXURE - III**

**DRAWINGS**

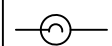


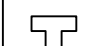
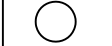
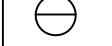
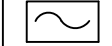

# SYMBOLS & ABBREVIATIONS

DRG. NO. MEC/23UU/05/28/M/000/0001


## SYMBOLS

-  VP-PLUG VALVE
-  VB-BALL VALVE WELDED END
-  VB-BALL VALVE FLANGED END
-  GATE VALVE
-  GV-GLOBE VALVE
-  PRESSURE RELIEF OR SAFETY VALVE (PSV)
-  PRESSURE REGULATING VALVE (PCV) (SELF ACTUATING TYPE)
-  NON RETURN VALVE
-  CONTROL VALVE WITH SLAM SHUT-OFF VALVE
-  SOLENOID VALVE
-  GAS ACTUATED ISOLATION VALVE
-  GAS ACTUATED ISOLATION VALVE WITH HANDWHEEL
-  REDUCER
-  FLANGE
-  FLAME ARRESTOR (FA)
-  REMOTE TERMINAL UNIT
-  DIAPHRAM
-  PIG SIGNALLER
-  VENT
-  SPECTACLE BLIND

## SYMBOLS

-  PD METER
-  TURBINE METER
-  INSULATION JOINT (IJ)
-  FLOW TEE (FWT)
-  FIELD MOUNTED INSTRUMENT
-  CONTROL PANEL MOUNTED INSTRUMENT
-  ULTRASONIC METER
-  SCADA INDICATOR, CONTROLLER OR OTHER DEVICES WITH OPERATOR ACCESS TO ADJUSTMENT.

## ABBREVIATIONS



- AE ANALYZER SENSOR (GAS CHROMATOGRAPH)
- AI ANALYZER INDICATOR
- AT ANALYZER TRANSMITTER
- FY FLOW COMPUTER
- FQI FLOW TOTALIZER & INDICATOR
- LG LEVEL GAUGE
- ZSH/ZSL LIMIT SWITCHES (OPEN/CLOSE)
- TI/TG TEMPERATURE INDICATOR/ GAUGE
- TE TEMPERATURE ELEMENT
- TW THERMOWELL
- DPI/DPG DIFF. PRESSURE INDICATOR/ GAUGE
- DPT DIFF. PRESSURE TRANSMITTER
- PI/PG PRESSURE INDICATOR/ GAUGE
- PT PRESSURE TRANSMITTER
- FC/FO FAILURE TO CLOSE/OPEN
- LO LOCK OPEN
- FIC/PIC FLOW/PRESS. INDICATING CONTROLLER
-  INTERLOCK
- XRL LOCAL/REMOTE INDICATION
- XSL LOCAL/REMOTE SWITCH
- HSH HAND SWITCH HIGH
- HSL HAND SWITCH LOW
- FT FLOW TRANSMITTER
- FE FLOW ELEMENT
- Q.O.E.C. QUICK OPENING END CLOSURE

## ABBREVIATIONS

- TT TEMP TRANSMITTER
- FR FLOW RECORDER
- PIR PRESSURE IND.RECORDER
- TIR TEMP. IND. RECORDER
- PSH PRESSURE SWITCH HIGH
- PSL PRESSURE SWITCH LOW
- LSH LEVEL SWITCH HIGH
- LSL LEVEL SWITCH LOW
- LAH LEVEL ALARM HIGH
- LAL LEVEL ALARM LOW
- D CONDENSATE DRAIN
- A1A/B1A 150#/300# RATING
- C1A/D1A 400#/600# RATING
- LX/PX PNEUMATIC/ ELECTRIC SIGNAL TRANSMITTER
- FB FULL BORE
- SP SAMPLER
- NG NATURAL GAS
- V VENT
- AS AUTO SAMPLER
- CP CORROSION PROBE
- CC CORROSION COUPON
- AV ACTUATED VALVE
- SDV SHUT DOWN VALVE
- LV LEVEL CONTROL VALVE
- PV/PCV PRESSURE CONTROL VALVE
- FCV FLOW CONTROL VALVE

00"-FLUID-00-00-A1A/B1A/C1A/D1A/D4A

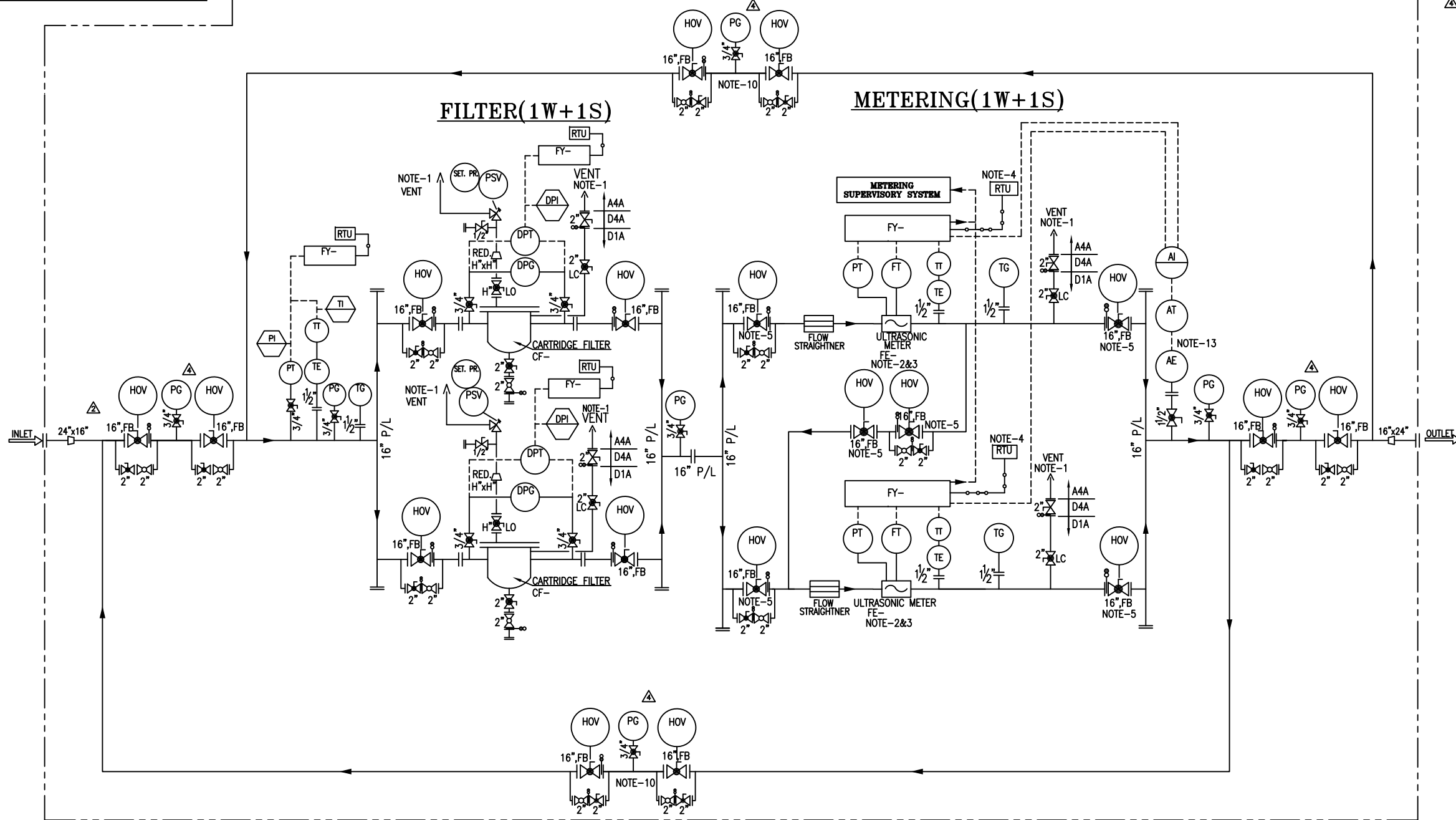
- MATERIAL SPEC.
- LINE NO.
- UNIT NO.
- (P-NATURAL GAS)
- LINE SIZE (NOMINAL)

	<b>INDRADHANUSH GAS GRID LIMITED</b>
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<b>MECON LIMITED</b>	
SECTION OIL & GAS	NORTH EAST GAS GRID
LOCATION DELHI	(PHASE-1 & 2 P/L SECTION)
DESIGNED	DRAWN SUNIL
CHECKED AND VERIFIED	LEGEND / DRAWING SYMBOLS
APPROVED	SCALE : NTS
DATE	DRG. NO. MEC/23UU/05/28/M/000/0001
SHEET 1 OF 2	REV 0

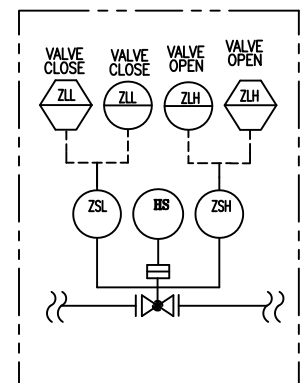
REV	INST.	CONCURRED BY	REV.NO	DATE	ZONE	DESCRIPTION	BY	VERIFIED

REFERENCES DRG.NO.  
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- NOTES:**
1. ALL VENTS SHALL BE LOCATED MIN. HEIGHT OF 3 MTR. ABOVE THE HIGHEST OPERATING LEVEL.
  2. METERING SHALL BE DONE BY ULTRASONIC FLOW METER WITH CONTROL PANEL MOUNTED FLOW COMPUTER. INSTALLATION SHALL BE AS PER AG99 LATEST EDITION. HOWEVER THERE SHALL BE TWO STREAMS OF METERING (1W+1S) FOR CHECK METERING.
  3. ENVIRONMENTAL ENCLOSURE REQUIRED FOR METERING INSTRUMENTS. INSULATION OF USM METER, METER RUN & IMPLUSE LINES OF METERING INSTRUMENT IS REQUIRED.
  4. PROVISION SHALL BE KEPT TO HOOK UP METERING PR. & TEMP., FLOW PARAMETERS WITH SCADA.
  5. VALVES ACROSS THE USM SHALL BE PROVIDED WITH LIMIT SWITCHES.
  6. INLET & OUTLET OF SKID SHALL BE PROVIDED WITH COMPANION FLANGES.
  7. ALL BALL VALVES SHALL BE FULL BORE ONLY.
  8. SIZE, RATING & SET PRESSURE OF PSV's TO BE DECIDED DURING DETAILED ENGINEERING.
  9. SKID SHALL BE SYMMETRIC ACROSS CENTRE LINE.
  10. PROVISION FOR BI-DIRECTIONAL FLOW HAS BEEN CONSIDERED. HOWEVER, M/S IGGL HAS TO CONFIRM.
  11. EACH VENT LINE SHALL BE COMBINATION OF A BALL VALVE AND A PLUG VALVE/GLOBE VALVE.
  12. NOTE DELETED.
  13. 20D UPSTREAM SHALL BE MAINTAINED FOR GC SAMPLE POINT. APART FROM GC, NECESSARY H2S, TOTAL SULPHUR AND MOISTURE ANALYZER ALSO TO BE INSTALLED FOR MEASUREMENT OF H2S, TOTAL SULPHUR & MOISTURE (IF ANY) IN GAS STREAM.



**TYPICAL HOV ARRANGEMENT**

**CHECK METERING FACILITY  
PROCESS DATA**

LOCATION	FLOW (MMSCMD)	INLET/OUTLET PRESSURE Kg/Cm <sup>2</sup> (G)	TEMPERATURE(DESIGN)	TEMPERATURE(WORKING)	DESIGN PRESSURE	DESIGN CLASS
DT GUWAHATI, SECTION-1	3.75	30-55	-29° TO 65°C	0° TO 55°C	92 Kg/Cm <sup>2</sup> (g)	600#

- VALVE LEGEND**
- ⊞ BALL VALVE FLANGE END
  - ⊞ BALL VALVE BW END/UPTO 1/2" SW END.
  - ⊞ PLUG VALVE BW END/UPTO 1/2" SW END.
  - ⊞ PLUG VALVE FLANGE END
  - ⊞ GLOBE VALVE.

**INDRADHANUSH GAS GRID LIMITED**

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**MECON LIMITED**

REV	INST.	CONCURRED BY	DATE	ZONE	DESCRIPTION	BY	VERIFIED	REFERENCES	DRG.NO.	CHECKED AND VERIFIED	SIG	(S.KUMAR)	DATE	13.09.22	SCALE : NTS	REV	
13.09.22					GENERAL REVISION	UMAR	AKB										
22.08.22					GENERAL REVISION	ANAND	UMAR										
06.08.22					AS PER REQUIREMENT	ANAND	UMAR										
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SECTION	OIL & GAS	<p><b>NORTH EAST GAS GRID (PHASE-1 &amp; 2 P/L SECTION)</b></p> <p><b>P &amp; ID FOR CHECK METERING FACILITY AT DT GUWAHATI</b></p>
LOCATION	DELHI	
DESIGNED	UMAR	
DRAWN	BOBBY	
CHECKED AND VERIFIED	A.K.BHARTI	
APPROVED	SIG (S.KUMAR)	
DATE	13.09.22	