STANDARD FORMS

INSTRUMENTATION

DEP 00.30.10.05-Gen.

February 1990
(DEP Circular 44/92 has been incorporated)

DESIGN AND ENGINEERING PRACTICE

USED BY

COMPANIES OF THE ROYAL DUTCH/SHELL GROUP

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PREFACE

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The Hague, The Netherlands,

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They are based on the experience acquired during their involvement with the design, construction, operation and maintenance of processing units and facilities, and they are supplemented with the experience of Group Operating companies. Where appropriate they are based on, or reference is made to, national and international standards and codes of practice.

The objective is to set the recommended standard for good design and engineering practice applied by Group companies operating an oil refinery, gas handling installation, chemical plant, oil and gas production facility, or any other such facility, and thereby to achieve maximum technical and economic benefit from standardization.

The information set forth in these publications is provided to users for their consideration and decision to implement. This is of particular importance where DEPs may not cover every requirement or diversity of condition at each locality. The system of DEPs is expected to be sufficiently flexible to allow individual operating companies to adapt the information set forth in DEPs to their own environment and requirements.

When Contractors or Manufacturers/Suppliers use DEPs they shall be solely responsible for the quality of work and the attainment of the required design and engineering standards. In particular, for those requirements not specifically covered, the Principal will expect them to follow those design and engineering practices which will achieve the same level of integrity as reflected in the DEPs. If in doubt, the Contractor or Manufacturer/Supplier shall, without detracting from his own responsibility, consult the Principal or its technical advisor.

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1) Operating companies having a Service Agreement with SIOP, SIEP, SIC or other Service Company. The use of DEPs by these Operating companies is subject in all respects to the terms and conditions of the relevant Service Agreement.

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Without prejudice to any specific terms in respect of confidentiality under relevant contractual arrangements, DEPs shall not, without the prior written consent of SIOP and SIEP, be disclosed by users to any company or person whomsoever and the DEPs shall be used exclusively for the purpose for which they have been provided to the user. They shall be returned after use, including any copies which shall only be made by users with the express prior written consent of SIOP and SIEP. The copyright of DEPs vests in SIOP and SIEP. Users shall arrange for DEPs to be held in safe custody and SIOP or SIEP may at any time require information satisfactory to them in order to ascertain how users implement this requirement.

All administrative queries should be directed to the DEP Administrator in SIOP.

NOTE: In addition to DEP publications there are Standard Specifications and Draft DEPs for Development (DDDs). DDDs generally introduce new procedures or techniques that will probably need updating as further experience develops during their use. The above requirements for distribution and use of DEPs are also applicable to Standard Specifications and DDDs. Standard Specifications and DDDs will gradually be replaced by DEPs.

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INTRODUCTION

This publication is a compilation of "Instrumentation" standard forms.

For all other standard forms, refer to DEP 00.00.10.05-Gen.

For data sheets and data/requisition sheets, refer to DEP 30.10.01.10-Gen., "Requisitioning".

The forms are intended for use by Group companies and, where required, by their contractors and suppliers.

The applications of these forms is in general, described in the relevant DEP publication, but for ease of reference they have been collected in binders.

New and revised standard forms will be supplied as yellow "master" copies only. All instrumentation standard forms should be kept in this DEP binder and used for printing yellow or white working copies as required. It is recommended that "blank" working copies should also be made on yellow paper to identify them as masters, since on completion of the technical information they will be used to produce copies.

The contents of this binder have been sub-divided into the following groups of standard forms for the subjects listed:

1. Instrumentation - General
2. Flow calculations
3. Instrument installations

1. INSTRUMENTATION - GENERAL

Instrument engineering data sheet	DEP 05.00.51.84-Gen., 4/79
List of selected instrument equipment (20 sheets)	DEP 05.00.54.40-Gen., 10/82
General purpose sheet (A4 size)	DEP 05.00.54.80-Gen., 9/75
General purpose sheet (A3 size)	DEP 05.00.54.83-Gen., 9/79
Summary of instrumentation documents and drawings (3 sheets)	DEP 05.00.54.88-Gen., 9/79
Amended per Circular 44/92 Summary of instrumentation requisitions (2 sheets)	DEP 05.00.54.89-Gen., sheet 1, 4/85 sheet 2, 9/79
Summary of instrumentation cables (4 sheets)	DEP 05.00.54.90-Gen., 9/79

Instrument engineering data sheet - DEP 05.00.51.84-Gen., 4/79

Group 30 General instrumentation								Group 31 Analyser and sundry instruments								Group 32 Flow 1) elements				Flow instruments				Group 33 Level instruments				P
Sheet	Revision			Sheet	Revision			Sheet	Revision			Sheet	Revision			Sheet	Revision			Sheet	Revision			Sheet	Revision			Sheet
100				150				200				250				300				350				400				500
101				151				201				251				301				351				401				501
148				198				248				298				348				398				448				548
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REMARKS

1) Includes restriction orifices (RO)

33 el ients	Group 34						Group 35												Group 36			
	Pressure gauges			Pressure instruments			Multipoint temp. indicators			Temperature instruments			Local temp. indicators			Thermowells			Control valves		
vision	Sheet	Revision		Sheet	Revision		Sheet	Revision		Sheet	Revision		Sheet	Revision		Sheet	Revision		Sheet	Revision	
	500			550			600			625			650			675			700		
	501			551			601			626			651			676			701		

List of selected instrument - DEP 05.00.54.40-Gen., sheet 1 10/82

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Notes	3	301-302
List	4	401-416
– Control room instruments and systems	4.1	
– Basement/Auxiliary room instruments and systems	4.2	
– Computer equipment and peripherals	4.3	
– Plant instruments:	4.4	
– Miscellaneous instrument equipment and accessories	4.4.1	
– Instrument equipment for flow (measurement)	4.4.2	
– Instrument equipment for level (measurement)	4.4.3	
– Instrument equipment for pressure (measurement)	4.4.4	
– Instrument equipment for temperature (measurement)	4.4.5	
– Control valves and accessories	4.5	
– Plant communication systems	4.6	
– Quality measuring instruments & process analysers:	4.7	
– QMIs general	4.7.1	
– Air quality	4.7.2	
– Water quality	4.7.3	
– Auxiliaries	4.7.4	

Issue \ Approved by:														
	Sign.	Date	Sign.	Date	Sign.	Date	Sign.	Date	Sign	Date	Sign.	Date	Sign	Date

Made by:	Date:	Title: **LIST OF SELECTED INSTRUMENT EQUIPMENT**	
Checked by:	Date:	Section 1: Table of contents	
LOCATION:	PLANT:	Project & group No.:	
Eng. by: Principal:		Sheet No. 101 cont'd on sheet No. 201 Drawing No. T	

DEP 05.00.54.40-Gen. sheet 1 10/82

List of selected instrument equipment - DEP 05.00.54.40-Gen., sheet 2 10/82

Sheet No.	Issue	Date	Issue	Date	Issue	Date	Issue	Date	Issue	Date

List of selected instrument equipment - DEP 05.00.54.40-Gen., sheet 3 10/82

3.1 GENERAL

This document lists the makes and types of instruments, instrument systems, instrument accessories, computer equipment, computer peripherals and plant telecommunication equipment, which have been selected by the principal for use in the project indicated in the title blocks. All items of the list are henceforth referred to as instrument equipment.

3.2 CODES

The letters used in the 'Code' column of the list shall have the following meanings:

3.2.1 **Code 'C'**

The contractor is free to make a choice from the alternatives, if shown, on condition that:
- only one type of instrument equipment shall be chosen for a given service for the whole project, including instrument equipment which forms part of equipment packages
- multihousing panel instrument equipment shall all be of the same make and type
- the contractor's choice shall be included in the tender.

3.2.2 **Code 'CD'**

The same rules shall apply as for items with code 'C', but in addition the contractor shall submit in the tender details of differences in cost including freight, where applicable, between the chosen instrument equipment and the alternatives.

3.2.3 **Code 'P'**

The contractor shall submit to the principal quotations received for the makes and types of the instrument equipment shown.
Based on a comparison of quotations (bid evaluation) submitted by the contractor, the principal will then make a choice.

3.2.4 **Code 'S'**

The principal will decide on the make and type of instrument equipment based on the following information which shall be submitted by the contractor as part of the tender:
- technical details
- detailed cost breakdown of the hardware ex factory
- detailed cost breakdown of the software ex factory, if applicable
- freight details
- detailed cost breakdown for installation/commissioning work
- available service facilities at destination.

Made by:	Date:	Title: **List of Selected Instrument Equipment**	
Checked by:	Date:	Section 3: Notes	
LOCATION:		PLANT:	Project & group No.:
Eng. by: Principal:			Sheet No. 301 cont'd on sheet No. 302 Drawing No. T

DEP 05.00.54.40 - Gen., sheet 3. 10/82

List of selected instrument equipment - DEP 05.00.54.40-Gen., sheet 4 10/82

3.2.5 **Code 'NA'**

Items are not applicable for this project.

3.3 DEVIATIONS

Deviations from the list are not normally allowed.
The contractor may, if considered necessary, submit a proposal for approval by the principal making amendments to the list.
The proposal shall include:

- the technical reasons for the proposed change
- the financial consequences of the proposed change.

3.4 DEFICIENCIES

When during the preparation of the tender or in the engineering stage it appears that the list is not complete, the contractor shall inform the principal immediately in writing, giving details of the deficiency in the list.
The principal will then change/amend the list as appropriate.

3.5 VALIDITY

A list of which the latest revision is authorized by signature on the cover sheet dated more than 6 months previously, is not valid for tendering purposes. In such a case the contractor shall inform the principal immediately in writing.
The principal will then submit an updated and valid list.

3.6 STATUS

The list shall be treated as confidential and shall not be disclosed to any manufacturer or other third party.

3.7 MODIFICATION TO THE LIST BY THE PRINCIPAL

During the project phase the principal reserves the right to make modifications of addition/ omission, etc., to the list, which shall be negotiable with the contractor.

Made by:	Date:	Title: **List of Selected Instrument Equipment**	
Checked by:	Date:	Section 3: Notes	
LOCATION:		PLANT:	Project & group No.:
Eng. by: Principal:			Sheet No. 302 cont'd on sheet No. 401 Drawing No. T

DEP 05.00.54.40 - Gen., sheet 4, 10/82

List of selected instrument equipment - DEP 05.00.54.40-Gen., sheet 5 10/82

Item	Description	Code	Manufacturer	Type	Manufacturer	Type	Manufacturer	Type
4.1	CONTROL ROOM INSTRUMENTS AND							
	SYSTEMS							
	Integrated control systems							
	Indicators/recorders/controllers (pneumatic)							
	Indicators/recorders/controllers (electric)							
	Indicators/controllers (digital)							
	Multi-point indicators (electric)							
	Multi-point recorders (pneumatic)							
	Multi-point recorders (electric)							
	Integrators							
	Pulse counters							
	Mass-flow computers							
	Printers							
	Displacement monitors							
	Vibration monitors							
	Alarm light units							
	Howlers							
	Manual change-over switches/selector switches							
	Push-button switches							
	Manual loading stations							
	Blenders							
	Instrument consoles							
	Graphic selection panel							
	Alarm display panel							
	Meter prover controls							
	Turbine meter/PD meter – read out panel							
	Tank gauging – read out panel							
	Roll charts – desk type							

Made by:	Date:	Title: **List of Selected Instrument Equipment**		Project & group No.:
Checked by:	Date:	Section 4: List		Rev.: / Date:
Eng. by: / Principal:		Location:	Plant:	Sheet No. 401 cont'd on sheet No. 402 / Drawing No. T

DEP 05.00.54.40 - Gen., sheet 5, 10/82

List of selected instrument equipment - DEP 05.00.54.40-Gen., sheet 6 10/82

Item	Description	Code	Manufacturer	Type	Manufacturer	Type	Manufacturer	Type
4.2	BASEMENT/AUXILIARY ROOM INSTR.							
	AND SYSTEMS							
	Instrument power supplies							
	Power supply distribution boxes							
	Alarm service units							
	Auxiliary racks (electric-termination/							
	cross wiring/interfacing)							
	Auxiliary racks (TC)							
	Auxiliary racks (pneumatic)							
	Binary logic systems (relays)							
	Binary logic systems (pneumatic)							
	Binary logic systems (electronic)							
	Binary logic systems (programmable)							
	Programmable cycle timers							
	Displacement monitors							
	Vibration monitors							
	Proximity amplifiers							
	Converters (mV/mA)							
	Converters (mV/pneumatic)							
	Converters (freq./analog)							
	Converters (resistance/mA)							
	Computing relays (pneumatic)							
	Computing relays (electric)							
	Selecting relays							
	Limiting relays							
	Time delay relays							

Made by:	Date:	Title: **List of Selected Instrument Equipment**		Project & group No.:
Checked by:	Date:	Section 4: List		Rev.: / Date:
Eng. by: / Principal:		Location:	Plant:	Sheet No. 402 cont'd on sheet No. 403 / Drawing No. T

DEP 05.00.54.40 - Gen., sheet 6, 10/82

List of selected instrument equipment - DEP 05.00.54.40-Gen., sheet 7 10/82

Item	Description	Code	Manufacturer	Type	Manufacturer	Type	Manufacturer	Type
(4.2)	Receiver switches (pneumatic/electric)							
	Receiver switches (pneumatic/pneumatic)							
	Receiver switches (electric/electric)							
	Volume boosters							
	Air filter – reducers							
	Air filters							
	Air reducers							
	Scanners (pneumatic)							
	Dead weight testers							
	Analog multiplexer systems for							
	temperature measurement							
	Cabinet supply units							
	Cabinet supply batteries (scaled type)							
	System cabinets							
	System cables							
	Terminals rail-mounted: pneumatic							
	: electric							
4.3	COMPUTER EQUIPMENT AND PERIPHERALS							
	Process computer							
	Teletransmission systems							
	VDUs							
	Printer terminals							
	Sequential event recorders							
	Plant operator computer consoles							
	Modems							
	Line drivers							
	Digital clock							

Made by:	Date:	Title: **List of Selected Instrument Equipment**		Project & group No.:
Checked by:	Date:	Section 4: List		Rev.: / Date:
Eng. by: / Principal:		Location:	Plant:	Sheet No. 403 cont'd on sheet No. 404 / Drawing No. T

DEP.05.00.54.40 - Gen., sheet 7, 10/82

List of selected instrument equipment - DEP 05.00.54.40-Gen., sheet 8 10/82

Item	Description	Code	Manufacturer	Type	Manufacturer	Type	Manufacturer	Type
4.4	PLANT INSTRUMENTS							
4.4.1	**Miscellaneous instruments and accessories**							
	Receiving indicators (pneumatic)							
	Receiving indicators (electric)							
	Recorders (pneumatic)							
	(Indicating) controllers (pneumatic)							
	Recording controllers (pneumatic)							
	Manual loading stations (pneumatic)							
	Converters (pneumatic/mA)							
	Converters (mA/pneumatic)							
	Flame detectors (main burner)							
	Flame detectors (pilot burner)							
	Displacement transmitters							
	Vibration transmitter							
	Speed transmitters (pneumatic)							
	Speed transmitters (electric)							
	Receiving switches (electric with							
	electric contacts)							
	Weighing bridges							
	Weighing scales							
	Load cells							
	Instr./Electr. interposing relays							
	Local panels							
	Switches (Ex)							
	Push buttons (Ex)							
	Audible alarm systems							
	Visual alarm systems							
	Compression fittings for: pneumatic + signal lines							
	: impulse lines							
	Equalizing manifolds							
	Transmitter interface boxes							
	Instrument protection boxes (enclosures)							
	Terminal boxes							

Made by:	Date:	Title: **List of Selected Instrument Equipment**		Project & group No.:
Checked by:	Date:	Section 4: List		Rev.: / Date:
Eng. by: / Principal:		Location:	Plant:	Sheet No. 404 cont'd on sheet No. 405 / Drawing No. T

DEP 05.00.54.40 - Gen., sheet 8, 10/82

List of selected instrument equipment - DEP 05.00.54.40-Gen., sheet 9 10/82

Item	Description	Code	Manufacturer	Type	Manufacturer	Type	Manufacturer	Type
4.4.2	**Instrument equipment for flow (measurement)**							
	Orifice plates (square edge)							
	Orifice plates (quarter circle)							
	Orifice plates (conical entrance)							
	Venturi tubes							
	Dall tubes							
	Flow nozzles							
	Pitot tubes							
	Meter-runs (prefabricated)							
	Restriction orifices							
	Transmitters (pneumatic)							
	Transmitters (electric)							
	Electromagnetic flow meters							
	Positive displacement meters							
	Turbine meters							
	Variable-area meters							
	Vortex flow meters							
	Impact flow meters							
	Ultrasonic flow meters							
	Flow straighteners							
	Strainers for turbine/PD meters							
	Integrators							
	Pulse counters							
	Flow switches (pneumatic)							
	Flow switches (electric)							
	Metering stations (package)							
	Meter provers							
	Equalizing manifolds							
	Vapour eliminators for turbine/PD meters							
	Pig detectors							

Made by:	Date:	Title: **List of Selected Instrument Equipment**		Project & group No.:
Checked by:	Date:	Section 4: List		Rev.: / Date:
Eng. by: / Principal:		Location:	Plant:	Sheet No. 405 cont'd on sheet No. 406 / Drawing No. T

DEP 05.00.54.40 - Gen., sheet 9, 10/82

List of selected instrument equipment - DEP 05.00.54.40-Gen., sheet 10 10/82

Item	Description	Code	Manufacturer	Type	Manufacturer	Type	Manufacturer	Type
4.4.3	**Instrument equipment for level (measurement)**							
	Transmitter/controller							
	(displacer type – pneumatic)							
	Transmitter/controller							
	(displacer type – electric)							
	Transmitter vessel - mounted							
	(displacer type – pneumatic)							
	Transmitter vessel - mounted							
	(displacer type – electric)							
	Tank gauges – local reading							
	Tank gauges – remote reading							
	Detectors – capacitance type							
	Detectors – conductance type							
	Detectors – sonic type							
	Detectors – radioactive							
	Indicators – floar-operated type							
	Indicators – surface seeking type							
	Level switches – rotating paddle							
	Level switches – tuning fork							
	Level switches – float type (pneumatic)							
	Level switches – float type (electric)							
4.4.4	**Instrument equipment for pressure (measurement)**							
	Pressure gauges – general							
	Pressure gauges – diaphragm-sealed							
	Transmitters (pneumatic)							
	Transmitters (electric)							
	dP transmitters (pneumatic)							
	dP transmitters (electric)							
	Pressure switches (contact output)							
	dP switches (contact output)							
	Draught (low pressure) gauge							

Made by:	Date:	Title: **List of Selected Instrument Equipment**	Project & group No.:	
Checked by:	Date:	Section 4: List	Rev. / Date:	
Eng. by: / Principal:		Location:	Plant:	Sheet No. 406 cont'd on sheet No. 407 / Drawing No. T

List of selected instrument equipment - DEP 05.00.54.40-Gen., sheet 11 10/82

Item	Description	Code	Manufacturer	Type	Manufacturer	Type	Manufacturer	Type
(4.4.4)	Draught (low pressure) transmitter (pneumatic)							
	Draught (low pressure) transmitter (electric)							
	Pressure (indicating) controllers							
4.4.5	**Instrument equipment for temperature**							
	(measurement)							
	Thermocouple assemblies – general							
	TC assemblies – min. insul; metal-sheathed							
	TC assemblies – tube skin temp. for furnaces							
	TC assemblies – multi-element							
	Resistance thermometer elements							
	RTDs for storage tanks							
	Temperature gauges – bimetal							
	Transmitter – TC to current							
	Transmitter – resistance to current							
	Transmitter – bulb type (pneumatic)							
	Transmitter – bulb type (electric)							
	Temperature selection systems							
	Temperature switches – thermocouple							
	Temperature switches – RTD							
	Temperature switches – bulb type							
	Temperature (indicating) controller							
4.5	CONTROL VALVES AND ACCESSORIES							
	Control valves – general service							
	– Control valves – general							
	– Control valves – butterfly							
	– Control valves – cage trim							
	– Control valves – low noise							
	– Control valves – anti-cavitation							

Made by:	Date:	Title: **List of Selected Instrument Equipment**		Project & group No.:
Checked by:	Date:	Section 4: List		Rev.: / Date:
Eng. by: / Principal:		Location:	Plant:	Sheet No. 407 cont'd on sheet No. 408 / Drawing No. T

DEP 05.00.54.40 - Gen., sheet 11, 10/82

List of selected instrument equipment - DEP 05.00.54.40-Gen., sheet 12 10/82

Item	Description	Code	Manufacturer	Type	Manufacturer	Type	Manufacturer	Type
(4.5)	Control valves – cryogenic service							
	–							
	–							
	–							
	Control valves – high diff. pressure							
	–							
	–							
	Control valves – high temperature							
	–							
	–							
	–							
	Safety shut-off valves (liquid)							
	Safety shut-off valves (gas)							
	Valve actuators (pneumatic)							
	Valve actuators (electric)							
	Valve actuators (electric/hydraulic)							
	Valve positioners (pneumatic)							
	Pressure regulators – reducing							
	Pressure regulators – back pressure							
	Pressure regulators – tank blanket systems							
	Solenoid valves – pneumatic service							
	Solenoid valves – process service							

Made by:	Date:	Title: **List of Selected Instrument Equipment**		Project & group No.:
Checked by:	Date:	Section 4: List		Rev.: / Date:
Eng. by: / Principal:		Location:	Plant:	Sheet No. 408 cont'd on sheet No. 409 / Drawing No. T

DEP 05.00.54.40 - Gen., sheet 12, 10/82

List of selected instrument equipment - DEP 05.00.54.40-Gen., sheet 13 10/82

Item	Description	Code	Manufacturer	Type	Manufacturer	Type	Manufacturer	Type
(4.5)	Control drives for dampers –							
	stroke < 1000 mm (pneumatic)							
	Control drives for dampers –							
	stroke > 1000 mm (pneumatic)							
	Control drives for dampers – electric							
	Control drives (hydraulic)							
	Temperature regulators – self-acting							
	Lock-up devices (on air failure)							
	Boosting relays							
	Limit switches							
	Position transmitters							
4.6	PLANT COMMUNICATION SYSTEMS							
	Telephone exchange							
	Telephone sets: desk type							
	: flush-mounted type							
	: weather-proof type							
	: explosion-proof type							
	: intrinsically safe type							
	Hot line equipment							
	Intercom equipment							
	Telex message switch							
	Teleprinter terminal							
	Radio consoles							
	Plant radio system							
	Radio paging system							
	CCTV system							
	Power supply system							
	Power supply batteries							
	CCTV camera masts							
	Antenna masts							

Made by:	Date:	Title: **List of Selected Instrument Equipment**		Project & group No.:
Checked by:	Date:	Section 4: List		Rev.: / Date:
Eng. by: / Principal:		Location:	Plant:	Sheet No. 409 cont'd on sheet No. 410 / Drawing No. T

List of selected instrument equipment - DEP 05.00.54.40-Gen., sheet 14 10/82

Item	Description	Code	Manufacturer	Type	Manufacturer	Type	Manufacturer	Type
4.7	QUALITY MEASURING INSTR. AND							
	PROCESS ANALYSERS							
4.7.1	**QMIs general**							
	Cloud point of transparent products							
	Cloud point of opaque products							
	Cold filter plugging point (CFPP)							
	CO/CO_2							
	Colour							
	– ASTM colour							
	– Saybolt colour							
	Conductivity:							
	– Electrical conductivity of petroleum products							
	– Electrical conductivity (electrodeless)							
	– Electrical conductivity of water, see (4.7.3)							
	– Thermal conductivity							
	Density:							
	– Gas density at process conditions							
	– Gas density relative to air							
	– Liquid density at process conditions							
	– Liquid density at referred conditions							
	– Liquid density using radio-active sources							
	Distillation:							
	– Boiling point at specified % rec. (<300C)							
	– Boiling point at specified % rec. (>300C)							
	– Final boiling point (<300C)							
	– % rec. at specified boiling point (<300C)							
	– % rec. at specified boiling point (>300C)							

Made by:	Date:	Title: **List of Selected Instrument Equipment**		Project & group No.:
Checked by:	Date:	Section 4: List		Rev.: / Date:
Eng. by: / Principal:		Location:	Plant:	Sheet No. 410 cont'd on sheet No. 411 / Drawing No. T

DEP 05.00.54.40 - Gen., sheet 14, 10/82

List of selected instrument equipment - DEP 05.00.54.40-Gen., sheet 15 10/82

Item	Description	Code	Manufacturer	Type	Manufacturer	Type	Manufacturer	Type
(4.7.1)	Flash point							
	– <128C (product cloud point below							
	ambient temperature)							
	– <350C (product cloud point above							
	ambient temperature)							
	Freezing point:							
	– of transparent liquids							
	– of opaque liquids							
	Heating value:							
	– by direct measurement							
	– calculated from composition							
	– in relation to Wobbe index							
	HCl in cat. reformer recycle gas							
	H_2 & hydrocarbons in							
	Hydrocarbon dew point							
	H_2S							
	– H_2S in process gas ppb							
	– H_2S in process gas <10 ppm *							
	– H_2S in process gas 10 – 100 ppm *							
	– H_2S in process gas % mol.							
	– H_2S in ambient air see (4.7.2)							
	(* depends on application)							
	Lead in petrol							
	NO_x							
	– NO_x in flue gas							
	– NO_x in ambient air see (4.7.2)							

Made by:	Date:	Title: **List of Selected Instrument Equipment**			Project & group No.:		
Checked by:	Date:	Section 4: List			Rev.:		
					Date:		
Eng. by: Principal:		Location:	Plant:		Sheet No. 411 cont'd on sheet No. 412 Drawing No. T		

List of selected instrument equipment - DEP 05.00.54.40-Gen., sheet 16 10/82

Item	Description	Code	Manufacturer	Type	Manufacturer	Type	Manufacturer	Type
(4.7.1)	Knock characteristics of engine fuels:							
	Cetane number							
	Octane number							
	– Octane number by direct measurement							
	– Octane number by inferential method							
	– Octane number calculated from composition							
	Opacity of flue gas (Smoke density)							
	Oxygen:							
	– in boiler/furnace flue gas							
	– in boiler/furnace flue gas							
	(low-sulphur fuel fired burners)							
	– in cat. cracker unit regenerator gas							
	– in combustible process gas							
	– in inert gas not containing combustibles							
	– in inert gas containing combustibles							
	– at ppm levels							
	pH							
	PGCs – Process gas chromatographs							
	Pour point:							
	– of products with viscosity pour point							
	– of products with wax pour point							
	Spectrophotometers							
	– Infra-red spectrophotometers							
	– Ultraviolet spectrophotometers							

Made by:	Date:	Title: **List of Selected Instrument Equipment**		Project & group No.:
Checked by:	Date:	Section 4: List		Rev.: / Date:
Eng. by: / Principal:		Location:	Plant:	Sheet No. 412 cont'd on sheet No. 413 / Drawing No. T

List of selected instrument equipment - DEP 05.00.54.40-Gen., sheet 17 10/82

Item	Description	Code	Manufacturer	Type	Manufacturer	Type	Manufacturer	Type
(4.7.1)	Refractive index:							
	– of products with cloud point below							
	ambient temperature							
	– of products with cloud point above							
	ambient temperature							
	Sulphur:							
	– in gas <100 ppm							
	– in gas >100 ppm							
	– in liquid prod. $<0.1\%$							
	– in liquid prod. $>0.1\%$							
	SO_2							
	– in flue gas							
	– in ambient air see (4.7.2)							
	Vapour pressure:							
	– True VP of LPG by direct measurement							
	– True VP of LPG calculated from components							
	– True VP of naphthas and kerosines							
	– True VP of gasoils							
	– Reid VP of naphthas and kerosines							
	– Reid VP of gasoils							
	– Reid VP of crude							
	– VP of crude							
	– Kinetic vapour pressure							
	Viscosity:							
	– of residual fuel oils							
	– of distillates with a viscosity up to 250 cP							
	– of distillates with a viscosity between							
	250 - 1000 cP							
	– Iso Viscous Temperature (IVT)							

Made by:	Date:	Title: **List of Selected Instrument Equipment**		Project & group No.:	
Checked by:	Date:	Section 4: List		Rev.:	
				Date:	
Eng. by: Principal:		Location:	Plant:	Sheet No. 413 cont'd on sheet No. 414 Drawing No. T	

DEP 05.00.54.40 - Gen., sheet 17, 10/82

List of selected instrument equipment - DEP 05.00.54.40-Gen., sheet 18 10/82

Item	Description	Code	Manufacturer	Type	Manufacturer	Type	Manufacturer	Type
(4.7.1)	Water content:							
	– in mol. sieves drier bed gas							
	– at outlet mol. sieves drier							
	– of cat. reformer recycle gas							
	– in ..... gas							
	Water dew point:							
	– in instrument air systems							
	– of hydrocarbon gas							
	– of ..... gas							
4.7.2	**Air quality**							
	Flammable gas detectors							
	(HCl) smoke detector							
	H_2S in ambient air							
	NO_x							
	SO_2							
	Vinyl chloride							
	Spectrophotometers see (4.7.1)							

Made by:	Date:	Title: **List of Selected Instrument Equipment**	Project & group No.:
Checked by	Date:	Section 4: List	Rev.: / Date:
Eng. by: / Principal:	Location:	Plant:	Sheet No. 414 cont'd on sheet No. 415 / Drawing No. T

DEP 05.00.54.40 - Gen., sheet 18, 10/82

List of selected instrument equipment - DEP 05.00.54.40-Gen., sheet 19 10/82

Item	Description	Code	Manufacturer	Type	Manufacturer	Type	Manufacturer	Type
4.7.3	**Water quality**							
	Conductivity							
	– Electrical conductivity (2-electrode type)							
	– Electrical conductivity (4-electrode type)							
	– Electrical conductivity (electrodeless)							
	Chlorine. Free residual –/Total – etc.							
	Dissolved oxygen:							
	– in BFW/Condensate .... ppb							
	– in BFW/Condensate .... ppm							
	– in effluent water							
	Hardness							
	Organic material:							
	–/Oil in BFW/Condensate							
	–/Oil in effluent water							
	–/TOD – Total Oxygen Demand							
	–/COD – Chemical Oxygen Demand							
	–/TOC – Total Organic Carbon							
	–/TC – Total Carbon							
	Redox potential							
	pH of oil-contaminated water							
	pH of low-conductivity water $< 10\ \mu\Omega$							
	pH of normal conductivity water							
	pH of HF-contaminated water							
	Phosphate							
	Silicate							
	Sodium							
	Steam purity							
	Water quality analysers – General							
	Spectrophotometers see (4.7.1)							

Made by:	Date:	Title: **List of Selected Instrument Equipment**	Project & group No.:
Checked by:	Date:	Section 4: List	Rev.: / Date:
Eng. by: / Principal:	Location:	Plant:	Sheet No. 415 cont'd on sheet No. 416 / Drawing No. T

DEP 05.00.54.40 - Gen., sheet 19, 10/82

List of selected instrument equipment - DEP 05.00.54.40-Gen., sheet 20 10/82

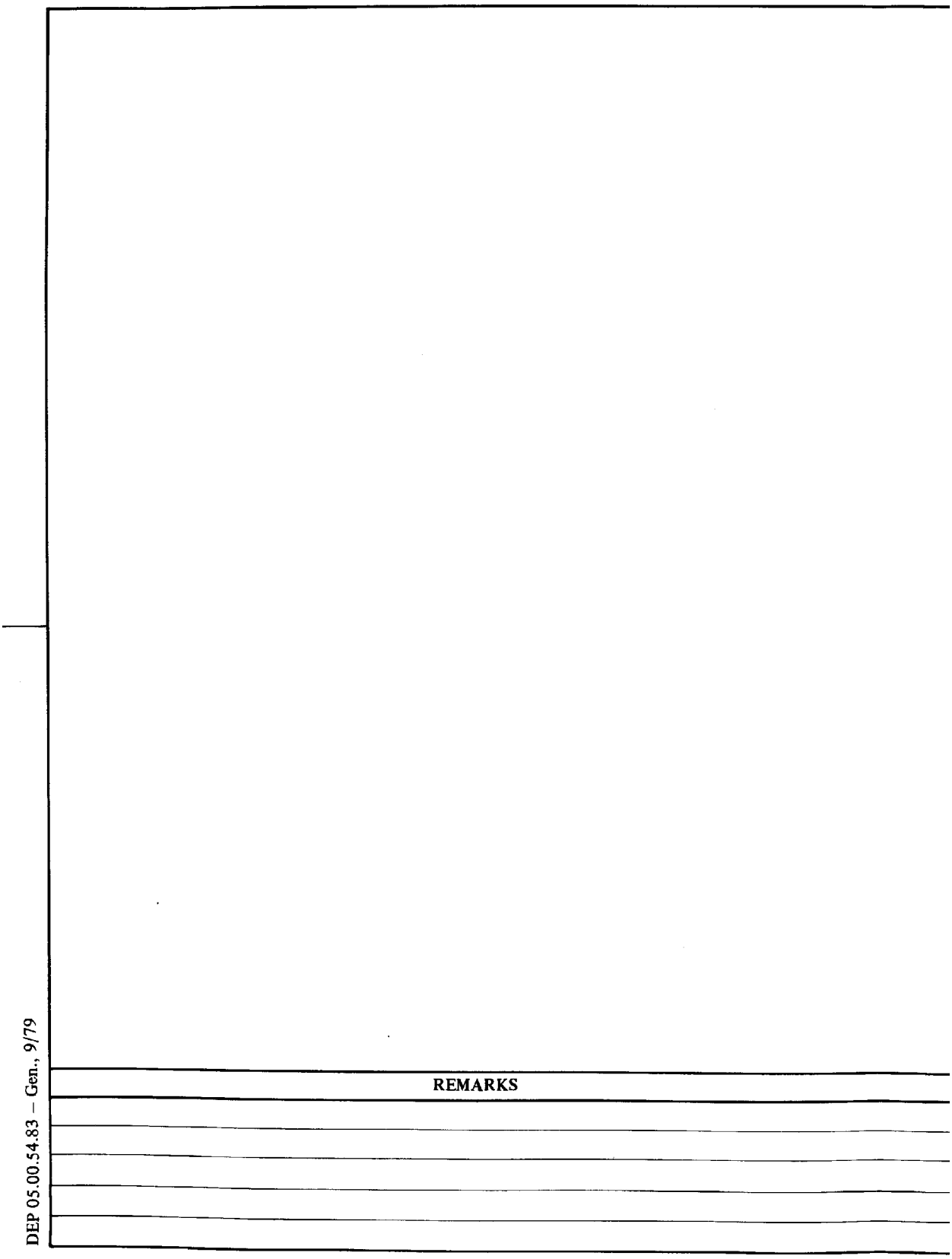
Item	Description	Code	Manufacturer	Type	Manufacturer	Type	Manufacturer	Type
4.7.4	**Auxiliaries**							
	Hydrogen generators							
	Hydrogen purifiers							
	Recorders in analyser houses							
	Sample conditioning systems							
	– for QMIs general including PGCs							
	– for PGCs only							
	Enclosures for outdoor installation							
	Local cabinets							

General purpose sheet (A4 size) - DEP 05.00.54.80-Gen., 9/75

Made by :	Date:	Title:	Issue				
Checked by :	Date:		Date				
Appr. by :	Date:		By				
LOCATION:	PLANT:		Project & group No.:				
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T				

DEP 05.00.54.80 – Gen., 9/75

General purpose sheet (A3 size) - DEP 05.00.54.83-Gen., 9/79



	Made by :	Date:	Title:		Issue				
	Checked by:	Date:			Date				
	Appr. by :	Date:			Sign.				
	Location:		Plant:		Project & group No.				
	Eng. by : Principal:				Sheet No. cont'd on sheet No. Drawing No. T				

SECTION 1 Engineering drawings	Sheet No.	100																						
	Issue																							
	Sheet No.																							
	Issue																							
SECTION 2 Manufacturer's drawings	Sheet No.	200																						
	Issue																							
	Sheet No.																							
	Issue																							

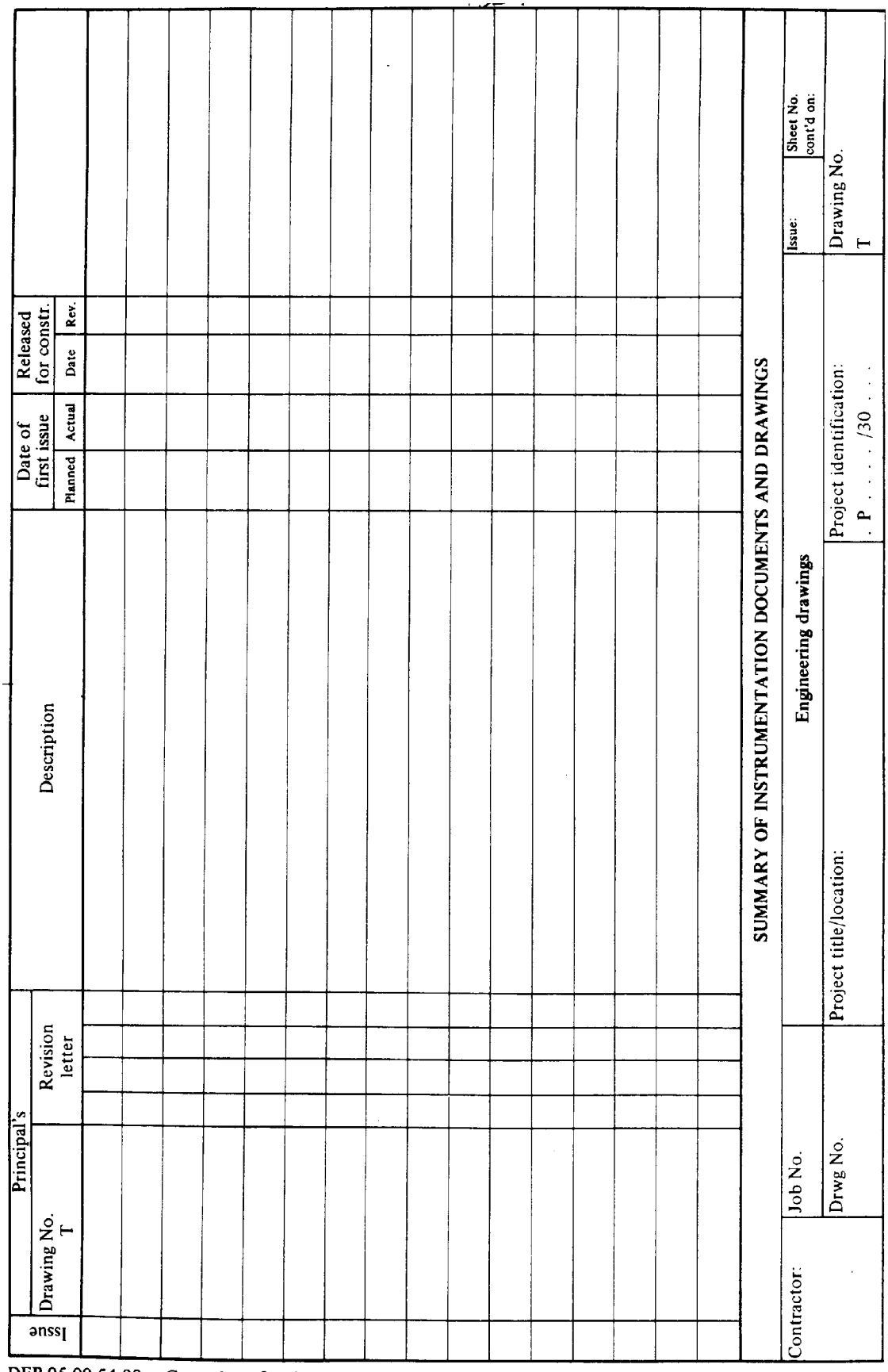
Instructions for the preparation: See DEP 32.31.00.34 – Gen. "Instrumentation documents and drawings"

Issue	O	A	B	C	D	E	F	G	H	K	L	M	N	P	R	S	T	U	V	W	X	Y	Z		
Year/Month																									
Made by																									

SUMMARY OF INSTRUMENTATION DOCUMENTS AND DRAWINGS

Contractor:	Job No.	Index sheet		Issue:	Sheet No. 1 cont'd on: 100
	Drwg No.	Project title/location:	Project identification: . P . . . . /30 . . .	Drawing No. T	

Summary of instrumentation documents and drawings - DEP 05.00.54.88-Gen., sheet 2 09/79



DEP 05.00.54.88 – Gen., sheet 2, 9/79

Summary of instrumentation documents and drawings - DEP 05.00.54.88-Gen., sheet 3 09/79

Issue	Principal's		Supplier's			Description	Requis.	Remarks
	Drawing No. T	Revision letter	Name and address	Drawing No.	Rev.		Group/ serial	

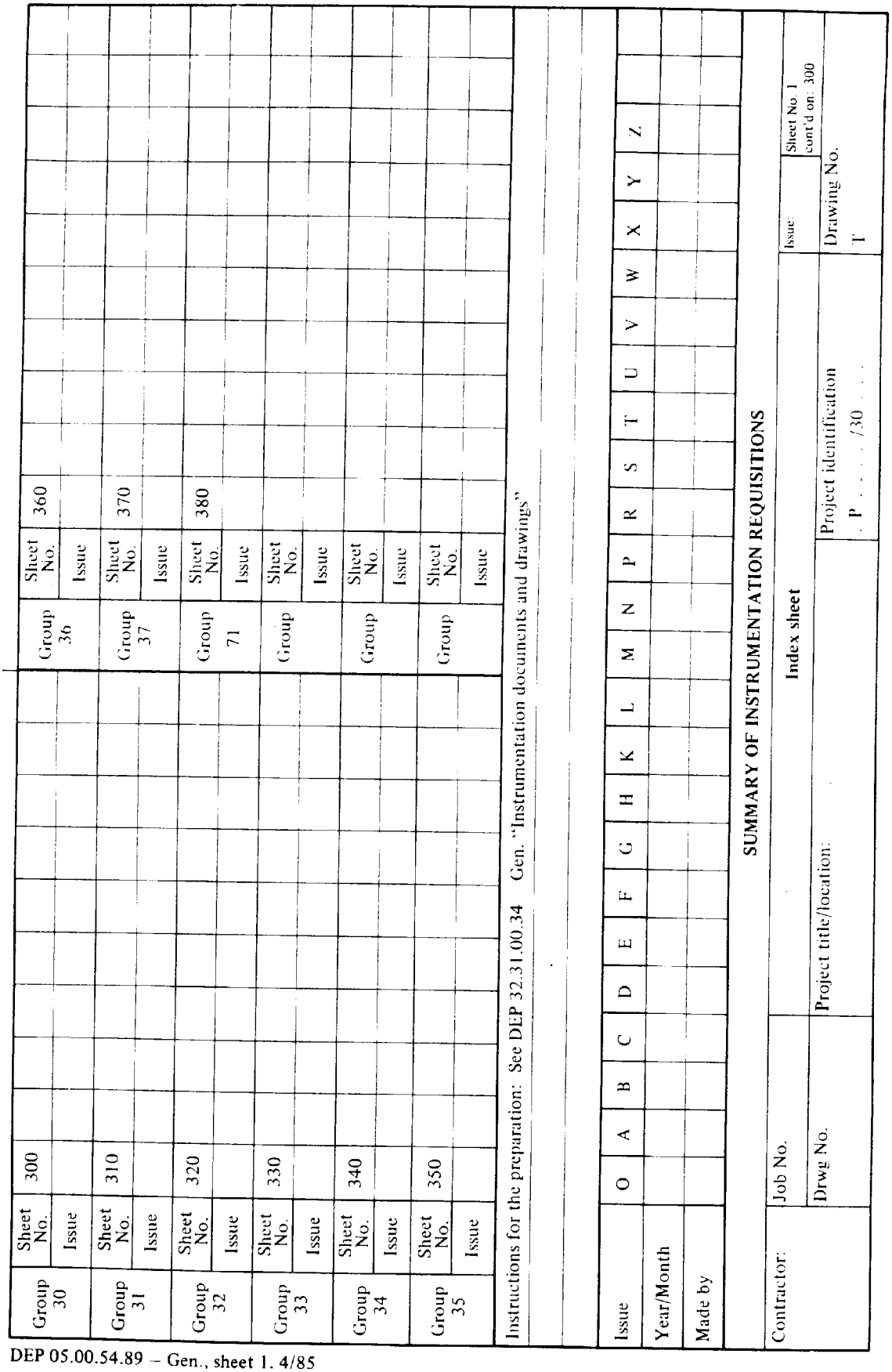
SUMMARY OF INSTRUMENTATION DOCUMENTS AND DRAWINGS

Contractor: | Job No. | **Manufacturer's drawings** | Issue: | Sheet No. cont'd on:

Drwg No. | Project title/location: | Project identification: . P . . . . /30 . . . | Drawing No. T

DEP 05.00.54.88 – Gen., sheet 3, 9/79

Summary of instrumentation requisitions - DEP 05.00.54.89-Gen., sheet 1 04/85



DEP 05.00.54.89 – Gen., sheet 1. 4/85

Summary of instrumentation requisitions - DEP 05.00.54.89-Gen., sheet 2 9/79

Issue	Requis. Serial No.	Requis. Rev.	Subject	Date of First issue Planned	Date of First issue Actual	Date of Bid Tab.	Date of Bid Appr.	Supplier	Date Of order	Date Ex works Prom.	Date Ex works Actual	Date At site Required	Date At site Actual

SUMMARY OF INSTRUMENTATION REQUISITIONS

Contractor: | Job No. | Requisitions in group . . | Issue: | Sheet No. cont'd on:

Drwg No. | Project title/location: | Project identification . P . . . . /30 . . . | Drawing No. T

DEP 05.00.54.89 – Gen., sheet 2, 9/79

| | | |

Summary of instrumentation cables - DEP 05.00.54.90-Gen., sheet 2 09/79

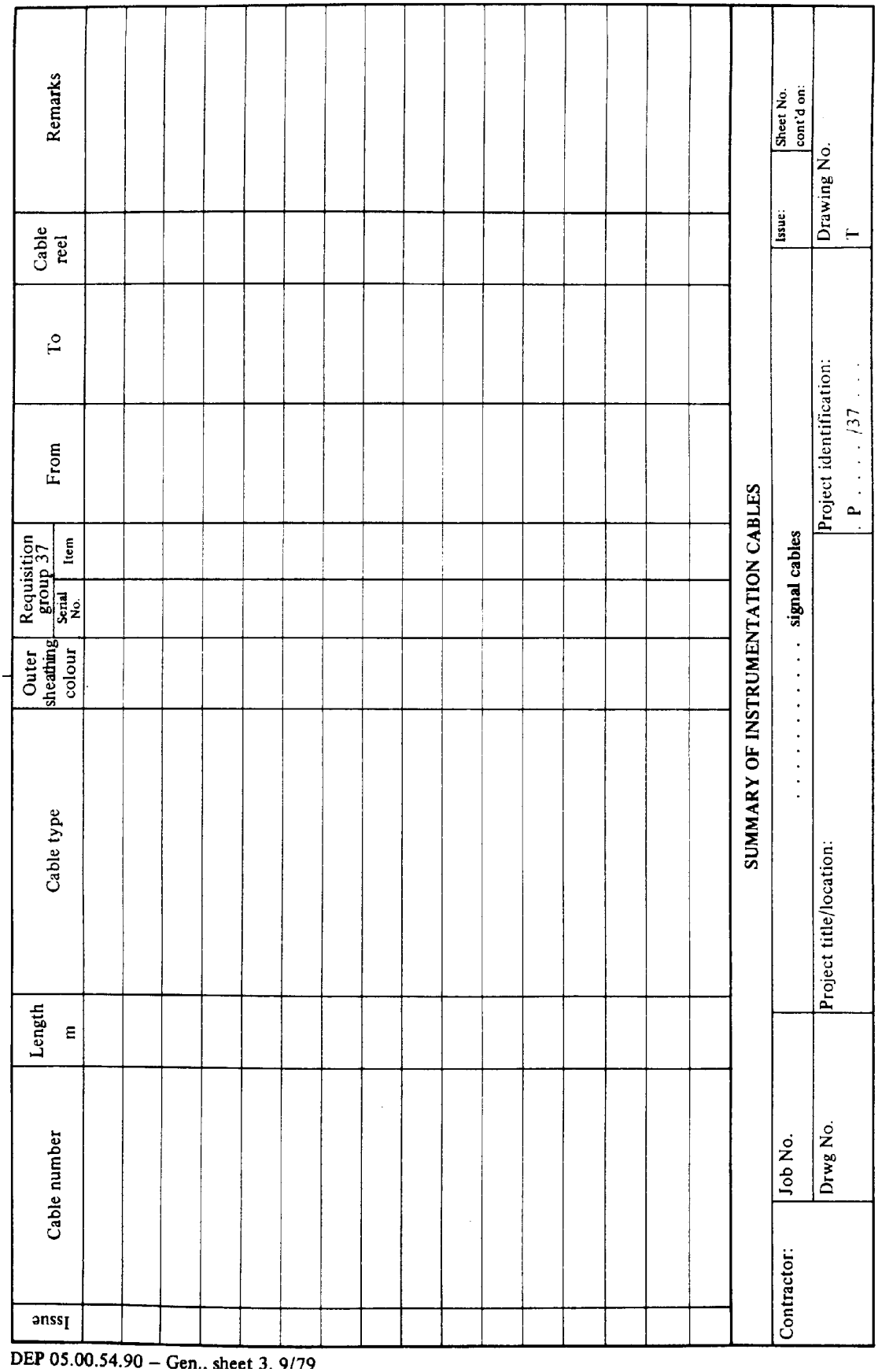
Issue	Cable number	Length m	Cable type	Plug			Requisition group 37		Termination points		Remarks
				Make	Type		Serial No.	Item	Socket	Socket	

SUMMARY OF INSTRUMENTATION CABLES

Contractor:	Job No.	System cables	Issue:	Sheet No. cont'd on:
	Drwg No.	Project title/location:	Project identification: . P . . . . /37 . . .	Drawing No. T

DEP 05.00.54.90 – Gen., sheet 2, 9/79

Summary of instrumentation cables - DEP 05.00.54.90-Gen., sheet 3 09/79



SUMMARY OF INSTRUMENTATION CABLES

. . . . . signal cables

Issue	Cable number	Length m	Cable type	Outer sheathing colour	Requisition group 37 Serial No.	Requisition group 37 Item	From	To	Cable reel	Remarks

Contractor:

Job No.

Drwg No.

Project title/location:

Project identification:
P . . . . /37 . . .

Issue:

Sheet No. cont'd on:

Drawing No.
T

Summary of instrumentation cables - DEP 05.00.54.90-Gen., sheet 4 09/79

Issue	Cable number	Length m	Cable type	Voltage level	Requisition group 37 Serial No.	Requisition group 37 Item	From	To	Cable reel	Remarks 1)

1) Cables marked with * under "Remarks" shall be run in cable trenches for power and lighting

SUMMARY OF INSTRUMENTATION CABLES

Contractor:	Job No.	Electricity supply cables	Issue:	Sheet No. cont'd on
	Drwg No.	Project title/location:	Project identification: . P . . . /37 . . .	Drawing No. T

DEP 05.00.54.90 – Gen., sheet 4, 9/79

2. FLOW CALCULATIONS

Input data sheet for flow computer program BBRl01-Q	DEP 32.32.10.81-Gen., 10/86
Sizing form for square edge orifices with flange tappings	DEP 32.32.11.45-Gen., 03/86
Sizing form for square edge orifices with corner tappings	DEP 32.32.11.46-Gen., 08/86
Sizing form for square edge orifices with radius tappings	DEP 32.32.11.47-Gen., 03/86
Sizing form for quarter of circle orifices with flange tappings	DEP 32.32.11.48-Gen., 03/86
Sizing form for conical entrance orifice with corner tappings	DEP 32.32.11.49-Gen., 03/86
Sizing form for venturi tubes (A, B and C)	DEP 32.32.11.50-Gen., 03/86
Sizing form for rectangular venturi tubes	DEP 32.32.11.51-Gen., 03/86
Sizing form for ISA 1932 nozzles	DEP 32.32.11.52-Gen., 03/86
Sizing form for long radius nozzles	DEP 32.32.11.53-Gen., 03/86
Flow factor calculation form for square edge orifices with flange tappings	DEP 32.32.11.60-Gen., 03/86
Flow factor calculation form for square edge orifices with corner tappings	DEP 32.32.11.61-Gen., 03/86
Flow factor calculation form for square edge orifices with radius tappings	DEP 32.32.11.62-Gen., 03/86
Flow factor calculation form for quarter of circle orifices with flange tappings	DEP 32.32.11.63-Gen., 03/86
Flow factor calculation form for conical entrance orifices with corner tappings	DEP 32.32.11.64-Gen., 03/86
Flow factor calculation form for Venturi tubes (A, B and C)	DEP 32.32.11.65-Gen., 03/86
Flow factor calculation form for rectangular venturi tubes	DEP 32.32.11.66-Gen., 03/86
Flow factor calculation form for ISA 1932 nozzles	DEP 32.32.11.67-Gen., 03/86
Flow factor calculation form for long radius nozzles	DEP 32.32.11.68-Gen., 03/86
Control valve calculation form: Compressible fluids	DEP 32.36.01.41-Gen., 11/88
Control valve calculation form: Incompressible fluids	DEP 32.36.01.42-Gen., 11/88

Input data sheet for flow computer. program BBRI01-Q - DEP 32.32.10.81-Gen., sheet 1 10/86

INPUT DATA SHEET FOR FLOW COMPUTER PROGRAM BBRIO1-Q

Instrument engineer : . . . . . Page : . . . . .
Room : . . . . . Project : . . . . .
Extension : . . . . . Date : . . . . .

1 data base existing . . : yes (1)/no (2)
2 name of data base . . : ⌊_⌊_⌊_⌊_⌊_⌊_⌊_⌊_⌋

3 tag number . . . . . : add (1) / change (2)
4 plant . . . . . : ⌊_⌊_⌊_⌊_⌊_⌊_⌊_⌊_⌊_⌊_⌊_⌊_⌋
5 tag name . . . . . : ⌊_⌊_⌊_⌊_⌊_⌊_⌊_⌊_⌊_⌊_⌊_⌊_⌋
6 service . . . . . : ⌊_⌊_⌊_⌊_⌊_⌊_⌊_⌊_⌊_⌊_⌊_⌊_⌋

*7 type of fluid . . . . . : ⌊_⌋

*8 units

	preferred	alternative
flow rate	☐ kg/s	☐ t/d ☐ m³/d ☐ . . .
density	☐ kg/m³	☐ kg/dm³ ☐ lb/ft³
temperature	☐ °C	☐ °F ☐ K
viscosity	☐ mPa.s	☐ mm²/s
pressure	☐ bar	☐ Pa ☐ kPa ☐ . . .
pipe dia./duct size	☐ mm	☐ inch
orifice dia./radius	☐ mm	☐ inch
roughness	☐ mm	☐ inch
meter range	☐ mbar	☐ mmWG ☐ mmHg ☐ kPa ☐ . . .

*9 type of element . . . . . : ⌊_⌋

Fluid data:
10 design flow rate . . . . . : ⌊_⌊_⌊_⌊_⌊_⌊_⌊_⌊_⌋
*11 volume reference condition code (volumetric flows) . . . . . : ⌊_⌋
*12 chart reading . . . . . : ⌊_⌊_⌊_⌊_⌋
*13 density . . . . . : ⌊_⌊_⌊_⌊_⌊_⌊_⌋
*14 density under operating (1) or reference (2) condition . . . . . : ⌊_⌋
*15 relative density . . . . . : ⌊_⌊_⌊_⌊_⌊_⌋
*16 relative density at d¹ (1) or at d² (2) . . . . . : ⌊_⌋
*17 molecular mass . . . . . : ⌊_⌊_⌊_⌊_⌊_⌊_⌋
*18 humidity of wet gas or water in wet steam . . . . . : ⌊_⌊_⌊_⌊_⌋
*19 total density (1) or density dry part (2) . . . . . : ⌊_⌋
*20 ratio of specific heats, Cp/Cv . . . . . : ⌊_⌊_⌊_⌊_⌋
*21 relative compressibility factor, Z0/Z1 . . . . . : ⌊_⌊_⌊_⌊_⌋
22 temperature . . . . . : ⌊_⌊_⌊_⌊_⌊_⌋
23 viscosity . . . . . : ⌊_⌊_⌊_⌊_⌊_⌊_⌋
*24 absolute pressure . . . . . : ⌊_⌊_⌊_⌊_⌊_⌊_⌋
*25 maximum allowable pressure loss . . . . . : ⌊_⌊_⌊_⌊_⌋

Piping data:
*26 nominal size . . . . . : ⌊_⌊_⌊_⌋
*27 nominal pressure or schedule . . . . . : P ⌊_⌊_⌋ S ⌊_⌊_⌋
*28 internal pipe diameter . . . . . : ⌊_⌊_⌊_⌊_⌊_⌊_⌋
29 internal duct height (rectangular Venturi) . . . . . : ⌊_⌊_⌊_⌊_⌊_⌊_⌋
30 internal duct width (rectangular Venturi) . . . . . : ⌊_⌊_⌊_⌊_⌊_⌊_⌋
*31 roughness of pipe wall . . . . . : ⌊_⌊_⌊_⌊_⌋
*32 linear expansion coefficient *10^-6/°C . . . . . : ⌊_⌊_⌊_⌊_⌋

Element data:
33 orifice diameter . . . . . : ⌊_⌊_⌊_⌊_⌊_⌊_⌋
*34 bleed hole size . . . . . : ⌊_⌊_⌊_⌊_⌋
35 radius of a quarter circle . . . . . : ⌊_⌊_⌊_⌊_⌊_⌊_⌋
*36 internal throat height (rectangular Venturi) . . . . . : ⌊_⌊_⌊_⌊_⌊_⌊_⌋
*37 internal throat width (rectangular Venturi) . . . . . : ⌊_⌊_⌊_⌊_⌊_⌊_⌋
*38 linear expansion coefficient *10^-6/°C . . . . . : ⌊_⌊_⌊_⌊_⌋

Instrument data:
*39 meter range . . . . . : ⌊_⌊_⌊_⌊_⌊_⌊_⌋
*40 turndown ratio . . . . . : ⌊_⌊_⌊_⌋ : 1

*) for abridged instructions and codes, see sheet 2.
■ unit selected.
☐ unit not selected.

DEP 32.32.10.81 - Gen., Sheet 1/2, 10/86

Input data sheet for flow computer program BBRI01-Q - DEP 32.32.10.81-Gen, Sheet 2 10/86

ABRIDGED INSTRUCTIONS AND CODES

7	Fluid type	1 liquid 3 hydrocarbon gas 5 air 2 steam 4 other gas
8	Other alternative units for:	
	flow rate :	kg/h, m^3/s; L/h; lb/d; Lt/d (long ton/day); b/d; USGPM; IGPM; scft/d; $scft^3$ (10 6 scft/d)
	pressure :	MPa; psi; mmHg; inHg
	meter range :	inWG; inHg, bar
9	Element type:	
		0 programmed selection 1 square edge flange tappings 7 ISA 1932 nozzle 2 square edge corner tappings 8 long radius nozzle 3 square edge radius tappings 9 Venturi type A 4 quarter circle 10 Venturi type B 5 conical entrance corner tappings 11 Venturi type C 6 rectangular Venturi 12 restriction orifice
11	Enter :	
		0 0°C and 1.01325 bar abs. 4 0°C and 1 bar abs. 1 15°C and 1.01325 bar abs. 5 15°C and 1 bar abs. 2 60°C and 14.69594 psia 3 for volumetric flows under operating conditions
	NB. -	only if a volumetric flow rate is entered (see 10); - enter 3, when relative density/molecular mass is entered (see 15, 17); - not to be entered for liquid/steam volumetric flow rates.
12	If nothing is entered, system default is 10	
14	Enter :	
		- 1 for density under operating condition; - 2 for density under reference condition.
	NB.	Reference condition of density shall be same as the reference condition for volumetric flow rates.
16	Enter :	
		- 1 for d^1 = density relative to air at 0°C and 1.01325 bar abs., - 2 for d^2 = density relative to air at 0°C and 14.69594 psia.
18	If nothing is entered, system default is 0%.	
19	Enter :	
		- 1 when total density, wet+dry part, is entered (see 13/15/17); - 2 when dry part of density is entered (see 13/15/17).
	NB.	not for liquids and steam
20	Not for liquid.	
21	Enter when :	density under reference conditions/relative density/molecular mass is entered.
	NB.	not for liquid and steam.
24	Not required for liquid.	
25	Not required.	
26/27	Not required when 28 will be entered.	
27	Preferred :	P25, P40, P64, P100 (P25= DIN PN25 i.e. nominal pressure)
	Alternative :	S10, S20, S30, S40, S60, S80, S120, S160 (S10=schedule 10)
28	Enter only when internal pipe diameter has been measured.	
31	If nothing entered system default is 0.07 mm.	
32	If nothing entered system default is 0.000011 mm/°C.	
34	Enter 0 when no bleed hole is required.	
36/37	Enter, for one-plane contraction, (H=h or W=w) the same value as under 29 or 30.	
38	If nothing entered system default is 0.000017 mm/°C.	
39	Need not be entered for a programmed selection of element (see 9).	
40	If nothing entered system default is 3:1	

NB. For entering density, see 13-19:

Liquid : enter only density under operating condition (enter only 13);

Steam : enter either density under operating conditions or absolute operating pressure (enter only 13+18+24 or 18+24);

Gas : a) mass flows : -density under operating conditions (enter 13/14/18/19);
-relative density (enter 15/16/18/19);
-molecular mass (enter 17/18/19);

b) volumetric flows : -density under reference conditions (enter 13/14/18/19/11);
-relative density (enter 15/16/18/19 and 11=3);
-molecular mass (enter 17/18/19 and 11=3).

Preferred units are SI in accordance with the requirements of DEP 00.00.20.10-Gen.

Sizing form for square edge orifices with flange tappings - DEP 32.32.11.45-Gen., sheet 1 03/86

SIZING FORM FOR SQUARE EDGE ORIFICES WITH FLANGE TAPPINGS

Plant: _____

Service: _____ Tag No.: _____

DATA TO BE SUPPLIED BY OPERATIONS

Approx. norm. quantity q_m	_____ kg/s	Density ρ under operating cond.	_____ kg/m^3
Viscosity η under operating cond.	_____ m Pa • s	Operating pressure p	_____ bar
Operating temp. T	_____ °C	Water content in wet steam	_____ % wt

Orifice diameter d_m at T_0	_____ mm	Linear expansion coeff. α_{pipe}	_____ /°C
Internal pipe dia. D_m at T_0	_____ mm	Linear expansion coeff. α_{plate}	_____ /°C
Transmitter range DP	_____ bar	Ambient temp. T_0	_____ °C
Indication X of q_m on scale (0-10)	_____	Limitations:	$0.2 \leq \beta \leq 0.75$
Bleed hole size y	_____ mm		$1260\,\beta^2 D \leq Re_D \leq 10^8$
Ratio of specific heats $\kappa = C_p/C_v$	_____		

1. $D = D_m \left[1 + \alpha_{pipe} (T - T_0) \right]$ — D = _____ mm

2. $(Re_D)_{des} = \dfrac{1.2732 \cdot 10^6 (q_m)_{des}}{\eta D}$ — $(Re_D)_{des}$ = _____

3. $F_s = 1 + 0.0074\, W_t$
   For gas and liquid $F_s = 1$ — F_s = _____

4. $\beta = \left[\dfrac{(q_m)^2_{des}}{(4.6 \cdot 10^{-10} D^4 (DP) X^2 \rho) + (q_m)^2_{des}} \right]^{0.25}$ — estimated β = _____

5. $\epsilon = 1 - \left[0.41 + 0.35\,\beta^4\right] \cdot \left[(DP) / p \right] \cdot \left[X / 10 \right]^2 \cdot \kappa^{-1}$ — ϵ = _____
   N.B.: if the fluid is a liquid $\epsilon = 1$

6. $C = 0.5959 + 0.0312\,\beta^{2.1} - 0.184\,\beta^8 + 0.0029\,\beta^{2.5} \left[\dfrac{10^6}{(Re_D)_{des}} \right]^{0.75} +$
   $+ \left[\dfrac{2.286}{D} \right] \beta^4 \cdot (1-\beta^4)^{-1} - \left[\dfrac{0.85598}{D} \right] \beta^3$ — C = _____
   Note: If $D < 58.615$ mm use 0.0390 as coefficient of $\beta^4 \cdot (1-\beta^4)^{-1}$

7. $\beta = \left[\dfrac{28\,470.5\,(q_m)_{des} \sqrt{1-\beta^4}}{D^2 \epsilon C X F_s \sqrt{\rho\,(DP)}} \right]^{0.5}$ — calculated β = _____
   Repeat 5 through 7 until calculated β agrees with previously calculated β to within 0.01%

8. $d = \beta D$ — d = _____ mm

9. $d_m = d \left[1 - 0.55 (y/d)^2 \right] \left[1 + \alpha_{plate} (T - T_0) \right]^{-1}$ — d_m = _____ mm

Calculated by: _____ Date: _____ Sign.: _____

DEP 32.32.11. 45 - Gen., sheet 1, 03/86

Sizing for for square edge orifices with flange tappings - DEP 32.32.11.45-Gen., sheet 2 03/86

Program listing in basic:

```
10  INPUT "Service Liquid (L), Gas (G) or Steam (S)         :",FLUID$
20  INPUT "Approx. normal flow                        [ kg/s]:",QM
30  INPUT "Viscosity under operating conditions       [mPa.s]:",N
40  INPUT "Operating temperature                      [   °C]:",T
50  INPUT "Density under operating conditions         [kg/m3]:",R
60  INPUT "Operating pressure                         [  bar]:",P
70  INPUT "Internal pipe diameter at ambient          [   mm]:",DM
80  INPUT "Transmitter range                          [  bar]:",DP
90  INPUT "Indication of normal flow on scale  (0-10)        :",X
100 INPUT "Bleed hole size                            [   mm]:",DH
110 INPUT "Linear expansion coeff. pipe               [  /°C]:",AP
120 INPUT "Linear expansion coeff. orifice            [  /°C]:",AO
130 INPUT "Ambient temperature                        [   °C]:",TAMB
140 IF FLUID$ = "L" THEN W = 0 :GOTO 500
150 INPUT "Ratio of specific heats Cp/Cv                    :",Y
160 IF FLUID$ = "G" THEN W = 0 :GOTO 500
170 INPUT "Water content in wet steam                 [    %]:",W
500 REM STEP 1                    (calculate D under operating conditions)
510 D = DM * (1 + AP * (T - TAMB))
520 REM STEP 2                    (calculate ReD)
530 RED = 1273200 * QM / (N * D)
540 REM STEP 3                    (calculate steam correction factor Fs)
550 FS = 1 + 0.0074 * W
560 REM STEP 4                    (calculate dp at normal flow indication)
570 DPN = DP * (X / 10)^2
580 REM STEP 5                    (calculate the estimated ß)
590 B = (QM^2 / (4.6 * 10^-8 * D^4 * DPN * R + QM^2))^0.25
600 REM STEP 6                    (calculate epsilon)
610 E = 1
620 IF FLUID$ = "G" OR FLUID$ = "S" THEN E = 1 - (0.41 + 0.35 * B^4) * (DPN / P) / Y
630 REM STEP 7                    (calculate discharge coefficient)
640 C =  0.5959 + 0.0312 * B^2.1 - 0.184 * B^8 + 0.0029 * B^2.5 *
        * (1000000 / RED)^0.75 - 0.85598 * B^3 / D
650 IF D < 58.615 THEN C = C + 0.039 * B^4 / (1 - B^4) : GOTO 670
660 C = C + 2.286 * B^4 / (D * (1 - B^4))
670 REM STEP 8                    (calculate new ß)
680 B1 = (2847.05 * QM / (D^2 * E * FS * C * (1 - B^4)^-0.5 * (DPN * R)^0.5))^0.5
690 REM  check if calculated ß agrees with previous ß within 0.01%
700 IF ABS ((B - B1) / B1) > 0.0001 THEN B = B1 : GOTO 600
710 REM STEP 9                    (calculate d orifice at line temp)
720 DO = B1 * D
730 REM STEP 10                   (calculate d orifice at ambient temp)
740 DOM = DO * (1 - 0.55 * (DH / DO)^2) / (1 + AO * (T - TAMB))
750 REM  the following lines will print the output and restart the program
760 PRINT "Orifice diameter at ambient      [mm]:";DOM
770 PRINT "Beta ratio                          :";B1
780 PRINT "Reynolds Number                     :";RED
790 INPUT "A new calculation Y/N               :",A$
800 IF A$ = "Y" THEN GOTO 10
810 END
```

DEP 32.32.11.45 - Gen., sheet 2, 03/86

Sizing form for square edge orifices with corner tappings - DEP 32.32.11.46-Gen., sheet 1 08/86

SIZING FORM FOR SQUARE EDGE ORIFICES WITH CORNER TAPPINGS

Plant: _____

Service: _____ Tag No.: _____

DATA TO BE SUPPLIED BY OPERATIONS

Approx. norm. quantity q_m	_____ kg/s	Density ρ under operating cond.	_____ kg/m^3
Viscosity η under operating cond.	_____ m Pa • s	Operating pressure p	_____ bar
Operating temp. T	_____ °C	Water content in wet steam	_____ % wt

Orifice diameter d_m at T_0	_____ mm	Linear expansion coeff. α_{pipe}	_____ /°C
Internal pipe dia. D_m at T_0	_____ mm	Linear expansion coeff. α_{plate}	_____ /°C
Transmitter range DP	_____ bar	Ambient temp. T_0	_____ °C
Indication X of q_m on scale (0-10)	_____	Limitations:	$0.23 \leq \beta \leq 0.80$
Bleed hole size y	_____ mm		$5\,000 \leq Re_D \leq 10^8$ for $0.23 \leq \beta \leq 0.45$
Ratio of specific heats $\kappa = C_p/C_v$	_____		$10\,000 \leq Re_D \leq 10^8$ for $0.45 < \beta \leq 0.77$
			$20\,000 \leq Re_D \leq 10^8$ for $0.77 < \beta \leq 0.80$

1. $D = D_m \left[1 + \alpha_{pipe} (T - T_0) \right]$ — D = _____ mm

2. $(Re_D)_{des} = \dfrac{1.2732 \cdot 10^6 (q_m)_{des}}{\eta D}$ — $(Re_D)_{des}$ = _____

3. $F_s = 1 + 0.0074 W_t$
   For gas and liquid $F_s = 1$ — F_s = _____

4. $\beta = \left[\dfrac{(q_m)^2_{des}}{(4.6 \cdot 10^{-10} D^4 (DP) X^2 \rho) + (q_m)^2_{des}} \right]^{0.25}$ — estimated β = _____

5. $\epsilon = 1 - \left[0.41 + 0.35 \beta^4 \right] \cdot \left[(DP) / p \right] \cdot \left[X / 10 \right]^2 \cdot \kappa^{-1}$
   N.B.: if the fluid is a liquid $\epsilon = 1$ — ϵ = _____

6. $C = 0.5959 + 0.0312 \beta^{2.1} - 0.184 \beta^8 + 0.0029 \beta^{2.5} \left[\dfrac{10^6}{(Re_D)_{des}} \right]^{0.75}$ — C = _____

7. $\beta = \left[\dfrac{28\,470.5 (q_m)_{des} \sqrt{1 - \beta^4}}{D^2 \epsilon C X F_s \sqrt{\rho (DP)}} \right]^{0.5}$ — calculated β = _____
   Repeat 5 through 7 until calculated β agrees with previously calculated β to within 0.01%

8. If $Re_D \leq 10^6$ then $Z_{Re_D} = Z_0$,
   otherwise $Z_{Re_D} = (Z_0 - 1) \left[\log (Re_D)/6 \right]^2 + 1$ — Z_{Re_D} = _____

9. $\beta = \beta \, (Z_{Re_D})^{-0.5}$ — corrected β = _____

10. $d = \beta D$ — d = _____ mm

11. $d_m = d \left[1 - 0.55 (y / d)^2 \right] \left[1 + \alpha_{plate} (T - T_0) \right]^{-1}$ — d_m = _____ mm

Calculated by: _____ Date: _____ Sign.: _____

Sizing for for square edge orifice with corner tappings - DEP 32.32.11.46-Gen., sheet 2 08/86

Program listing in basic:

```
10  INPUT "Service Liquid (L), Gas (G) or Steam (S)         :",FLUID$
20  INPUT "Approx. normal flow                        [ kg/s]:",QM
30  INPUT "Viscosity under operating conditions       [mPa.s]:",N
40  INPUT "Operating temperature                      [   °C]:",T
50  INPUT "Density under operating conditions         [kg/m3]:",R
60  INPUT "Operating pressure                         [  bar]:",P
70  INPUT "Internal pipe diameter at ambient          [   mm]:",DM
80  INPUT "Transmitter range                          [  bar]:",DP
90  INPUT "Indication of normal flow on scale  (0-10)       :",X
100 INPUT "Bleed hole size                            [   mm]:",DH
110 INPUT "Linear expansion coeff. pipe               [  /°C]:",AP
120 INPUT "Linear expansion coeff. orifice            [  /°C]:",AO
130 INPUT "Ambient temperature                        [   °C]:",TAMB
140 IF FLUID$ = "L" THEN W = 0 :GOTO 500
150 INPUT "Ratio of specific heats Cp/Cv                    :",Y
160 IF FLUID$ = "G" THEN W = 0 :GOTO 500
170 INPUT "Water content in wet steam                 [    %]:",W
500 REM STEP 1                      (calculate D under operating conditions)
510 D = DM * (1 + AP * (T - TAMB))
520 REM STEP 2                      (calculate ReD)
530 RED = 1273200 * QM / (N * D)
540 REM STEP 3                      (calculate steam correction factor Fs)
550 FS = 1 + 0.0074 * W
560 REM STEP 4                      (calculate dp at normal flow indication)
570 DPN = DP * (X / 10)^2
580 REM STEP 5                      (calculate the estimated ß)
590 B = (QM^2 / (4.6 * 10^-8 * D^4 * DPN * R + QM^2))^0.25
600 REM STEP 6                      (calculate epsilon)
610 E = 1
620 IF FLUID$ = "G" OR FLUID$ = "S" THEN E = 1 - (0.41 + 0.35 * B^4) * (DPN / P) / Y
630 REM STEP 7                      (calculate discharge coefficient)
640 C =  0.5959 + 0.0312 * B^2.1 - 0.184 * B^8 + 0.0029 * B^2.5 *
        * (1000000 / RED)^0.75
650 REM STEP 8                      (calculate new ß)
660 B1 = (2847.05 * QM / (D^2 * E * FS * C * (1 - B^4)^-0.5 * (DPN * R)^0.5))^0.5
670 REM  check if calculated ß agrees with previous ß within 0.01%
680 IF ABS ((B - B1) / B1) > 0.0001 THEN B = B1 : GOTO 600
690 REM STEP 9                      (check on roughness correction factor)
700 PRINT "Beta ratio                    :";B1
710 INPUT "Enter the roughness k         :";ROUGH
720 PRINT "k / D * 10000 = ";ROUGH / D * 10^4
730 INPUT "Roughness correction factor Zo :",Z0
740 IF RED >= 1000000 THEN ZRED = Z0 ELSE ZRED = (Z0 - 1) * ((LOG (RED) / LOG (10)) / 6)^2 + 1
750 REM STEP 10                     (calculate corrected ß)
760 B1 = B1 / ZRED^0.5
770 REM STEP 11                     (calculate d orifice at line temp)
780 DO = B1 * D
790 REM STEP 12                     (calculate d orifice at ambient temp)
800 DOM = DO * (1 - 0.55 * (DH / DO)^2) / (1 + AO * (T - TAMB))
810 REM  the following lines will print the output and restart the program
820 PRINT "Orifice diameter at ambient      [mm]:";DOM
830 PRINT "Beta ratio                          :";B1
840 PRINT "Reynolds Number                     :";RED
850 INPUT "A new calculation Y/N               :",A$
860 IF A$ = "Y" THEN GOTO 10
870 END
```

Sizing form for square edge orifices with radius tappings - DEP 32.32.11.47-Gen., sheet 1 03/86

SIZING FORM FOR SQUARE EDGE ORIFICES WITH RADIUS TAPPINGS

Plant: _____

Service: _____ Tag No.: _____

DATA TO BE SUPPLIED BY OPERATIONS

Approx. norm. quantity q_m	_____ kg/s	Density ρ under operating cond.	_____ kg/m^3
Viscosity η under operating cond.	_____ m Pa • s	Operating pressure p	_____ bar
Operating temp. T	_____ °C	Water content in wet steam	_____ % wt

Orifice diameter d_m at T_0	_____ mm	Linear expansion coeff. α_{pipe}	_____ /°C
Internal pipe dia. D_m at T_0	_____ mm	Linear expansion coeff. α_{plate}	_____ /°C
Transmitter range DP	_____ bar	Ambient temp. T_0	_____ °C
Indication X of q_m on scale (0-10)	_____	Limitations:	$0.2 \leq \beta \leq 0.75$
Bleed hole size y	_____ mm		$1260\,\beta^2 D \leq Re_D \leq 10^8$
Ratio of specific heats $\kappa = C_p/C_v$	_____		

1. $D = D_m \left[1 + \alpha_{pipe} (T - T_0) \right]$ — D = _____ mm

2. $(Re_D)_{des} = \dfrac{1.2732 \cdot 10^6 (q_m)_{des}}{\eta D}$ — $(Re_D)_{des}$ = _____

3. $F_s = 1 + 0.0074\, W_t$
   For gas and liquid $F_s = 1$ — F_s = _____

4. $\beta = \left[\dfrac{(q_m)^2_{des}}{(4.6 \cdot 10^{-10} D^4 (DP) X^2 \rho) + (q_m)^2_{des}} \right]^{0.25}$ — estimated β = _____

5. $\epsilon = 1 - \left[0.41 + 0.35\,\beta^4 \right] \cdot \left[(DP)/p \right] \cdot \left[X/10 \right]^2 \cdot \kappa^{-1}$
   N.B.: if the fluid is a liquid $\epsilon = 1$ — ϵ = _____

6. $C = 0.5959 + 0.0312\,\beta^{2.1} - 0.184\,\beta^8 + 0.0029\,\beta^{2.5} \left[\dfrac{10^6}{(Re_D)_{des}} \right]^{0.75} + 0.039\,\beta^4 \cdot (1 - \beta^4)^{-1} - 0.015839\,\beta^3$ — C = _____

7. $\beta = \left[\dfrac{28470.5\,(q_m)_{des} \sqrt{1 - \beta^4}}{D^2\, \epsilon\, C\, X\, F_s \sqrt{\rho\,(DP)}} \right]^{0.5}$ — calculated β = _____

   Repeat 5 through 7 until calculated β agrees with previously calculated β to within 0.01%

8. $d = \beta D$ — d = _____ mm

9. $d_m = d \left[1 - 0.55 (y/d)^2 \right] \left[1 + \alpha_{plate} (T - T_0) \right]^{-1}$ — d_m = _____ mm

Calculated by: _____ Date: _____ Sign.: _____

Sizing for for square edge orifices with radius tappings - DEP 32.32.11.47-Gen., sheet 2 03/86

Program listing in basic:

```
10  INPUT "Service Liquid (L), Gas (G) or Steam (S)         :",FLUID$
20  INPUT "Approx. normal flow                          [ kg/s]:",QM
30  INPUT "Viscosity under operating conditions         [mPa.s]:",N
40  INPUT "Operating temperature                        [   °C]:",T
50  INPUT "Density under operating conditions           [kg/m3]:",R
60  INPUT "Operating pressure                           [  bar]:",P
70  INPUT "Internal pipe diameter at ambient            [   mm]:",DM
80  INPUT "Transmitter range                            [  bar]:",DP
90  INPUT "Indication of normal flow on scale  (0-10)        :",X
100 INPUT "Bleed hole size                              [   mm]:",DH
110 INPUT "Linear expansion coeff. pipe                 [  /°C]:",AP
120 INPUT "Linear expansion coeff. orifice              [  /°C]:",AO
130 INPUT "Ambient temperature                          [   °C]:",TAMB
140 IF FLUID$ = "L" THEN W = 0 :GOTO 500
150 INPUT "Ratio of specific heats Cp/Cv                     :",Y
160 IF FLUID$ = "G" GOTO 500
170 INPUT "Water content in wet steam                   [    %]:",W
500 REM STEP 1                      (calculate D under operating conditions)
510 D = DM * (1 + AP * (T - TAMB))
520 REM STEP 2                      (calculate ReD)
530 RED = 1273200 * QM / (N * D)
540 REM STEP 3                      (calculate steam correction factor Fs)
550 FS = 1 + 0.0074 * W
560 REM STEP 4                      (calculate dp at normal flow indication)
570 DPN = DP * (X / 10)^2
580 REM STEP 5                      (calculate the estimated ß)
590 B = (QM^2 / (4.6 * 10^-8 * D^4 * DPN * R + QM^2))^0.25
600 REM STEP 6                      (calculate epsilon)
610 E = 1
620 IF FLUID$ = "G" OR FLUID$ = "S" THEN E = 1 - (0.41 + 0.35 * B^4) * (DPN / P) / Y
630 REM STEP 7                      (calculate discharge coefficient)
640 C =  0.5959 + 0.0312 * B^2.1 - 0.184 * B^8 + 0.0029 * B^2.5 *
       * (1000000 / RED)^0.75 + 0.039 * B^4 / (1 - B^4) - 0.015839 * B^3
650 REM STEP 8                      (calculate new ß)
660 B1 = (2847.05 * QM / (D^2 * E * FS * C * (1 - B^4)^-0.5 * (DPN * R)^0.5))^0.5
670 REM  check if calculated ß agrees with previous ß within 0.01%
680 IF ABS ((B - B1) / B1) > 0.0001 THEN B = B1 : GOTO 600
690 REM STEP 9                      (calculate d orifice at line temp)
700 DO = B1 * D
710 REM STEP 10                     (calculate d orifice at ambient temp)
720 DOM = DO * (1 - 0.55 * (DH / DO)^2) / (1 + AO * (T - TAMB))
730 REM  the following lines will print the output and restart the program
740 PRINT "Orifice diameter at ambient      [mm]:";DOM
750 PRINT "Beta ratio                           :";B1
760 PRINT "Reynolds Number                      :";RED
770 INPUT "A new calculation Y/N                :",A$
780 IF A$ = "Y" THEN GOTO 10
790 END
```

Sizing form for quarter of circle orifices with flange tappings - DEP 32.32.11.48-Gen., sheet 1 03/86

SIZING FORM FOR QUARTER OF CIRCLE ORIFICES WITH FLANGE TAPPINGS

Plant: _____

Service: _____ Tag No.: _____

DATA TO BE SUPPLIED BY OPERATIONS

Approx. norm. quantity q_m	_____ kg/s	Density ρ under operating cond.	_____ kg/m^3
Viscosity η under operating cond.	_____ m Pa • s	Operating pressure p	_____ bar
Operating temp. T	_____ °C	Water content in wet steam	_____ % wt

Orifice diameter d_m at T_0	_____ mm	Linear expansion coeff. α_{pipe}	_____ /°C
Orifice r	_____ mm	Linear expansion coeff. α_{plate}	_____ /°C
Internal pipe dia. D_m at T_0	_____ mm	Ambient temp. T_0	_____ °C
Transmitter range DP	_____ bar	Limitations:	$0.245 \leq \beta \leq 0.6$
Indication X of q_m on scale (0-10)	_____		$1000\,\beta + 9.4 \cdot 10^6 (\beta - 0.24)^8 \leq Re_D \leq 10^5 \beta$
Bleed hole size y	_____ mm		
Ratio of specific heats $\kappa = C_p/C_v$	_____		

1. $D = D_m \left[1 + \alpha_{pipe} (T - T_0) \right]$ — D = _____ mm

2. $(Re_D)_{des} = \dfrac{1.2732 \cdot 10^6 (q_m)_{des}}{\eta D}$ — $(Re_D)_{des}$ = _____

3. $F_s = 1 + 0.0074\, W_t$
   For gas and liquid $F_s = 1$ — F_s = _____

4. $\beta = \left[\dfrac{(q_m)^2_{des}}{(4.6 \cdot 10^{-10} D^4 (DP) X^2 \rho) + (q_m)^2_{des}} \right]^{0.25}$ — estimated β = _____

5. $\epsilon = 1 - \left[0.41 + 0.35\,\beta^4\right] \cdot \left[(DP) / p \right] \cdot \left[X / 10 \right]^2 \cdot \kappa^{-1}$
   N.B.: if the fluid is a liquid $\epsilon = 1$ — ϵ = _____

6. $C = 0.73823 + 0.3309\ \beta - 1.1615\ \beta^2 + 1.5084\ \beta^3$ — C = _____

7. $\beta = \left[\dfrac{28\,470.5\ (q_m)_{des}\ \sqrt{1 - \beta^4}}{D^2\, \epsilon\, C\, X\, F_s \sqrt{\rho\ (DP)}} \right]^{0.5}$ — calculated β = _____

   Repeat 5 through 7 until calculated β agrees with previously calculated β to within 0.01%

8. $d = \beta D$ — d = _____ mm

9. $d_m = d \left[1 - 0.55 \left(y / d \right)^2 \right] \left[1 + \alpha_{plate} (T - T_0) \right]^{-1}$ — d_m = _____ mm

10. $r = \dfrac{(0.0757141\ \beta - 0.06253143)\ d}{\beta - 0.6828572}$ — r = _____ mm

Calculated by: _____ Date: _____ Sign.: _____

DEP 32.32.11.48 - Gen., sheet 1, 03/86

Sizing for for quarter of circle orifices with flange tappings - DEP 32.32.11.48-Gen., sheet 2 03/86

Program listing in basic:

```
10  INPUT "Service Liquid (L), Gas (G) or Steam (S)         :",FLUID$
20  INPUT "Approx. normal flow                        [ kg/s]:",QM
30  INPUT "Viscosity under operating conditions       [mPa.s]:",N
40  INPUT "Operating temperature                      [   °C]:",T
50  INPUT "Density under operating conditions         [kg/m3]:",R
60  INPUT "Operating pressure                         [  bar]:",P
70  INPUT "Internal pipe diameter at ambient          [   mm]:",DM
80  INPUT "Transmitter range                          [  bar]:",DP
90  INPUT "Indication of normal flow on scale  (0-10)       :",X
100 INPUT "Bleed hole size                            [   mm]:",DH
110 INPUT "Linear expansion coeff. pipe               [  /°C]:",AP
120 INPUT "Linear expansion coeff. orifice            [  /°C]:",AO
130 INPUT "Ambient temperature                        [   °C]:",TAMB
140 IF FLUID$ = "L" THEN W = 0 :GOTO 500
150 INPUT "Ratio of specific heats Cp/Cv                    :",Y
160 IF FLUID$ = "G" THEN W = 0 :GOTO 500
170 INPUT "Water content in wet steam                 [    %]:",W
500 REM STEP 1                    (calculate D under operating conditions)
510 D = DM * (1 + AP * (T - TAMB))
520 REM STEP 2                    (calculate ReD)
530 RED = 1273200 * QM / (N * D)
540 REM STEP 3                    (calculate steam correction factor Fs)
550 FS = 1 + 0.0074 * W
560 REM STEP 4                    (calculate dp at normal flow indication)
570 DPN = DP * (X / 10)^2
580 REM STEP 5                    (calculate the estimated ß)
590 B = (QM^2 / (4.6 * 10^-8 * D^4 * DPN * R + QM^2))^0.25
600 REM STEP 6                    (calculate epsilon)
610 E = 1
620 IF FLUID$ = "G" OR FLUID$ = "S" THEN E = 1 - (0.41 + 0.35 * B^4) * (DPN / P) / Y
630 REM STEP 7                    (calculate discharge coefficient)
640 C =  0.73823 + 0.3309 * B - 1.1615 * B^2 + 1.5084 * B^3
650 REM STEP 8                    (calculate new ß)
660 B1 = (2847.05 * QM / (D^2 * E * FS * C * (1 - B^4)^-0.5 * (DPN * R)^0.5))^0.5
670 REM  check if calculated ß agrees with previous ß within 0.01%
680 IF ABS ((B - B1) / B1) > 0.0001 THEN B = B1 : GOTO 600
690 REM STEP 9                    (calculate d orifice at line temp)
700 DO = B1 * D
710 REM STEP 10                   (calculate d orifice at ambient temp)
720 DOM = DO * (1 - 0.55 * (DH / DO)^2) / (1 + AO * (T - TAMB))
730 REM STEP 11                   (calculate the radius)
740 RA = (0.0757141 * B1 - 0.06253143) * DOM / (B1 - 0.6828572)
750 REM  the following lines will print the output and restart the program
760 PRINT "Orifice diameter at ambient      [mm]:";DOM
770 PRINT "The radius of the orifice        [mm]:";RA
780 PRINT "Beta ratio                           :";B1
790 PRINT "Reynolds Number                      :";RED
800 INPUT "A new calculation Y/N                :",A$
810 IF A$ = "Y" THEN GOTO 10
820 END
```

Sizing form for conical entrance orifice with corner tappings - DEP 32.32.11.49-Gen., sheet 1 03/86

SIZING FORM FOR CONICAL ENTRANCE ORIFICES WITH CORNER TAPPINGS

Plant: _____

Service: _____ Tag No.: _____

DATA TO BE SUPPLIED BY OPERATIONS

Approx. norm. quantity q_m	_____ kg/s	Density ρ under operating cond.	_____ kg/m^3
Viscosity η under operating cond.	_____ m Pa • s	Operating pressure p	_____ bar
Operating temp. T	_____ °C	Water content in wet steam	_____ % wt

Orifice diameter d_m at T_0	_____ mm	Linear expansion coeff. α_{pipe}	_____ /°C
Internal pipe dia. D_m at T_0	_____ mm	Linear expansion coeff. α_{plate}	_____ /°C
Transmitter range DP	_____ bar	Ambient temp. T_0	_____ °C
Indication X of q_m on scale (0-10)	_____	Limitations:	$0.1 \leq \beta \leq 0.316$
Bleed hole size y	_____ mm		$250\,\beta \leq Re_D \leq 2 \cdot 10^5\,\beta$
Ratio of specific heats $\kappa = C_p/C_v$	_____		

1. $D = D_m \left[1 + \alpha_{pipe} (T - T_0) \right]$ — D = _____ mm

2. $(Re_D)_{des} = \dfrac{1.2732 \cdot 10^6 (q_m)_{des}}{\eta D}$ — $(Re_D)_{des}$ = _____

3. $F_s = 1 + 0.0074\, W_t$
   For gas and liquid $F_s = 1$ — F_s = _____

4. $\beta = \left[\dfrac{(q_m)^2_{des}}{(4.6 \cdot 10^{-10} D^4 (DP) X^2 \rho) + (q_m)^2_{des}} \right]^{0.25}$ — estimated β = _____

5. $\epsilon = 1 - \left[0.41 + 0.35\beta^4\right] \cdot \left[(DP)/p \right] \cdot \left[X/10 \right]^2 \cdot \kappa^{-1}$
   N.B.: if the fluid is a liquid $\epsilon = 1$ — ϵ = _____

6. $C = 0.734$ for $250\,\beta \leq Re_D \leq 5000\,\beta$
   $C = 0.730$ for $5000\,\beta < Re_D \leq 2 \cdot 10^5\,\beta$ — C = _____

7. $\beta = \left[\dfrac{28470.5\,(q_m)_{des} \sqrt{1-\beta^4}}{D^2\,\epsilon\,C\,X\,F_s \sqrt{\rho\,(DP)}} \right]^{0.5}$ — calculated β = _____
   Repeat 5 through 7 until calculated β agrees with previously calculated β to within 0.01%

8. If $Re_D \leq 10^6$ then $Z_{Re_D} = Z_0$,
   otherwise $Z_{Re_D} = (Z_0 - 1) \left[\log (Re_D)/6 \right]^2 + 1$ — Z_{Re_D} = _____

9. $\beta = \beta\,(Z_{Re_D})^{-0.5}$ — corrected β = _____

10. $d = \beta D$ — d = _____ mm

11. $d_m = d \left[1 - 0.55 (y/d)^2 \right] \left[1 + \alpha_{plate} (T - T_0) \right]^{-1}$ — d_m = _____ mm

Calculated by: _____ Date: _____ Sign.: _____

DEP 32.32.11.49 - Gen., sheet 1, 03/86

Sizing for conical entrance orifice with corner tappings - DEP 32.32.11.49-Gen., sheet 2 03/86

Program listing in basic:

```
10  INPUT "Service Liquid (L), Gas (G) or Steam (S)          :",FLUID$
20  INPUT "Approx. normal flow                        [ kg/s]:",QM
30  INPUT "Viscosity under operating conditions       [mPa.s]:",N
40  INPUT "Operating temperature                      [   °C]:",T
50  INPUT "Density under operating conditions         [kg/m3]:",R
60  INPUT "Operating pressure                         [  bar]:",P
70  INPUT "Internal pipe diameter at ambient          [   mm]:",DM
80  INPUT "Transmitter range                          [  bar]:",DP
90  INPUT "Indication of normal flow on scale  (0-10)        :",X
100 INPUT "Bleed hole size                            [   mm]:",DH
110 INPUT "Linear expansion coeff. pipe               [ /°C]:",AP
120 INPUT "Linear expansion coeff. orifice            [ /°C]:",AO
130 INPUT "Ambient temperature                        [   °C]:",TAMB
140 IF FLUID$ = "L" THEN W = 0 :GOTO 500
150 INPUT "Ratio of specific heats Cp/Cv                    :",Y
160 IF FLUID$ = "G" THEN W = 0 :GOTO 500
170 INPUT "Water content in wet steam                 [    %]:",W
500 REM STEP 1                      (calculate D under operating conditions)
510 D = DM * (1 + AP * (T - TAMB))
520 REM STEP 2                      (calculate ReD)
530 RED = 1273200 * QM / (N * D)
540 REM STEP 3                      (calculate steam correction factor Fs)
550 FS = 1 + 0.0074 * W
560 REM STEP 4                      (calculate dp at normal flow indication)
570 DPN = DP * (X / 10)^2
580 REM STEP 5                      (calculate the estimated ß)
590 B = (QM^2 / (4.6 * 10^-8 * D^4 * DPN * R + QM^2))^0.25
600 REM STEP 6                      (calculate epsilon)
610 E = 1
620 IF FLUID$ = "G" OR FLUID$ = "S" THEN E = 1 - (0.41 + 0.35 * B^4) * (DPN / P) / Y
630 REM STEP 7                      (determ discharge coefficient)
640 IF RED >= 250 * B AND RED <= 5000 * B THEN C = 0.734
650 IF RED > 5000 * B AND RED <= 200000 * B THEN C = 0.730
660 REM STEP 8                      (calculate new ß)
670 B1 = (2847.05 * QM / (D^2 * E * FS * C * (1 - B^4)^-0.5 * (DPN * R)^0.5))^0.5
680 REM  check if calculated ß agrees with previous ß within 0.01%
690 IF ABS ((B - B1) / B1) > 0.0001 THEN B = B1 : GOTO 600
700 REM STEP 9                      (check on roughness correction factor)
710 PRINT "Beta ratio                    :";B1
720 INPUT "Enter the roughness k         :";ROUGH
730 PRINT "k / D * 10000 = ";ROUGH / D * 10^4
740 INPUT "Roughness correction factor Zo :",Z0
750 IF RED >= 1000000 THEN ZRED = Z0 ELSE ZRED = (Z0 - 1) * ((LOG(RED) / LOG(10)) / 6)^2 + 1
760 REM STEP 10                     (calculate corrected ß)
770 B1 = B1 / ZRED^0.5
780 REM STEP 11                     (calculate d orifice at line temp)
790 DO = B1 * D
800 REM STEP 12                     (calculate d orifice at ambient temp)
810 DOM = DO * (1 - 0.55 * (DH / DO)^2) / (1 + AO * (T - TAMB))
820 REM  the following lines will print the output and restart the program
830 PRINT "Orifice diameter at ambient      [mm]:";DOM
840 PRINT "Beta ratio                        :";B1
850 PRINT "Reynolds Number                   :";RED
860 INPUT "A new calculation Y/N             :",A$
870 IF A$ = "Y" THEN GOTO 10
880 END
```

DEP 32.32.11.49 - Gen., sheet 2, 03/86

Sizing form for venturi tubes (A, B and C) - DEP 32.32.11.50-Gen., sheet 1 03/86

SIZING FORM FOR VENTURI TUBES (A, B and C)

Plant: _____

Service: _____ Tag No.: _____

DATA TO BE SUPPLIED BY OPERATIONS

Approx. norm. quantity q_m	_____ kg/s	Density ρ under operating cond.	_____ kg/m^3
Viscosity η under operating cond.	_____ m Pa • s	Operating pressure p	_____ bar
Operating temp. T	_____ °C	Water content in wet steam	_____ % wt

Venturi throat diameter d_m at T_0	_____ mm	Linear expansion coeff. $\alpha_{Venturi}$	_____ /°C
Venturi inlet dia. D_m at T_0	_____ mm	Ambient temp. T_0	_____ °C
Transmitter range DP	_____ bar	Limitations: Type A: $0.3 \leq \beta \leq 0.75$ and $2 \cdot 10^5 \leq Re_D \leq 2 \cdot 10^6$	
Indication X of q_m on scale (0-10)	_____	Type B: $0.4 \leq \beta \leq 0.75$ and $2 \cdot 10^5 \leq Re_D \leq 10^6$	
Ratio of specific heats $\kappa = C_p/C_v$	_____	Type C: $0.4 \leq \beta \leq 0.70$ and $1 \cdot 10^5 \leq Re_D \leq 2 \cdot 10^6$	

1. $D = D_m \left[1 + \alpha_{Venturi} (T - T_0) \right]$ — D = _____ mm

2. $(Re_D)_{des} = \dfrac{1.2732 \cdot 10^6 (q_m)_{des}}{\eta D}$ — $(Re_D)_{des}$ = _____

3. $F_s = 1 + 0.0074 W_t$ — F_s = _____

   For gas and liquid $F_s = 1$

4. $\beta = \left[\dfrac{(q_m)^2_{des}}{(12.3 \cdot 10^{-10} D^4 (DP) X^2 \rho) + (q_m)^2_{des}} \right]^{0.25}$ — estimated β = _____

5. $\epsilon = \left[\left(\dfrac{\kappa (K)^{\frac{2}{\kappa}}}{\kappa - 1} \right) \left(\dfrac{1 - \beta^4}{1 - \beta^4 (K)^{\frac{2}{\kappa}}} \right) \left(\dfrac{1 - (K)^{\frac{\kappa - 1}{\kappa}}}{1 - K} \right) \right]^{0.5}$ — ϵ = _____

   Where: $K = \left[p - (DP) (X/10)^2 \right] / p$

   N.B.: if the fluid is a liquid $\epsilon = 1$

6. Type A: In case of rough cast convergent — C = 0.984
   Type B: In case of machined convergent — C = 0.995
   Type C: In case of rough welded sheet iron convergent — C = 0.985

   C = _____

7. $\beta = \left[\dfrac{28\,470.5 (q_m)_{des} \sqrt{1 - \beta^4}}{D^2 \epsilon C X F_s \sqrt{\rho (DP)}} \right]^{0.5}$ — calculated β = _____

   Repeat 5 through 7 until calculated β agrees with previously calculated β to within 0.01%

8. $d = \beta D$ — d = _____ mm

9. $d_m = d \left[1 + \alpha_{Venturi} (T - T_0) \right]$ — d_m = _____ mm

Calculated by: _____ Date: _____ Sign.: _____

Sizing for for venturi tubes (A,B and C) - DEP 32.32.11.50-Gen., sheet 2 03/86

Program listing in basic:

```
10  INPUT "Service Liquid (L), Gas (G) or Steam (S)         :",FLUID$
20  INPUT "Type of venturi A, B or C                        :",T$
30  IF T$<>"A" AND T$<>"B" AND T$<>"C" THEN GOTO 20
40  INPUT "Approx. normal flow                    [ kg/s]:",QM
50  INPUT "Viscosity under operating conditions   [mPa.s]:",N
60  INPUT "Operating temperature                  [   °C]:",T
70  INPUT "Density under operating conditions     [kg/m3]:",R
80  INPUT "Operating pressure                     [  bar]:",P
90  INPUT "Internal pipe diameter at ambient      [   mm]:",DM
100 INPUT "Transmitter range                      [  bar]:",DP
110 INPUT "Indication of normal flow on scale  (0-10)       :",X
120 INPUT "Linear expansion coeff. Venturi        [  /°C]:",AP
130 INPUT "Ambient temperature                    [   °C]:",TAMB
140 IF FLUID$ = "L" THEN W = 0 :GOTO 500
150 INPUT "Ratio of specific heats Cp/Cv                  :",Y
160 IF FLUID$ = "G" THEN W = 0 :GOTO 500
170 INPUT "Water content in wet steam             [    %]:",W
500 REM STEP 1                    (calculate D under operating conditions)
510 D = DM * (1 + AP * (T - TAMB))
520 REM STEP 2                    (calculate ReD)
530 RED = 1273200 * QM / (N * D)
540 REM STEP 3                    (calculate steam correction factor Fs)
550 FS = 1 + 0.0074 * W
560 REM STEP 4                    (calculate dp at normal flow indication)
570 DPN = DP * (X / 10)^2
580 REM STEP 5                    (calculate the estimated ß)
590 B = (QM^2 / (1.23 * 10^-7 * D^4 * DPN * R + QM^2))^0.25
600 REM STEP 6                    (calculate epsilon)
610 E = 1
620 IF FLUID$ = "L" THEN GOTO 670
630 K = (P - DPN) / P
640 K1 = K^(2 / Y)
650 K2 = K^((Y - 1) / Y)
660 E = ((Y * K1 / (Y - 1)) * ((1 - B^4) / (1 - B^4 * K1)) * ((1 - K2) / (1 - K)))^0.5
670 REM STEP 7
680 IF T$ = "A" THEN C = 0.984
690 IF T$ = "B" THEN C = 0.995
700 IF T$ = "C" THEN C = 0.985
710 REM STEP 8                    (calculate new ß)
720 B1 = (2847.05 * QM / (D^2 * E * FS * C * (1 - B^4)^-0.5 * (DPN * R)^0.5))^0.5
730 REM  check if calculated ß agrees with previous ß within 0.01%
740 IF ABS ((B - B1) / B1) > 0.0001 THEN B = B1 : GOTO 600
750 REM STEP 9                    (calculate d orifice at line temp)
760 DO = B1 * D
770 REM STEP 10                   (calculate d orifice at ambient temp)
780 DOM = DO / (1 + AP * (T - TAMB))
790 REM  the following lines will print the output and restart the program
800 PRINT "Orifice diameter at ambient      [mm]:";DOM
810 PRINT "Beta ratio                          :";B1
820 PRINT "Reynolds Number                     :";RED
830 INPUT "A new calculation Y/N               :",A$
840 IF A$ = "Y" THEN GOTO 10
850 END
```

Sizing form for rectangular venturi tubes - DEP 32.32.11.51-Gen., sheet 1 03/86

SIZING FORM FOR RECTANGULAR VENTURI TUBES

Plant: _____

Service: _____ Tag No.: _____

DATA TO BE SUPPLIED BY OPERATIONS

Approx. norm. quantity q_m	_____ kg/s	Density ρ under operating cond.	_____ kg/m^3
Viscosity η under operating cond.	_____ m Pa • s	Operating pressure p	_____ bar
Operating temp. T	_____ °C	Water content in wet steam	_____ % wt

Throat with w at T_0	_____ mm	Linear expansion coeff. $\alpha_{Venturi}$	_____ /°C
Throat height h at T_0	_____ mm	Ambient temp. T_0	_____ °C
Duct width W at T_0	_____ mm		
Duct height H at T_0	_____ mm	Limitations: $0.44 \leq \sqrt{\frac{wh}{WH}} \leq 0.74$	
Transmitter range DP	_____ bar	$2 \cdot 10^5 \leq Re_D \leq 2 \cdot 10^7$	
Indication X of q_m on scale (0-10)	_____		
Ratio of specific heats $\kappa = C_p/C_v$	_____		

1. $D_e = 1.1284\ (WH)^{0.5}$ — D_e = _____ mm

2. $D = D_e\ [1 + \alpha_{Venturi}\ (T - T_0)]$ — D = _____ mm

3. $(Re_D)_{des} = \dfrac{1.2732 \cdot 10^6\ (q_m)_{des}}{\eta\ D}$ — $(Re_D)_{des}$ = _____

4. $F_s = 1 + 0.0074\ W_t$ — F_s = _____

   For gas and liquid $F_s = 1$

5. $\beta = \left[\dfrac{(q_m)^2_{des}}{(12.3 \cdot 10^{-10}\ D^4\ (DP)\ X^2\ \rho) + (q_m)^2_{des}}\right]^{0.25}$ — estimated β = _____

6. $\epsilon = \left[\left(\dfrac{\kappa\ (K)^{\frac{2}{\kappa}}}{\kappa - 1}\right)\left(\dfrac{1 - \beta^4}{1 - \beta^4\ (K)^{\frac{2}{\kappa}}}\right)\left(\dfrac{1 - (K)^{\frac{\kappa-1}{\kappa}}}{1 - K}\right)\right]^{0.5}$ — ϵ = _____

   Where: $K = [p - (DP)\ (X/10)^2\ ] / p$

   N.B.: if the fluid is a liquid $\epsilon = 1$

7. $C = 0.975$ — C = 0.975

8. $\beta = \left[\dfrac{28\,470.5\ (q_m)_{des}\ \sqrt{1 - \beta^4}}{D^2\ \epsilon\ C\ X\ F_s \sqrt{\rho\ (DP)}}\right]^{0.5}$ — calculated β = _____

   Repeat 5 through 7 until calculated β agrees with previously calculated β to within 0.01%

9. In case of two-plane contraction select w and h

   wh = β^2 WH — wh = _____ mm^2

   w = — w = _____ mm

   h = — h = _____ mm

10. In case of one-plane contraction

    w = β^2 W — w = _____ mm

    h = H — h = _____ mm

Calculated by: _____ Date: _____ Sign.: _____

DEP 32.32.11.51 - Gen., sheet 1, 03/86

Sizing for for rectangular venturi tubes - DEP 32.32.11.51-Gen., sheet 2 03/86

SIZING FORM FOR ISA 1932 NOZZLES

Plant: _____

Service: _____ Tag No.: _____

DATA TO BE SUPPLIED BY OPERATIONS

Approx. norm. quantity q_m	_____ kg/s	Density ρ under operating cond.	_____ kg/m^3
Viscosity η under operating cond.	_____ m Pa • s	Operating pressure p	_____ bar
Operating temp. T	_____ °C	Water content in wet steam	_____ % wt
Throat diameter d_m at T_0	_____ mm	Linear expansion coeff. α_{pipe}	_____ /°C
Internal pipe dia. D_m at T_0	_____ mm	Linear expansion coeff. α_{nozzle}	_____ /°C
Transmitter range DP	_____ bar	Ambient temp. T_0	_____ °C
Indication X of q_m on scale (0-10)	_____	Limitations:	$0.30 \leq \beta \leq 0.80$
Ratio of specific heats $\kappa = C_p/C_v$	_____		$70\,000 \leq Re_D \leq 10^7$ for $0.30 \leq \beta \leq 0.44$
			$20\,000 \leq Re_D \leq 10^7$ for $0.44 < \beta \leq 0.80$

1. $D = D_m \left[1 + \alpha_{pipe} (T - T_0) \right]$ — D = _____ mm

2. $(Re_D)_{des} = \dfrac{1.2732 \cdot 10^6 (q_m)_{des}}{\eta D}$ — $(Re_D)_{des}$ = _____

3. $F_s = 1 + 0.0074 W_t$ — F_s = _____

   For gas and liquid $F_s = 1$

4. $\beta = \left[\dfrac{(q_m)^2_{des}}{(4.6 \cdot 10^{-10} D^4 (DP) X^2 \rho) + (q_m)^2_{des}} \right]^{0.25}$ — estimated β = _____

5. $\epsilon = \left[\left(\dfrac{\kappa (K)^{\frac{2}{\kappa}}}{\kappa - 1} \right) \left(\dfrac{1 - \beta^4}{1 - \beta^4 (K)^{\frac{2}{\kappa}}} \right) \left(\dfrac{1 - (K)^{\frac{K-1}{\kappa}}}{1 - K} \right) \right]^{0.5}$ — ϵ = _____

   Where: $K = \left[p - (DP) (X/10)^2 \right] / p$

   N.B.: if the fluid is a liquid $\epsilon = 1$

6. $C = 0.99 - 0.2262 \beta^{4.1} + \left[0.000215 - 0.001125 \beta + 0.00249 \beta^{4.7} \right] \cdot \left[\dfrac{10^6}{(Re_D)_{des}} \right]^{1.15}$ — C = _____

7. $\beta = \left[\dfrac{28\,470.5 (q_m)_{des} \sqrt{1 - \beta^4}}{D^2 \epsilon C X F_s \sqrt{\rho (DP)}} \right]^{0.5}$ — calculated β = _____

   Repeat 5 through 7 until calculated β agrees with previously calculated β to within 0.01%

8. $d = \beta D$ — d = _____ mm

9. $d_m = d \left[(1 + \alpha_{nozzle} (T - T_0) \right]^{-1}$ — d_m = _____ mm

Calculated by: _____ Date: _____ Sign.: _____

Sizing form for ISA 1932 nozzles - DEP 32.32.11.52-Gen., sheet 1 03/86

SIZING FORM FOR ISA 1932 NOZZLES

Plant: _____

Service: _____ Tag No.: _____

DATA TO BE SUPPLIED BY OPERATIONS

Approx. norm. quantity q_m	_____ kg/s	Density ρ under operating cond.	_____ kg/m^3
Viscosity η under operating cond.	_____ m Pa • s	Operating pressure p	_____ bar
Operating temp. T	_____ °C	Water content in wet steam	_____ % wt
Throat diameter d_m at T_0	_____ mm	Linear expansion coeff. α_{pipe}	_____ /°C
Internal pipe dia. D_m at T_0	_____ mm	Linear expansion coeff. α_{nozzle}	_____ /°C
Transmitter range DP	_____ bar	Ambient temp. T_0	_____ °C
Indication X of q_m on scale (0-10)	_____	Limitations:	$0.30 \leq \beta \leq 0.80$
Ratio of specific heats $\kappa = C_p/C_v$	_____		$70\,000 \leq Re_D \leq 10^7$ for $0.30 \leq \beta \leq 0.44$
			$20\,000 \leq Re_D \leq 10^7$ for $0.44 < \beta \leq 0.80$

1. $D = D_m \left[1 + \alpha_{pipe} (T - T_0) \right]$ — D = _____ mm

2. $(Re_D)_{des} = \dfrac{1.2732 \cdot 10^6 (q_m)_{des}}{\eta D}$ — $(Re_D)_{des}$ = _____

3. $F_s = 1 + 0.0074 W_t$ — F_s = _____

   For gas and liquid $F_s = 1$

4. $\beta = \left[\dfrac{(q_m)^2_{des}}{(4.6 \cdot 10^{-10} D^4 (DP) X^2 \rho) + (q_m)^2_{des}} \right]^{0.25}$ — estimated β = _____

5. $\epsilon = \left[\left(\dfrac{\kappa (K)^{\frac{2}{\kappa}}}{\kappa - 1} \right) \left(\dfrac{1 - \beta^4}{1 - \beta^4 (K)^{\frac{2}{\kappa}}} \right) \left(\dfrac{1 - (K)^{\frac{\kappa - 1}{\kappa}}}{1 - K} \right) \right]^{0.5}$ — ϵ = _____

   Where: $K = \left[p - (DP) (X/10)^2 \right] / p$

   N.B.: if the fluid is a liquid $\epsilon = 1$

6. $C = 0.99 - 0.2262 \beta^{4.1} + \left[0.000215 - 0.001125 \beta + 0.00249 \beta^{4.7} \right] \cdot \left[\dfrac{10^6}{(Re_D)_{des}} \right]^{1.15}$ — C = _____

7. $\beta = \left[\dfrac{28\,470.5 (q_m)_{des} \sqrt{1 - \beta^4}}{D^2 \epsilon C X F_s \sqrt{\rho (DP)}} \right]^{0.5}$ — calculated β = _____

   Repeat 5 through 7 until calculated β agrees with previously calculated β to within 0.01%

8. $d = \beta D$ — d = _____ mm

9. $d_m = d \left[(1 + \alpha_{nozzle} (T - T_0) \right]^{-1}$ — d_m = _____ mm

Calculated by: _____ Date: _____ Sign.: _____

Sizing for ISA 1932 nozzle - DEP 32.32.11.52-Gen., sheet 2 03/86

Program listing in basic:

```
10  INPUT "Service Liquid (L), Gas (G) or Steam (S)         :",FLUID$
20  INPUT "Approx. normal flow                        [ kg/s]:",QM
30  INPUT "Viscosity under operating conditions       [mPa.s]:",N
40  INPUT "Operating temperature                      [   °C]:",T
50  INPUT "Density under operating conditions         [kg/m3]:",R
60  INPUT "Operating pressure                         [  bar]:",P
70  INPUT "Nozzle pipe diameter at ambient            [   mm]:",DM
80  INPUT "Transmitter range                          [  bar]:",DP
90  INPUT "Indication of normal flow on scale  (0-10)        :",X
100 INPUT "Linear expansion coeff. of the pipe        [ /°C]:",AP
110 INPUT "Linear expansion coeff. of the nozzle      [ /°C]:",AO
120 INPUT "Ambient temperature                        [   °C]:",TAMB
130 IF FLUID$ = "L" THEN W = 0 :GOTO 500
140 INPUT "Ratio of specific heats Cp/Cv                   :",Y
150 IF FLUID$ = "G" THEN W = 0 :GOTO 500
160 INPUT "Water content in wet steam                 [    %]:",W
500 REM STEP 1                      (calculate D under operating conditions)
510 D = DM * (1 + AP * (T - TAMB))
520 REM STEP 2                      (calculate ReD)
530 RED = 1273200 * QM / (N * D)
540 REM STEP 3                      (calculate steam correction factor Fs)
550 FS = 1 + 0.0074 * W
560 REM STEP 4                      (calculate dp at normal flow indication)
570 DPN = DP * (X / 10)^2
580 REM STEP 5                      (calculate the estimated ß)
590 B = (QM^2 / (4.6 * 10^-8 * D^4 * DPN * R + QM^2))^0.25
600 REM STEP 6                      (calculate epsilon)
610 E = 1
620 IF FLUID$ = "L" THEN GOTO 670
630 K = (P - DPN) / P
640 K1 = K^(2 / Y)
650 K2 = K^((Y - 1) / Y)
660 E = ((Y * K1 / (Y - 1)) * ((1 - B^4) / (1 - B^4 * K1)) * ((1 - K2) / (1 - K)))^0.5
670 REM STEP 7                      (calculate discharge coefficient)
680 C = 0.99 - 0.2262 * B^4.1 + (0.000215 - 0.001125 * B + 0.00249 * B^4.7) *
      * (1000000 / RED)^1.15
690 B1 = (2847.05 * QM / (D^2 * E * FS * C * (1 - B^4)^-0.5 * (DPN * R)^0.5))^0.5
700 REM  check if calculated ß agrees with previous ß within 0.01%
710 IF ABS ((B - B1) / B1) > 0.0001 THEN B = B1 : GOTO 600
720 REM STEP 9                      (calculate d nozzle at line temp)
730 DO = B1 * D
740 REM STEP 10                     (calculate d nozzle at ambient temp)
750 DOM = DO / (1 + AO * (T - TAMB))
760 REM  the following lines will print the output and restart the program
770 PRINT "Orifice diameter nozzle at ambient  [mm]:";DOM
780 PRINT "Beta ratio                             :";B1
790 PRINT "Reynolds Number                        :";RED
800 INPUT "A new calculation Y/N                  :",A$
810 IF A$ = "Y" THEN GOTO 10
820 END
```

Sizing form for long radius nozzles - DEP 32.32.11.53 Gen., sheet 1 03/86

SIZING FORM FOR LONG RADIUS NOZZLES

Plant: _____

Service: _____ Tag No.: _____

DATA TO BE SUPPLIED BY OPERATIONS

Approx. norm. quantity q_m	_____ kg/s	Density ρ under operating cond.	_____ kg/m^3
Viscosity η under operating cond.	_____ m Pa • s	Operating pressure p	_____ bar
Operating temp. T	_____ °C	Water content in wet steam	_____ % wt

Throat diameter d_m at T_0	_____ mm	Linear expansion coeff. α_{pipe}	_____ /°C
Internal pipe dia. D_m at T_0	_____ mm	Linear expansion coeff. α_{nozzle}	_____ /°C
Transmitter range DP	_____ bar	Ambient temp. T_0	_____ °C
Indication X of q_m on scale (0-10)	_____	Limitations:	$0.2 \leq \beta \leq 0.80$
Ratio of specific heats $\kappa = C_p/C_v$	_____		$10^4 \leq Re_D \leq 10^7$

1. $D = D_m \left[1 + \alpha_{pipe} (T - T_0) \right]$ — D = _____ mm

2. $(Re_D)_{des} = \dfrac{1.2732 \cdot 10^6 (q_m)_{des}}{\eta D}$ — $(Re_D)_{des}$ = _____

3. $F_s = 1 + 0.0074 W_t$
   For gas and liquid $F_s = 1$ — F_s = _____

4. $\beta = \left[\dfrac{(q_m)^2_{des}}{(4.6 \cdot 10^{-10} D^4 (DP) X^2 \rho) + (q_m)^2_{des}} \right]^{0.25}$ — estimated β = _____

5. $\epsilon = \left[\left(\dfrac{\kappa (K)^{\frac{2}{\kappa}}}{\kappa - 1} \right) \left(\dfrac{1 - \beta^4}{1 - \beta^4 (K)^{\frac{2}{\kappa}}} \right) \left(\dfrac{1 - (K)^{\frac{\kappa - 1}{\kappa}}}{1 - K} \right) \right]^{0.5}$ — ϵ = _____

   Where: $K = \left[p - (DP) (X/10)^2 \right] / p$
   N.B.: If the fluid is a liquid $\epsilon = 1$

6. $C = 0.9965 - 0.00653 \beta^{0.5} \left[\dfrac{10^6}{(Re_D)_{des}} \right]^{0.5}$ — C = _____

7. $\beta = \left[\dfrac{28\,470.5 (q_m)_{des} \sqrt{1 - \beta^4}}{D^2 \epsilon C X F_s \sqrt{\rho (DP)}} \right]^{0.5}$ — calculated β = _____

   Repeat 5 through 7 until calculated β agrees with previously calculated β to within 0.01%

8. $d = \beta D$ — d = _____ mm

9. $d_m = d \left[(1 + \alpha_{nozzle} (T - T_0) \right]^{-1}$ — d_m = _____ mm

Calculated by: _____ Date: _____ Sign.: _____

DEP 32.32.11.53 - Gen., sheet 1, 03/86

Sizing for long radius nozzles - DEP 32.32.11.53-Gen., sheet 2 03/86

Program listing in basic:

```
10  INPUT "Service Liquid (L), Gas (G) or Steam (S)          :",FLUID$
20  INPUT "Approx. normal flow                          [ kg/s]:",QM
30  INPUT "Viscosity under operating conditions         [mPa.s]:",N
40  INPUT "Operating temperature                        [   °C]:",T
50  INPUT "Density under operating conditions           [kg/m3]:",R
60  INPUT "Operating pressure                           [  bar]:",P
70  INPUT "Nozzle diameter at ambient                   [   mm]:",DM
80  INPUT "Transmitter range                            [  bar]:",DP
90  INPUT "Indication of normal flow on scale  (0-10)         :",X
100 INPUT "Linear expansion coeff. of the pipe          [  /°C]:",AP
110 INPUT "Linear expansion coeff. of the nozzle        [  /°C]:",AO
120 INPUT "Ambient temperature                          [   °C]:",TAMB
130 IF FLUID$ = "L" THEN W = 0 :GOTO 500
140 INPUT "Ratio of specific heats Cp/Cv                    :",Y
150 IF FLUID$ = "G" THEN W = 0 :GOTO 500
160 INPUT "Water content in wet steam                   [    %]:",W
500 REM STEP 1                      (calculate D under operating conditions)
510 D = DM * (1 + AP * (T - TAMB))
520 REM STEP 2                      (calculate ReD)
530 RED = 1273200 * QM / (N * D)
540 REM STEP 3                      (calculate steam correction factor Fs)
550 FS = 1 + 0.0074 * W
560 REM STEP 4                      (calculate dp at normal flow indication)
570 DPN = DP * (X / 10)^2
580 REM STEP 5                      (calculate the estimated ß)
590 B = (QM^2 / (4.6 * 10^-8 * D^4 * DPN * R + QM^2))^0.25
600 REM STEP 6                      (calculate epsilon)
610 E = 1
620 IF FLUID$ = "L" THEN GOTO 670
630 K = (P - DPN) / P
640 K1 = K^(2 / Y)
650 K2 = K^((Y - 1) / Y)
660 E = ((Y * K1 / (Y - 1)) * ((1 - B^4) / (1 - B^4 * K1)) * ((1 - K2) / (1 - K)))^0.5
670 REM STEP 7                      (calculate discharge coefficient)
680 C = 0.9965 - 0.00653 * B^0.5  * (1000000 / RED)^.5
690 B1 = (2847.05 * QM / (D^2 * E * FS * C * (1 - B^4)^-0.5 * (DPN * R)^0.5))^0.5
700 REM  check if calculated ß agrees with previous ß within 0.01%
710 IF ABS ((B - B1) / B1) > 0.0001 THEN B = B1 : GOTO 600
720 REM STEP 9                      (calculate d nozzle at line temp)
730 DO = B1 * D
740 REM STEP 10                     (calculate d nozzle at ambient temp)
750 DOM = DO / (1 + AO * (T - TAMB))
760 REM  the following lines will print the output and restart the program
770 PRINT "Orifice diameter nozzle at ambient [mm]:";DOM
780 PRINT "Beta ratio                              :";B1
790 PRINT "Reynolds Number                         :";RED
800 INPUT "A new calculation Y/N                   :",A$
810 IF A$ = "Y" THEN GOTO 10
820 END
```

DEP 32.32.11.53 - Gen., sheet 2, 03/86

Flow factor calculation form for square edge orifices with flange tapping - DEP 32.32.11.60-Gen., sheet 1 03/86

FLOW FACTOR CALCULATION FORM FOR SQUARE EDGE ORIFICES WITH FLANGE TAPPINGS

Plant: _____

Service: _____ Tag No.: _____

DATA TO BE SUPPLIED BY OPERATIONS

Approx. norm. quantity q_m	_____ kg/s	Density ρ under operating cond.	_____ kg/m^3
Viscosity η under operating cond.	_____ m Pa • s	Operating pressure p	_____ bar
Operating temp. T	_____ °C	Water content in wet steam	_____ % wt
Orifice diameter d_m at T_0	_____ mm	Linear expansion coeff. α_{pipe}	_____ /°C
Internal pipe dia. D_m at T_0	_____ mm	Linear expansion coeff. α_{plate}	_____ /°C
Transmitter range DP	_____ bar	Ambient temp. T_0	_____ °C
Indication X of q_m on scale (0-10)	_____	Limitations:	$0.2 \leq \beta \leq 0.75$
Bleed hole size y	_____ mm		$1260\,\beta^2 D \leq Re_D \leq 10^8$
Ratio of specific heats $\kappa = C_p/C_v$	_____		

1. $d = d_m \left[1 + 0.55 \left(y / d_m \right)^2 \right] \left[1 + \alpha_{plate} \left(T - T_0 \right) \right]$ $\quad d =$ _____ mm

2. $D = D_m \left[1 + \alpha_{pipe} \left(T - T_0 \right) \right]$ $\quad D =$ _____ mm

3. $\beta = d/D$ $\quad \beta =$ _____

4. $F_s = 1 + 0.0074\, W_t$ $\quad F_s =$ _____

   For gas and liquid $F_s = 1$

5. $\epsilon = 1 - \left[0.41 + 0.35\,\beta^4 \right] \cdot \left[(DP) / p \right] \cdot \left[X / 10 \right]^2 \cdot \kappa^{-1}$ $\quad \epsilon =$ _____

   N.B.: if the fluid is a liquid $\epsilon = 1$

6. $q_m = 2.107 \cdot 10^{-5} \dfrac{1}{\sqrt{1-\beta^4}}\ \epsilon\, X\, d^2 \sqrt{DP\, \rho}$ $\quad$ estimated $q_m =$ _____ kg/s

7. $Re_D = \dfrac{1.2732 \cdot 10^6\, q_m}{\eta\, D}$ $\quad Re_D =$ _____

8. $C = 0.5959 + 0.0312\,\beta^{2.1} - 0.184\,\beta^8 + 0.0029\,\beta^{2.5} \left[\dfrac{10^6}{(Re_D)} \right]^{0.75} +$

   $+ \left[\dfrac{2.286}{D} \right] \beta^4 \cdot (1-\beta^4)^{-1} - \left[\dfrac{0.85598}{D} \right] \beta^3$ $\quad C =$ _____

   Note: if $D < 58.615$ mm use 0.0390 as coefficient of $\beta^4 \cdot (1-\beta^4)^{-1}$

9. $q_m = 3.512407 \cdot 10^{-5}\, C \dfrac{1}{\sqrt{1-\beta^4}}\ \epsilon\, X\, d^2\, F_s \sqrt{DP\, \rho}$ $\quad$ calculated $q_m =$ _____ kg/s

   Repeat 7 through 9 until calculated q_m agrees with previously calculated q_m to within 0,01%

   $X =$ _____

   Flow factor $q_m / X =$ _____ kg/s

Calculated by: _____ Date: _____ Sign.: _____

DEP 32.32.11.60 - Gen., sheet 1, 03/86

Flow factor calculation for square edge orifices with flange tappings - DEP 32.32.11.60-Gen., sheet 2 03/86

Program listing in basic:

```
10  INPUT "Service Liquid (L), Gas (G) or Steam (S)         :",FLUID$
20  INPUT "Viscosity under operating conditions      [mPa.s]:",N
30  INPUT "Operating temperature                     [   °C]:",T
40  INPUT "Density under operating conditions        [kg/m3]:",R
50  INPUT "Operating pressure                        [  bar]:",P
60  INPUT "Internal pipe diameter at ambient         [   mm]:",DM
70  INPUT "Orifice diameter at ambient               [   mm]:",DOM
80  INPUT "Transmitter range                         [  bar]:",DP
90  INPUT "Indication of normal flow on scale  (0-10)       :",X
100 INPUT "Bleed hole size                           [   mm]:",DH
110 INPUT "Linear expansion coeff. pipe              [  /°C]:",AP
120 INPUT "Linear expansion coeff. orifice           [  /°C]:",AO
130 INPUT "Ambient temperature                       [   °C]:",TAMB
140 IF FLUID$ = "L" THEN W = 0 :GOTO 500
150 INPUT "Ratio of specific heats Cp/Cv                 :",Y
160 IF FLUID$ = "G" THEN W = 0 :GOTO 500
170 INPUT "Water content in wet steam                [    %]:",W
500 REM STEP 1                    (calculate d orifice at line conditions)
510 DO = DOM * (1 + 0.55 * (DH / DOM)^2) * (1 + AO * (T - TAMB))
520 REM STEP 2                    (calculate D under operating conditions)
530 D = DM * (1 + AP * (T - TAMB))
540 REM STEP 3                    (calculate ß ratio)
550 B = DO / D
560 REM STEP 4                    (calculate dp at normal flow indication)
570 DPN = DP * (X / 10)^2
580 REM STEP 5                    (calculate steam correction factor Fs)
590 FS = 1 + 0.0074 * W
600 REM STEP 6                    (calculate epsilon)
610 E = 1
620 IF FLUID$ = "G" OR FLUID$ = "S" THEN E = 1 - (0.41 + 0.35 * B^4) * (DPN / P) / Y
630 REM STEP 7
640 QM = 2.107 * 10^-4 * (1 - B^4)^-0.5 * E * DO^2 * (DPN * R)^0.5
650 REM STEP 8                    (calculate ReD)
660 RED = 1273200 * QM / (N * D)
670 REM STEP 9                    (calculate discharge coefficient)
680 C = 0.5959 + 0.0312 * B^2.1 - 0.184 * B^8 + 0.0029 * B^2.5 *
        * (1000000 / RED)^0.75 - 0.85598 * B^3 / D
690 IF D < 58.615 THEN C = C + 0.039 * B^4 / (1 - B^4) : GOTO 710
700 C = C + 2.286 * B^4 / (D * (1 - B^4))
710 REM STEP 10                   (calculate new QM)
720 QM1 = 3.512407 * 10^-4 * C * FS * (1 - B^4)^-0.5 * E * DO^2 * (DPN * R)^0.5
730 REM  check if calculated QM agrees with previous QM within 0.01%
740 IF ABS ((QM - QM1) / QM1) > 0.0001 THEN QM = QM1 : GOTO 650
750 REM  the following lines will print the output and restart the program
760 PRINT "Normal flow at scale          [kg/s]:";QM1
770 PRINT "Flow factor                   [kg/s]:";QM1 / X
780 PRINT "Beta ratio                          :";B
790 PRINT "Reynolds Number                     :";RED
800 INPUT "A new calculation Y/N               :",A$
810 IF A$ = "Y" THEN GOTO 10
820 END
```

DEP 32.32.11.60 - Gen., sheet 2, 03/86

Flow factor calculation form for square edge orifices with corner tappings - DEP 32.32.11.61-Gen., sheet 1 03/86

FLOW FACTOR CALCULATION FORM FOR SQUARE EDGE ORIFICES WITH CORNER TAPPINGS

Plant: _____

Service: _____ Tag No.: _____

DATA TO BE SUPPLIED BY OPERATIONS

Approx. norm. quantity q_m	_____ kg/s	Density ρ under operating cond.	_____ kg/m^3
Viscosity η under operating cond.	_____ m Pa • s	Operating pressure p	_____ bar
Operating temp. T	_____ °C	Water content in wet steam	_____ % wt
Orifice diameter d_m at T_0	_____ mm	Linear expansion coeff. α_{pipe}	_____ /°C
Internal pipe dia. D_m at T_0	_____ mm	Linear expansion coeff. α_{plate}	_____ /°C
Transmitter range DP	_____ bar	Ambient temp. T_0	_____ °C
Indication X of q_m on scale (0-10)	_____	Limitations:	$0.23 \leq \beta \leq 0.80$
Bleed hole size y	_____ mm		$5\,000 \leq Re_D \leq 10^8$ for $0.23 \leq \beta \leq 0.45$
Ratio of specific heats $\kappa = C_p/C_v$	_____		$10\,000 \leq Re_D \leq 10^8$ for $0.45 \leq \beta \leq 0.77$
			$20\,000 \leq Re_D \leq 10^8$ for $0.77 \leq \beta \leq 0.80$

1. $d = d_m \left[1 + 0.55 \left(y / d_m \right)^2 \right] \left[1 + \alpha_{plate} \left(T - T_0 \right) \right]$ — d = _____ mm

2. $D = D_m \left[1 + \alpha_{pipe} \left(T - T_0 \right) \right]$ — D = _____ mm

3. $\beta = d/D$ — β = _____

4. $F_s = 1 + 0.0074\, W_t$
   For gas and liquid $F_s = 1$ — F_s = _____

5. $\epsilon = 1 - \left[0.41 + 0.35\, \beta^4 \right] \cdot \left[(DP) / p \right] \cdot \left[X / 10 \right]^2 \cdot \kappa^{-1}$
   N.B.: if the fluid is a liquid $\epsilon = 1$ — ϵ = _____

6. $q_m = 2.107 \cdot 10^{-5} \dfrac{1}{\sqrt{1 - \beta^4}} \epsilon X d^2 \sqrt{DP\, \rho}$ — estimated q_m = _____ kg/s

7. $Re_D = \dfrac{1.2732 \cdot 10^6\, q_m}{\eta D}$ — Re_D = _____

8. $C = 0.5959 + 0.0312\, \beta^{2.1} - 0.184\, \beta^8 + 0.0029\, \beta^{2.5} \left[\dfrac{10^6}{(Re_D)} \right]^{0.75}$ — C = _____

9. $q_m = 3.512407 \cdot 10^{-5}\, C \dfrac{1}{\sqrt{1 - \beta^4}} \epsilon X d^2 F_s \sqrt{DP\, \rho}$ — calculated q_m = _____ kg/s

   Repeat 7 through 9 until calculated q_m agrees with previously calculated q_m to within 0.01%

10. If $Re_D \leq 10^6$ then $Z_{Re_D} = Z_0$,
    otherwise $Z_{Re_D} = (Z_0 - 1) \left[\log (Re_D)/6 \right]^2 + 1$ — Z_{Re_D} = _____

11. $q_m = q_m\, Z_{Re_D}$ — corrected q_m = _____ kg/s

X = _____

Flow factor q_m / X = _____ kg/s

Calculated by: _____ Date: _____ Sign.: _____

Flow factor calculation for square edge orifices with corner tappings - DEP 32.32.11.61-Gen., sheet 2 03/86

Program listing in basic:

```
10  INPUT "Service Liquid (L), Gas (G) or Steam (S)         :",FLUID$
20  INPUT "Viscosity under operating conditions      [mPa.s]:",N
30  INPUT "Operating temperature                     [   °C]:",T
40  INPUT "Density under operating conditions        [kg/m3]:",R
50  INPUT "Operating pressure                        [  bar]:",P
60  INPUT "Internal pipe diameter at ambient         [   mm]:",DM
70  INPUT "Orifice diameter at ambient               [   mm]:",DOM
80  INPUT "Transmitter range                         [  bar]:",DP
90  INPUT "Indication of normal flow on scale  (0-10)       :",X
100 INPUT "Bleed hole size                           [   mm]:",DH
110 INPUT "Linear expansion coeff. pipe              [  /°C]:",AP
120 INPUT "Linear expansion coeff. orifice           [  /°C]:",AO
130 INPUT "Ambient temperature                       [   °C]:",TAMB
140 IF FLUID$ = "L" THEN W = 0 :GOTO 500
150 INPUT "Ratio of specific heats Cp/Cv                 :",Y
160 IF FLUID$ = "G" THEN W = 0 :GOTO 500
170 INPUT "Water content in wet steam                [    %]:",W
500 REM STEP 1                    (calculate d orifice at line conditions)
510 DO = DOM * (1 + 0.55 * (DH / DOM)^2) * (1 + AO * (T - TAMB))
520 REM STEP 2                    (calculate D under operating conditions)
530 D = DM * (1 + AP * (T - TAMB))
540 REM STEP 3                    (calculate ß ratio)
550 B = DO / D
560 REM STEP 4                    (calculate dp at normal flow indication)
570 DPN = DP * (X / 10)^2
580 REM STEP 5                    (calculate steam correction factor Fs)
590 FS = 1 + 0.0074 * W
600 REM STEP 6                    (calculate epsilon)
610 E = 1
620 IF FLUID$ = "G" OR FLUID$ = "S" THEN E = 1 - (0.41 + 0.35 * B^4) * (DPN / P) / Y
630 REM STEP 7
640 QM = 2.107 * 10^-4 * (1 - B^4)^-0.5 * E * DO^2 * (DPN * R)^0.5
650 REM STEP 8                    (calculate ReD)
660 RED = 1273200 * QM / (N * D)
670 REM STEP 9                    (calculate discharge coefficient)
680 C= 0.5959 + 0.0312 * B^2.1 - 0.184 * B^8 + 0.0029 * B^2.5 *
        * (1000000 / RED)^0.75
690 REM STEP 10                   (calculate new QM)
700 QM1 = 3.512407 * 10^-4 * C * FS * (1 - B^4)^-0.5 * E * DO^2 * (DPN * R)^0.5
710 REM  check if calculated QM agrees with previous QM within 0.01%
720 IF ABS ((QM - QM1) / QM1) > 0.0001 THEN QM = QM1 : GOTO 650
730 REM STEP 11
740 PRINT "Beta                          :";B
750 INPUT "Enter the roughness k         :";ROUGH
760 PRINT "k / D * 10000 =  ";ROUGH / D * 10^4
770 INPUT "Roughness correction factor Zo :",Z0
780 IF RED>= 1000000 THEN ZRED = Z0 ELSE ZRED = (Z0 - 1) * ((LOG(RED) / LOG(10)) / 6)^2 + 1
790 QM1 = QM1 * ZRED
800 REM  the following lines will print the output and restart the program
810 PRINT "Normal flow at scale          [kg/s]:";QM1
820 PRINT "Flow factor                   [kg/s]:";QM1 / X
830 PRINT "Beta ratio                          :";B
840 PRINT "Reynolds Number                     :";RED
850 INPUT "A new calculation Y/N               :",A$
860 IF A$ = "Y" THEN GOTO 10
870 END
```

DEP 32.32.11.61 - Gen., sheet 2, 03/86

Flow factor calculation form for square edge orifices with radius tappings - DEP 32.32.11.62-Gen., sheet 1 03/86

FLOW FACTOR CALCULATION FORM FOR SQUARE EDGE ORIFICES WITH RADIUS TAPPINGS

Plant: _____

Service: _____ Tag No.: _____

DATA TO BE SUPPLIED BY OPERATIONS

Approx. norm. quantity q_m	_____ kg/s	Density ρ under operating cond.	_____ kg/m^3
Viscosity η under operating cond.	_____ m Pa • s	Operating pressure p	_____ bar
Operating temp. T	_____ °C	Water content in wet steam	_____ % wt

Orifice diameter d_m at T_0	_____ mm	Linear expansion coeff. α_{pipe}	_____ /°C
Internal pipe dia. D_m at T_0	_____ mm	Linear expansion coeff. α_{plate}	_____ /°C
Transmitter range DP	_____ bar	Ambient temp. T_0	_____ °C
Indication X of q_m on scale (0-10)	_____	Limitations:	$0.2 \leq \beta \leq 0.75$
Bleed hole size y	_____ mm		$1260\ \beta^2 D \leq Re_D \leq 10^8$
Ratio of specific heats $\kappa = C_p/C_v$	_____		

1. $d = d_m \left[1 + 0.55 \, (y / d_m)^2 \right] \left[1 + \alpha_{plate} \, (T - T_0) \right]$ — d = _____ mm

2. $D = D_m \left[1 + \alpha_{pipe} \, (T - T_0) \right]$ — D = _____ mm

3. $\beta = d/D$ — β = _____

4. $F_s = 1 + 0.0074 \, W_t$
   For gas and liquid $F_s = 1$ — F_s = _____

5. $\epsilon = 1 - \left[0.41 + 0.35 \beta^4 \right] \cdot \left[(DP) / p \right] \cdot \left[X / 10 \right]^{2} \cdot \kappa^{-1}$
   N.B.: if the fluid is a liquid $\epsilon = 1$ — ϵ = _____

6. $q_m = 2.107 \cdot 10^{-5} \dfrac{1}{\sqrt{1 - \beta^4}} \, \epsilon \, X \, d^2 \sqrt{DP \, \rho}$ — estimated q_m = _____ kg/s

7. $Re_D = \dfrac{1.2732 \cdot 10^6 \, q_m}{\eta \, D}$ — Re_D = _____

8. $C = 0.5959 + 0.0312 \, \beta^{2.1} - 0.184 \, \beta^8 + 0.0029 \, \beta^{2.5} \left[\dfrac{10^6}{(Re_D)} \right]^{0.75} + 0.039 \, \beta^4 \, (1 - \beta^4)^{-1} - 0.015839 \, \beta^3$ — C = _____

9. $q_m = 3.512407 \cdot 10^{-5} \, C \dfrac{1}{\sqrt{1 - \beta^4}} \, \epsilon \, X \, d^2 \, F_s \sqrt{DP \, \rho}$ — calculated q_m = _____ kg/s

   Repeat 7 through 9 until calculated q_m agrees with previously calculated q_m to within 0.01%

   X = _____

   Flow factor q_m / X = _____ kg/s

Calculated by: _____ Date: _____ Sign.: _____

DEP 32.32.11.62 - Gen., sheet 1, 03/86

Flow factor calculation for square edge orifices with radius tappings - DEP 32.32.11.62-Gen., sheet 2 03/86

Program listing in basic:

```
10  INPUT "Service Liquid (L), Gas (G) or Steam (S)        :",FLUID$
20  INPUT "Viscosity under operating conditions      [mPa.s]:",N
30  INPUT "Operating temperature                     [   °C]:",T
40  INPUT "Density under operating conditions        [kg/m3]:",R
50  INPUT "Operating pressure                        [  bar]:",P
60  INPUT "Internal pipe diameter at ambient         [   mm]:",DM
70  INPUT "Orifice diameter at ambient               [   mm]:",DOM
80  INPUT "Transmitter range                         [  bar]:",DP
90  INPUT "Indication of normal flow on scale  (0-10)       :",X
100 INPUT "Bleed hole size                           [   mm]:",DH
110 INPUT "Linear expansion coeff. pipe              [  /°C]:",AP
120 INPUT "Linear expansion coeff. orifice           [  /°C]:",AO
130 INPUT "Ambient temperature                       [   °C]:",TAMB
140 IF FLUID$ = "L" THEN W = 0 :GOTO 500
150 INPUT "Ratio of specific heats Cp/Cv                 :",Y
160 IF FLUID$ = "G" THEN W = 0 :GOTO 500
170 INPUT "Water content in wet steam                [    %]:",W
500 REM STEP 1                    (calculate d orifice at line conditions)
510 DO = DOM * (1 + 0.55 * (DH / DOM)^2) * (1 + AO * (T - TAMB))
520 REM STEP 2                    (calculate D under operating conditions)
530 D = DM * (1 + AP * (T - TAMB))
540 REM STEP 3                    (calculate ß ratio)
550 B = DO / D
560 REM STEP 4                    (calculate dp at normal flow indication)
570 DPN = DP * (X / 10)^2
580 REM STEP 5                    (calculate steam correction factor Fs)
590 FS = 1 + 0.0074 * W
600 REM STEP 6                    (calculate epsilon)
610 E = 1
620 IF FLUID$ = "G" OR FLUID$ = "S" THEN E = 1 - (0.41 + 0.35 * B^4) * (DPN / P) / Y
630 REM STEP 7
640 QM = 2.107 * 10^-4 * (1 - B^4)^-0.5 * E * DO^2 * (DPN * R)^0.5
650 REM STEP 8                    (calculate ReD)
660 RED = 1273200 * QM / (N * D)
670 REM STEP 9                    (calculate discharge coefficient)
680 C =0.5959 + 0.0312 * B^2.1 - 0.184 * B^8 + 0.0029 * B^2.5 *
        * (1000000 / RED)^0.75 + 0.039 * B^4 / (1 - B^4) - 0.015839 * B^3
690 REM STEP 10                   (calculate new QM)
700 QM1 = 3.512407 * 10^-4 * C * FS * (1 - B^4)^-0.5 * E * DO^2 * (DPN * R)^0.5
710 REM  check if calculated QM agrees with previous QM within 0.01%
720 IF ABS ((QM - QM1) / QM1) > 0.0001 THEN QM = QM1 : GOTO 650
730 REM  the following lines will print the output and restart the program
740 PRINT "Normal flow at scale          [kg/s]:";QM1
750 PRINT "Flow factor                   [kg/s]:";QM1 / X
760 PRINT "Beta ratio                         :";B
770 PRINT "Reynolds Number                    :";RED
780 INPUT "A new calculation Y/N              :",A$
790 IF A$ = "Y" THEN GOTO 10
800 END
```

DEP 32.32.11.62 - Gen., sheet 2, 03/86

Flow factor calc. form for quarter of circle orifices with flange tappings - DEP 32.32.11.63-Gen., sheet 1 03/86

FLOW FACTOR CALCULATION FORM FOR QUARTER OF CIRCLE ORIFICES WITH FLANGE TAPPINGS

Plant: _____

Service: _____ Tag No.: _____

DATA TO BE SUPPLIED BY OPERATIONS

Approx. norm. quantity q_m	_____ kg/s	Density ρ under operating cond.	_____ kg/m^3
Viscosity η under operating cond.	_____ m Pa • s	Operating pressure p	_____ bar
Operating temp. T	_____ °C	Water content in wet steam	_____ % wt

Orifice diameter d_m at T_0	_____ mm	Linear expansion coeff. α_{pipe}	_____ /°C
Internal pipe dia. D_m at T_0	_____ mm	Linear expansion coeff. α_{plate}	_____ /°C
Transmitter range DP	_____ bar	Ambient temp. T_0	_____ °C
Indication X of q_m on scale (0-10)	_____	Limitations:	$0.245 \leq \beta \leq 0.6$
Bleed hole size y	_____ mm		$1000\ \beta + 9.4 \cdot 10^6 (\beta - 0.24)^8 \leq Re_D \leq 10^5 \beta$
Ratio of specific heats $\kappa = C_p/C_v$	_____		

1. $d = d_m \left[1 + 0.55 \left(y/d_m\right)^2\right] \left[1 + \alpha_{plate} (T - T_0)\right]$ — d = _____ mm

2. $D = D_m \left[1 + \alpha_{pipe} (T - T_0)\right]$ — D = _____ mm

3. $\beta = d/D$ — β = _____

4. $F_s = 1 + 0.0074\ W_t$
   For gas and liquid $F_s = 1$ — F_s = _____

5. $\epsilon = 1 - \left[0.41 + 0.35\beta^4\right] \cdot \left[(DP)/p\right] \cdot \left[X/10\right]^2 \cdot \kappa^{-1}$
   N.B.: if the fluid is a liquid $\epsilon = 1$ — ϵ = _____

6. $C = 0.73823 + 0.3309\beta - 1.1615\beta^2 + 1.5084\beta^3$ — C = _____

7. $q_m = 3.512407 \cdot 10^{-5}\ C \dfrac{1}{\sqrt{1-\beta^4}}\ \epsilon\ X\ d^2\ F_s \sqrt{DP\ \rho}$ — calculated q_m = _____ kg/s

8. $Re_D = \dfrac{1.2732 \cdot 10^6\ q_m}{\eta\ D}$ — Re_D = _____

X = _____

Flow factor q_m / X = _____ kg/s

Calculated by: _____ Date: _____ Sign.: _____

Flow factor calculation for quarter of circle orifices with flange tappings - DEP 32.32.11.63-Gen., sheet 2 03/86

Program listing in basic:

```
10  INPUT "Service Liquid (L), Gas (G) or Steam (S)        :",FLUID$
20  INPUT "Viscosity under operating conditions      [mPa.s]:",N
30  INPUT "Operating temperature                     [   °C]:",T
40  INPUT "Density under operating conditions        [kg/m3]:",R
50  INPUT "Operating pressure                        [  bar]:",P
60  INPUT "Internal pipe diameter at ambient         [   mm]:",DM
70  INPUT "Orifice diameter at ambient               [   mm]:",DOM
80  INPUT "Transmitter range                         [  bar]:",DP
90  INPUT "Indication of normal flow on scale  (0-10)      :",X
100 INPUT "Bleed hole size                           [   mm]:",DH
110 INPUT "Linear expansion coeff. pipe              [  /°C]:",AP
120 INPUT "Linear expansion coeff. orifice           [  /°C]:",AO
130 INPUT "Ambient temperature                       [   °C]:",TAMB
140 IF FLUID$ = "L" THEN W = 0 :GOTO 500
150 INPUT "Ratio of specific heats Cp/Cv                 :",Y
160 IF FLUID$ = "G" THEN W = 0 :GOTO 500
170 INPUT "Water content in wet steam                [    %]:",W
500 REM STEP 1                    (calculate d orifice at line conditions)
510 DO = DOM * (1 + 0.55 * (DH / DOM)^2) * (1 + AO * (T - TAMB))
520 REM STEP 2                    (calculate D under operating conditions)
530 D = DM * (1 + AP * (T - TAMB))
540 REM STEP 3                    (calculate ß ratio)
550 B = DO / D
560 REM STEP 4                    (calculate dp at normal flow indication)
570 DPN = DP * (X / 10)^2
580 REM STEP 5                    (calculate steam correction factor Fs)
590 FS = 1 + 0.0074 * W
600 REM STEP 6                    (calculate epsilon)
610 E = 1
620 IF FLUID$ = "G" OR FLUID$ = "S" THEN E = 1 - (0.41 + 0.35 * B^4) * (DPN / P) / Y
630 REM STEP 7                    (calculate discharge coefficient)
640 C = 0.73823 + 0.3309 * B- 1.1615 * B^2 + 1.5084 * B^3
650 REM STEP 8                    (calculate QM)
660 QM1 = 3.512407 * 10^-4 * C * FS * (1 - B^4)^-0.5 * E * DO^2 * (DPN * R)^0.5
670 REM STEP 9                    (calculate ReD)
680 RED = 1273200 * QM1 / (N * D)
690 REM  the following lines will print the output and restart the program
700 PRINT "Normal flow at scale          [kg/s]:";QM1
710 PRINT "Flow factor                   [kg/s]:";QM1 / X
720 PRINT "Beta ratio                          :";B
730 PRINT "Reynolds Number                     :";RED
740 INPUT "A new calculation Y/N               :",A$
750 IF A$ = "Y" THEN GOTO 10
760 END
```

DEP 32.32.11.63 - Gen., sheet 2, 03/86

Flow factor calculation form for conical entrance orifices with corner tappings- DEP 32.32.11.64-Gen., sheet 1 03/86

FLOW FACTOR CALCULATION FORM FOR CONICAL ENTRANCE ORIFICES WITH CORNER TAPPINGS

Plant: _____

Service: _____ Tag No.: _____

DATA TO BE SUPPLIED BY OPERATIONS

Approx. norm. quantity q_m	_____ kg/s	Density ρ under operating cond.	_____ kg/m^3
Viscosity η under operating cond.	_____ m Pa • s	Operating pressure p	_____ bar
Operating temp. T	_____ °C	Water content in wet steam	_____ % wt

Orifice diameter d_m at T_0	_____ mm	Linear expansion coeff. α_{pipe}	_____ /°C
Internal pipe dia. D_m at T_0	_____ mm	Linear expansion coeff. α_{plate}	_____ /°C
Transmitter range DP	_____ bar	Ambient temp. T_0	_____ °C
Indication X of q_m on scale (0-10)	_____	Limitations:	$0.1 \leq \beta \leq 0.316$
Bleed hole size y	_____ mm		$250\ \beta \leq Re_D \leq 2 \cdot 10^5\ \beta$
Ratio of specific heats $\kappa = C_p/C_v$	_____		

1. $d = d_m \left[1 + 0.55 \left(y / d_m \right)^2 \right] \left[1 + \alpha_{plate} \left(T - T_0 \right) \right]$ — d = _____ mm

2. $D = D_m \left[1 + \alpha_{pipe} \left(T - T_0 \right) \right]$ — D = _____ mm

3. $\beta = d/D$ — β = _____

4. $F_s = 1 + 0.0074\ W_t$
   For gas and liquid $F_s = 1$ — F_s = _____

5. $\epsilon = 1 - \left[0.41 + 0.35\ \beta^4 \right] \cdot \left[(DP) / p \right] \cdot \left[X / 10 \right]^2 \cdot \kappa^{-1}$
   N.B.: if the fluid is a liquid $\epsilon = 1$ — ϵ = _____

6. $C = 0.734$ for $250\ \beta \leq Re_D \leq 5000\ \beta$
   $C = 0.730$ for $5000\ \beta < Re_D \leq 2 \cdot 10^5\ \beta$
   Note: assume $Re_D < 5000\ \beta$ — C = _____

7. $q_m = 3.512407 \cdot 10^{-5}\ C \dfrac{1}{\sqrt{1-\beta^4}}\ \epsilon\ X\ d^2\ F_s \sqrt{DP\ \rho}$ — calculated q_m = _____ kg/s

8. $Re_D = \dfrac{1.2732 \cdot 10^6\ q_m}{\eta\ D}$ — Re_D = _____

9. Has the correct C factor been used,
   if not recalculate q_m with the correct factor

10. If $Re_D \leq 10^6$ then $Z_{Re_D} = Z_0$,
    otherwise $Z_{Re_D} = (Z_0 - 1) \left[\log (Re_D)/6 \right]^2 + 1$ — Z_{Re_D} = _____

11. $q_m = q_m\ Z_{Re_D}$ — corrected q_m = _____ kg/s

    X = _____

    Flow factor q_m / X = _____ kg/s

Calculated by: _____ Date: _____ Sign.: _____

DEP 32.32.11.64 - Gen., sheet 1. 03/86

Flow factor calculation for conical entrance orifices with corner tappings- DEP 32.32.11.64-Gen., sheet 2 03/86

Program listing in basic:

```
10  INPUT "Service Liquid (L), Gas (G) or Steam (S)          :",FLUID$
20  INPUT "Viscosity under operating conditions       [mPa.s]:",N
30  INPUT "Operating temperature                      [   °C]:",T
40  INPUT "Density under operating conditions         [kg/m3]:",R
50  INPUT "Operating pressure                         [  bar]:",P
60  INPUT "Internal pipe diameter at ambient          [   mm]:",DM
70  INPUT "Orifice diameter at ambient                [   mm]:",DOM
80  INPUT "Transmitter range                          [  bar]:",DP
90  INPUT "Indication of normal flow on scale  (0-10)        :",X
100 INPUT "Bleed hole size                            [   mm]:",DH
110 INPUT "Linear expansion coeff. pipe               [ /°C]:",AP
120 INPUT "Linear expansion coeff. orifice            [ /°C]:",AO
130 INPUT "Ambient temperature                        [   °C]:",TAMB
140 IF FLUID$ = "L" THEN W = 0 :GOTO 500
150 INPUT "Ratio of specific heats Cp/Cv                   :",Y
160 IF FLUID$ = "G" THEN W = 0 :GOTO 500
170 INPUT "Water content in wet steam                 [    %]:",W
500 REM STEP 1                      (calculate d orifice at line conditions)
510 DO = DOM * (1 + 0.55 * (DH / DOM)^2) * (1 + AO * (T - TAMB))
520 REM STEP 2                      (calculate D under operating conditions)
530 D = DM * (1 + AP * (T - TAMB))
540 REM STEP 3                      (calculate ß ratio)
550 B = DO / D
560 REM STEP 4                      (calculate dp at normal flow indication)
570 DPN = DP * (X / 10)^2
580 REM STEP 5                      (calculate steam correction factor Fs)
590 FS = 1 + 0.0074 * W
600 REM STEP 6                      (calculate epsilon)
610 E = 1
620 IF FLUID$ = "G" OR FLUID$ = "S" THEN E = 1 - (0.41 + 0.35 * B^4) * (DPN / P) / Y
630 REM STEP 7                      (select discharge coefficient)
640 C = 0.730
650 REM STEP 8                      (calculate QM)
660 QM1 = 3.512407 * 10^-4 * C * FS * (1 - B^4)^-0.5 * E * DO^2 * (DPN * R)^0.5
670 REM STEP 9                      (calculate ReD)
680 RED = 1273200 * QM1 / (N * D)
690 IF RED * B > 5000 THEN GOTO 720
700 QM1 = QM1 * 0.734 / 0.730
710 RED = 1273200 * QM1 / (N * D)
720 REM STEP 10                     (enter roughness correction factor)
730 PRINT "Beta                          :";B
740 INPUT "Enter the roughness k         :";ROUGH
760 PRINT "k / D * 10000 =  ";ROUGH / D * 10^4
770 INPUT "Roughness correction factor Zo :",Z0
780 IF RED>= 1000000 THEN ZRED = Z0 ELSE ZRED = (Z0 - 1) * ((LOG(RED) / LOG(10)) / 6)^2 + 1
790 QM1 = QM1 * ZRED  / LOG(10)
800 REM  the following lines will print the output and restart the program
810 PRINT "Normal flow at scale          [kg/s]:";QM1
820 PRINT "Flow factor                   [kg/s]:";QM1 / X
830 PRINT "Beta ratio                          :";B
840 PRINT "Reynolds Number                     :";RED
850 INPUT "A new calculation Y/N               :",A$
860 IF A$ = "Y" THEN GOTO 10
870 END
```

DEP 32.32.11.64 - Gen., sheet 2, 03/86

Flow factor calculation form for Venturi tubes (A,B and C) - DEP 32.32.11.65-Gen.,sheet 1 03/86

FLOW FACTOR CALCULATION FORM FOR VENTURI TUBES (A, B and C)

Plant: _____

Service: _____ Tag No.: _____

DATA TO BE SUPPLIED BY OPERATIONS

Approx. norm. quantity q_m	_____ kg/s	Density ρ under operating cond.	_____ kg/m^3
Viscosity η under operating cond.	_____ m Pa • s	Operating pressure p	_____ bar
Operating temp. T	_____ °C	Water content in wet steam	_____ % wt

Venturi throat diameter d_m at T_0	_____ mm	Linear expansion coeff. $\alpha_{Venturi}$	_____ /°C
Venturi inlet dia. D_m at T_0	_____ mm	Ambient temp. T_0	_____ °C
Transmitter range DP	_____ bar	Limitations: Type A: $0.3 \leq \beta \leq 0.75$ and $2 \cdot 10^5 \leq Re_D \leq 2 \cdot 10^6$	
Indication X of q_m on scale (0-10)	_____	Type B: $0.4 \leq \beta \leq 0.75$ and $2 \cdot 10^5 \leq Re_D \leq 10^6$	
Ratio of specific heats $\kappa = C_p/C_v$	_____	Type C: $0.4 \leq \beta \leq 0.70$ and $2 \cdot 10^5 \leq Re_D \leq 2 \cdot 10^6$	

1. $d = d_m \left[1 + \alpha_{Venturi} \ (T - T_0) \right]$ — d = _____ mm

2. $D = D_m \left[1 + \alpha_{Venturi} \ (T - T_0) \right]$ — D = _____ mm

3. $\beta = d/D$ — β = _____

4. $F_s = 1 + 0.0074 \, W_t$ — F_s = _____

   For gas and liquid $F_s = 1$

5. $$\epsilon = \left[\left(\frac{\kappa \, (K)^{\frac{2}{\kappa}}}{\kappa - 1} \right) \left(\frac{1 - \beta^4}{1 - \beta^4 \, (K)^{\frac{2}{\kappa}}} \right) \left(\frac{1 - (K)^{\frac{\kappa - 1}{\kappa}}}{1 - K} \right) \right]^{0.5}$$

   ϵ = _____

   Where: $K = \left[p - (DP) \, (X/10)^2 \right] / p$

   N.B.: if the fluid is a liquid $\epsilon = 1$

6. Type A: In case of rough cast convergent — C = 0.984
   Type B: In case of machined convergent — C = 0.995
   Type C: In case of rough welded sheet iron convergent — C = 0.985

   C = _____

7. $$q_m = 3.512407 \cdot 10^{-5} \, C \, \frac{1}{\sqrt{1 - \beta^4}} \, \epsilon \, X \, d^2 \, F_s \sqrt{DP \, \rho}$$

   calculated q_m = _____ kg/s

8. $$Re_D = \frac{1.2732 \cdot 10^6 \, q_m}{\eta \, D}$$

   Re_D = _____

   X = _____

   Flow factor q_m / X = _____ kg/s

Calculated by: _____ Date: _____ Sign.: _____

Flow factor calculation for Venturi tubes (A,B and C)- DEP 32.32.11.65-Gen., sheet 2 03/86

Program listing in basic:

```
10  INPUT "Service Liquid (L), Gas (G) or Steam (S)          :",FLUID$
20  INPUT "Type of venturi A, B or C                         :",T$
30  IF T$<>"A" AND T$<>"B" AND T$<>"C" THEN GOTO 20
40  INPUT "Viscosity under operating conditions      [mPa.s]:",N
50  INPUT "Operating temperature                     [   °C]:",T
60  INPUT "Density under operating conditions        [kg/m3]:",R
70  INPUT "Operating pressure                        [  bar]:",P
80  INPUT "Internal pipe diameter at ambient         [   mm]:",DM
90  INPUT "Internal throat diameter at ambient       [   mm]:",DOM
100 INPUT "Transmitter range                         [  bar]:",DP
110 INPUT "Indication of normal flow on scale  (0-10)        :",X
120 INPUT "Linear expansion coeff. Venturi           [  /°C]:",AP
130 INPUT "Ambient temperature                       [   °C]:",TAMB
140 IF FLUID$ = "L" THEN W = 0 :GOTO 500
150 INPUT "Ratio of specific heats Cp/Cv                     :",Y
160 IF FLUID$ = "G" THEN W = 0 :GOTO 500
170 INPUT "Water content in wet steam                [    %]:",W
500 REM STEP 1                    (calculate ß ratio)
510 B = DOM / DM
520 REM STEP 2                    (calculate steam correction factor Fs)
530 FS = 1 + 0.0074 * W
540 REM STEP 3                    (calculate dp at normal flow indication)
550 DPN = DP * (X / 10)^2
560 REM STEP 4                    (calculate epsilon)
570 E = 1
580 IF FLUID$ = "L" THEN GOTO 630
590 K = (P - DPN) / P
600 K1 = K^(2 / Y)
610 K2 = K^((Y - 1) / Y)
620 E = ((Y * K1 / (Y - 1)) * ((1 - B^4) / (1 - B^4 * K1)) * ((1 - K2) / (1 - K)))^0.5
630 REM STEP 5                    (calculate QM)
640 IF T$ = "A" THEN C = 0.984
650 IF T$ = "B" THEN C = 0.995
660 IF T$ = "C" THEN C = 0.985
670 QM1 = 3.512407 * 10^-4 * C * FS * (1 - B^4)^-0.5 * E *
        * (DOM * (1 + AP * (T - TAMB)))^2 * (DPN * R)^0.5
680 REM STEP 6                    (calculate ReD)
690 RED = 1273200 * QM1 / (N * DM * (1 + AP * (T - TAMB)))
700 REM  the following lines will print the output and restart the program
710 PRINT "Normal flow at scale          [kg/s]:";QM1
720 PRINT "Flow factor                   [kg/s]:";QM1 / X
730 PRINT "Beta ratio                          :";B
740 PRINT "Reynolds Number                     :";RED
750 INPUT "A new calculation Y/N               :",A$
760 IF A$ = "Y" THEN GOTO 10
770 END
```

DEP 32.32.11.65 - Gen., sheet 2. 03/86

Flow factor calculation. form for rectangular venturi tubes - DEP 32.32.11.66-Gen., sheet 1 03/86

FLOW FACTOR CALCULATION FORM FOR RECTANGULAR VENTURI TUBES

Plant: _____

Service: _____ Tag No.: _____

DATA TO BE SUPPLIED BY OPERATIONS

Approx. norm. quantity q_m	_____ kg/s	Density ρ under operating cond.	_____ kg/m^3
Viscosity η under operating cond.	_____ m Pa • s	Operating pressure p	_____ bar
Operating temp. T	_____ °C	Water content in wet steam	_____ % wt

Throat with w	_____ mm	Linear expansion coeff. $\alpha_{Venturi}$	_____ /°C
Throat height h	_____ mm	Ambient temp. T_0	_____ °C
Duct width W at T_0	_____ mm		
Duct height H at T_0	_____ mm	Limitations: $0.44 \leq \sqrt{\frac{wh}{WH}} \leq 0.74$	
Transmitter range DP	_____ bar	$2 \cdot 10^5 \leq Re_D \leq 2 \cdot 10^7$	
Indication X of q_m on scale (0-10)	_____		
Ratio of specific heats $\kappa = C_p/C_v$	_____		

1. $\beta = (wh/WH)^{0.5}$ β = _____

2. $F_s = 1 + 0.0074\ W_t$ F_s = _____

   For gas and liquid $F_s = 1$

3. $$\epsilon = \left[\left(\frac{\kappa\,(K)^{\frac{2}{\kappa}}}{\kappa - 1}\right)\left(\frac{1-\beta^4}{1-\beta^4\,(K)^{\frac{2}{\kappa}}}\right)\left(\frac{1-(K)^{\frac{\kappa-1}{\kappa}}}{1-K}\right)\right]^{0.5}$$ ϵ = _____

   Where: $K = [p - (DP)\,(X/10)^2\,] / p$

   N.B.: if the fluid is a liquid $\epsilon = 1$

4. $C = 0.975$ C = 0.975

5. $$q_m = 3.512407 \cdot 10^{-5}\ C\ \frac{1}{\sqrt{1-\beta^4}}\ \epsilon\ X \cdot$$

   $$\cdot \left[1.1284 \cdot \sqrt{wh} \cdot [\,1 + \alpha_{venturi}\ (T - T_0)\,]\right]^2 \cdot F_s \sqrt{DP\,\rho}$$ calculated q_m = _____ kg/s

6. $$Re_D = \frac{1.2732 \cdot 10^6\ q_m}{\eta \cdot 1.1284 \cdot \sqrt{WH} \cdot [\,1 + \alpha_{venturi}\,(T - T_0)\,]}$$ Re_D = _____

   X = _____

   Flow factor q_m / X = _____ kg/s

Calculated by: _____ Date: _____ Sign.: _____

Flow factor calculation for rectangular venturi tubes - DEP 32.32.11.66-Gen., sheet 2 03/86

Program listing in basic:

```
10  INPUT "Service Liquid (L), Gas (G) or Steam (S)         :",FLUID$
20  INPUT "Viscosity under operating conditions      [mPa.s]:",N
30  INPUT "Operating temperature                     [   °C]:",T
40  INPUT "Density under operating conditions        [kg/m3]:",R
50  INPUT "Operating pressure                        [  bar]:",P
60  INPUT "Throat width at ambient                   [   mm]:",TW
70  INPUT "Throat height at ambient                  [   mm]:",TH
80  INPUT "Internal pipe width at ambient            [   mm]:",PW
90  INPUT "Internal pipe height at ambient           [   mm]:",PH
100 INPUT "Transmitter range                         [  bar]:",DP
110 INPUT "Indication of normal flow on scale  (0-10)        :",X
120 INPUT "Linear expansion coeff. Venturi           [  /°C]:",AP
130 INPUT "Ambient temperature                       [   °C]:",TAMB
140 IF FLUID$ = "L" THEN W = 0 :GOTO 500
150 INPUT "Ratio of specific heats Cp/Cv                  :",Y
160 IF FLUID$ = "G" THEN W = 0 :GOTO 500
170 INPUT "Water content in wet steam                [    %]:",W
500 REM STEP 1                    (calculate ß ratio)
510 B = (TH * TW / (PH * PW))^0.5
520 REM STEP 2                    (calculate steam correction factor Fs)
530 FS = 1 + 0.0074 * W
540 REM STEP 3                    (calculate dp at normal flow indication)
550 DPN = DP * (X / 10)^2
560 REM STEP 4                    (calculate epsilon)
570 E = 1
580 IF FLUID$ = "L" THEN GOTO 640
590 K = (P - DPN) / P
600 K1 = K^(2 / Y)
610 K2 = K^((Y - 1) / Y)
620 E = ((Y * K1 / (Y - 1)) * ((1 - B^4) / (1 - B^4 * K1)) * ((1 - K2) / (1 - K)))^0.5
630 REM STEP 5                    (calulate QM)
640 C = 0.975
650 QM1 = 3.512407 * 10^-4 * C * FS * (1 - B^4)^-0.5 * E *
        * (1.1284 * (TH * TW)^0.5 * (1 + AP * (T - TAMB)))^2 * (DPN * R)^0.5
660 REM STEP 6                    (calculate ReD)
670 RED = 1273200 * QM1 / (N * (1.1284 * (PH * PW)^0.5 * (1 + AP * (T - TAMB))))
680 REM  the following lines will print the output and restart the program
690 PRINT "Normal flow at scale          [kg/s]:";QM1
700 PRINT "Flow factor                   [kg/s]:";QM1 / X
710 PRINT "Beta ratio                          :";B
720 PRINT "Reynolds Number                     :";RED
730 INPUT "A new calculation Y/N               :",A$
740 IF A$ = "Y" THEN GOTO 10
750 END
```

DEP 32.32.11.66 - Gen., sheet 2, 03/86

Flow factor calculation form for ISA 1932 nozzles - DEP 32.32.11.67-Gen., sheet 1 03/86

FLOW FACTOR CALCULATION FORM FOR ISA 1932 NOZZLES

Plant: _____

Service: _____ Tag No.: _____

DATA TO BE SUPPLIED BY OPERATIONS

Approx. norm. quantity q_m	_____ kg/s	Density ρ under operating cond.	_____ kg/m^3
Viscosity η under operating cond.	_____ m Pa • s	Operating pressure p	_____ bar
Operating temp. T	_____ °C	Water content in wet steam	_____ % wt

Throat diameter d_m at T_0	_____ mm	Linear expansion coeff. α_{pipe}	_____ /°C
Internal pipe dia. D_m at T_0	_____ mm	Linear expansion coeff. α_{nozzle}	_____ /°C
Transmitter range DP	_____ bar	Ambient temp. T_0	_____ °C
Indication X of q_m on scale (0-10)	_____	Limitations:	$0.3 \leq \beta \leq 0.80$
Ratio of specific heats $\kappa = C_p/C_v$	_____		$70\,000 \leq Re_D \leq 10^7$ for $0.30 \leq \beta \leq 0.44$
			$20\,000 \leq Re_D \leq 10^7$ for $0.44 < \beta \leq 0.80$

1. $d = d_m \left[(1 + \alpha_{nozzle} (T - T_0) \right]$ — d = _____ mm

2. $D = D_m \left[1 + \alpha_{pipe} (T - T_0) \right]$ — D = _____ mm

3. $\beta = d/D$ — β = _____

4. $F_s = 1 + 0.0074\, W_t$ — F_s = _____

   For gas and liquid $F_s = 1$

5. $$\epsilon = \left[\left(\frac{\kappa (K)^{\frac{2}{\kappa}}}{\kappa - 1} \right) \left(\frac{1 - \beta^4}{1 - \beta^4 (K)^{\frac{2}{\kappa}}} \right) \left(\frac{1 - (K)^{\frac{\kappa - 1}{\kappa}}}{1 - K} \right) \right]^{0.5}$$ — ϵ = _____

   Where: $K = \left[p - (DP) (X/10)^2 \right] / p$

   N.B.: if the fluid is a liquid $\epsilon = 1$

6. $$q_m = 2.107 \cdot 10^{-5} \frac{1}{\sqrt{1 - \beta^4}} \epsilon \, X \, d^2 \sqrt{DP \, \rho}$$ — estimated q_m = _____ kg/s

7. $$Re_D = \frac{1.2732 \cdot 10^6 \, q_m}{\eta \, D}$$ — Re_D = _____

8. $$C = 0.99 - 0.2262 \, \beta^{4.1} + \left[0.000215 - 0.001125 \, \beta + 0.00249 \, \beta^{4.7} \right] \cdot \left[\frac{10^6}{Re_D} \right]^{1.15}$$ — C = _____

9. $$q_m = 3.512407 \cdot 10^{-5} \, C \frac{1}{\sqrt{1 - \beta^4}} \epsilon \, X \, d^2 \, F_s \sqrt{DP \, \rho}$$ — calculated q_m = _____ kg/s

   Repeat 7 through 9 until calculated q_m agrees with previously calculated β to within 0.01%

X = _____

Flow factor q_m / X = _____ kg/s

Calculated by: _____ Date: _____ Sign.: _____

Flow factor calculation for ISA 1932 nozzles - DEP 32.32.11.67-Gen., sheet 2 03/86

Program listing in basic:

```
 10  INPUT "Service Liquid (L), Gas (G) or Steam (S)         :",FLUID$
 30  INPUT "Viscosity under operating conditions      [mPa.s]:",N
 40  INPUT "Operating temperature                     [   °C]:",T
 50  INPUT "Density under operating conditions        [kg/m3]:",R
 60  INPUT "Operating pressure                        [  bar]:",P
 70  INPUT "Pipe diameter at ambient                  [   mm]:",DM
 80  INPUT "Nozzle throat diameter at ambient         [   mm]:",DOM
 90  INPUT "Transmitter range                         [  bar]:",DP
100  INPUT "Indication of normal flow on scale  (0-10)       :",X
110  INPUT "Linear expansion coeff. of the pipe       [  /°C]:",AP
120  INPUT "Linear expansion coeff. of nozzle         [  /°C]:",AO
130  INPUT "Ambient temperature                       [   °C]:",TAMB
140  IF FLUID$ = "L" THEN W = 0 :GOTO 500
150  INPUT "Ratio of specific heats Cp/Cv                    :",Y
160  IF FLUID$ = "G" THEN W = 0 :GOTO 500
170  INPUT "Water content in wet steam                [    %]:",W
500  REM STEP 1                    (calculate d at line conditions)
510  DO = DOM * (1 + AO * (T - TAMB))
520  REM STEP 2                    (calculate D at line conditions)
530  D = DM * (1 + AP * (T - TAMB))
540  REM STEP 3                    (calculate ß ratio)
550  B = DO / D
560  REM STEP 4                    (calculate steam correction factor Fs)
570  FS = 1 + 0.0074 * W
580  REM STEP 5                    (calculate dp at normal flow indication)
590  DPN = DP * (X / 10)^2
600  REM STEP 6                    (calculate epsilon)
610  E = 1
620  IF FLUID$ = "L" THEN GOTO 670
630  K = (P - DPN) / P
640  K1 = K^(2 / Y)
650  K2 = K^((Y - 1) / Y)
660  E = ((Y * K1 / (Y - 1)) * ((1 - B^4) / (1 - B^4 * K1)) * ((1 - K2) / (1 - K)))^0.5
670  REM STEP 7
680  QM = 2.107 * 10^-4 * (1 - B^4)^-0.5 * E * DO^2 * (DPN * R)^0.5
690  REM STEP 8                    (calculate ReD)
700  RED = 1273200 * QM / (N * D)
710  REM STEP 9                    (calculate discharge coefficient)
720  C = 0.99 + 0.2262 * B^4.1+ (0.000215 - 0.001125 * B + 0.00249 * B^4.7) *
          * (1000000 / RED)^1.15
730  REM STEP 10                   (calculate new QM)
740  QM1 = 3.512407 * 10^-4 * C * FS * (1 - B^4)^-0.5 * E * DO^2 * (DPN * R)^0.5
750  REM  check if calculated QM agrees with previous QM within 0.01%
760  IF ABS ((QM - QM1) / QM1) > 0.0001 THEN QM = QM1 : GOTO 690
770  REM  the following lines will print the output and restart the program
780  PRINT "Normal flow at scale          [kg/s]:";QM1
790  PRINT "Flow factor                   [kg/s]:";QM1 / X
800  PRINT "Beta ratio                          :";B
810  PRINT "Reynolds Number                     :";RED
820  INPUT "A new calculation Y/N               :",A$
830  IF A$ = "Y" THEN GOTO 10
840  END
```

Flow factor calculation form for long radius nozzles - DEP 32.32.11.68-Gen., sheet 1 03/86

FLOW FACTOR CALCULATION FORM FOR LONG RADIUS NOZZLES

Plant: _____

Service: _____ Tag No.: _____

DATA TO BE SUPPLIED BY OPERATIONS

Approx. norm. quantity q_m	_____ kg/s	Density ρ under operating cond.	_____ kg/m^3
Viscosity η under operating cond.	_____ m Pa • s	Operating pressure p	_____ bar
Operating temp. T	_____ °C	Water content in wet steam	_____ % wt
Throat diameter d_m at T_0	_____ mm	Linear expansion coeff. α_{pipe}	_____ /°C
Internal pipe dia. D_m at T_0	_____ mm	Linear expansion coeff. α_{nozzle}	_____ /°C
Transmitter range DP	_____ bar	Ambient temp. T_0	_____ °C
Indication X of q_m on scale (0-10)	_____	Limitations:	$0.2 \leq \beta \leq 0.80$
Ratio of specific heats $\kappa = C_p/C_v$	_____		$10^4 \leq Re_D \leq 10^7$

1. $d = d_m \left[(1 + \alpha_{nozzle} (T - T_0) \right]$ — d = _____ mm

2. $D = D_m \left[1 + \alpha_{pipe} (T - T_0) \right]$ — D = _____ mm

3. $\beta = d/D$ — β = _____

4. $F_s = 1 + 0.0074\, W_t$ — F_s = _____

   For gas and liquid $F_s = 1$

5. $$\epsilon = \left[\left(\frac{\kappa (K)^{\frac{2}{\kappa}}}{\kappa - 1} \right) \left(\frac{1 - \beta^4}{1 - \beta^4 (K)^{\frac{2}{\kappa}}} \right) \left(\frac{1 - (K)^{\frac{\kappa - 1}{\kappa}}}{1 - K} \right) \right]^{0.5}$$ — ϵ = _____

   Where: $K = \left[p - (DP) (X/10)^2 \right] / p$

   N.B.: if the fluid is a liquid $\epsilon = 1$

6. $$q_m = 2.107 \cdot 10^{-5} \frac{1}{\sqrt{1 - \beta^4}} \epsilon \, X \, d^2 \sqrt{DP \, \rho}$$ — estimated q_m = _____ kg/s

7. $$Re_D = \frac{1.2732 \cdot 10^6 \, q_m}{\eta \, D}$$ — Re_D = _____

8. $$C = 0.9965 - 0.00653 \, \beta^{0.5} \left[\frac{10^6}{(Re_D)} \right]^{0.5}$$ — C = _____

9. $$q_m = 3.512407 \cdot 10^{-5} \, C \frac{1}{\sqrt{1 - \beta^4}} \epsilon \, X \, d^2 \, F_s \sqrt{DP \, \rho}$$ — calculated q_m = _____ kg/s

   Repeat 7 through 9 until calculated q_m agrees with previously calculated q_m to within 0.01%

X = _____

Flow factor is q_m / X = _____ kg/s

Calculated by: _____ Date: _____ Sign.: _____

DEP 32.32.11.68 - Gen., sheet 1, 03/86

Flow factor calculation for long radius nozzles - DEP 32.32.11.68-Gen., sheet 2 03/86

Program listing in basic:

```
10  INPUT "Service Liquid (L), Gas (G) or Steam (S)         :",FLUID$
30  INPUT "Viscosity under operating conditions      [mPa.s]:",N
40  INPUT "Operating temperature                     [   °C]:",T
50  INPUT "Density under operating conditions        [kg/m3]:",R
60  INPUT "Operating pressure                        [  bar]:",P
70  INPUT "Internal nozzle diameter at ambient       [   mm]:",DM
80  INPUT "Nozzle throat diameter at ambient         [   mm]:",DOM
90  INPUT "Transmitter range                         [  bar]:",DP
100 INPUT "Indication of normal flow on scale  (0-10)       :",X
110 INPUT "Linear expansion coeff. of the pipe       [  /°C]:",AP
120 INPUT "Linear expansion coeff. of nozzle         [  /°C]:",AO
130 INPUT "Ambient temperature                       [   °C]:",TAMB
140 IF FLUID$ = "L" THEN W = 0 :GOTO 500
150 INPUT "Ratio of specific heats Cp/Cv                    :",Y
160 IF FLUID$ = "G" THEN W = 0 :GOTO 500
170 INPUT "Water content in wet steam                [    %]:",W
500 REM STEP 1                    (calculate d at line conditions)
510 DO = DOM * (1 + AO * (T - TAMB))
520 REM STEP 2                    (calculate D at line conditions)
530 D = DM * (1 + AP * (T - TAMB))
540 REM STEP 3                    (calculate ß ratio)
550 B = DO / D
560 REM STEP 4                    (calculate steam correction factor Fs)
570 FS = 1 + 0.0074 * W
580 REM STEP 5                    (calculate dp at normal flow indication)
590 DPN = DP * (X / 10)^2
600 REM STEP 6                    (calculate epsilon)
610 E = 1
620 IF FLUID$ = "L" THEN GOTO 670
630 K = (P - DPN) / P
640 K1 = K^(2 / Y)
650 K2 = K^((Y - 1) / Y)
660 E = ((Y * K1 / (Y - 1)) * ((1 - B^4) / (1 - B^4 * K1)) * ((1 - K2) / (1 - K)))^0.5
670 REM STEP 7
680 QM = 2.107 * 10^-4 * (1 - B^4)^-0.5 * E * DO^2 * (DPN * R)^0.5
690 REM STEP 8                    (calculate ReD)
700 RED = 1273200 * QM / (N * D)
710 REM STEP 9                    (calculate discharge coefficient)
720 C = 0.9965 - 0.00653 * B^0.5 * (1000000 / RED)^0.5
730 REM STEP 10                   (calculate new QM)
740 QM1 = 3.512407 * 10^-4 * C * FS * (1 - B^4)^-0.5 * E * DO^2 * (DPN * R)^0.5
750 REM  check if calculated QM agrees with previous QM within 0.01%
760 IF ABS ((QM - QM1) / QM1) > 0.0001 THEN QM = QM1 : GOTO 690
770 REM  the following lines will print the output and restart the program
780 PRINT "Normal flow at scale          [kg/s]:";QM1
790 PRINT "Flow factor                   [kg/s]:";QM1 / X
800 PRINT "Beta ratio                          :";B
810 PRINT "Reynolds Number                     :";RED
820 INPUT "A new calculation Y/N               :",AS
830 IF AS = "Y" THEN GOTO 10
840 END
```

DEP 32.32.11.68 - Gen., sheet 2, 03/86

Control valve calculation form: compressible fluids - DEP 32.36.01.41-Gen., 11/88

Data/requisition sheet (cont. sheet) for CONTROL VALVE CALCULATION FORM: COMPRESSIBLE FLUIDS	Design book No.* : page Contr. Job No.: : M E S C No. :

SYSTEM CONDITION:						**FLUID DATA:**					
					unit	flow rate Q- = ... Qd = ... Q+ = ...					kg/s
upstream terminal pressure			[PA]	.....	bar abs		data at:	Q-	Qd	Q+	unit
downstream terminal pressure			[PB]	.....	bar abs	inlet pressure	[P1]	.....	.....	.....	bar abs
differential static head			[Ph]	.....	bar abs	outlet pressure	[P2]	.....	.....	.....	bar abs
				.....				.....	.....	.....	
DYNAMIC PRESSURE DIFFERENTIAL			[Pt]	.....	bar	pressure drop	[ΔP]	.....	.....	.....	bar
						density (✱)	[ρ]	.....	.....	.....	kg/m³
friction loss data at:		Q-	Qd	Q+		temperature		.....	.....	.....	degr C
before CV		.....	.....	.....	bar						
after CV		.....	.....	.....	bar	Qs/Qd		.....			
TOTAL		.....	.....	.....		Cp/Cv	[k]	.....			
FRICTION LOSS	[Ps]	.....	.....	.....	bar	compressibility	[Z]	.....			
						.....					
		internal pipe diam / wall thickness				.....					
upstream pipe	[D1]	..... /			mm	.....					
downstream pipe	[D2]	..... /			mm	(✱) at control valve inlet condition					
pipe material		.....				**CALCULATED DATA:**					
line no.		.....					data at:	Q-	Qd	Q+	
PEF no.		.....				Cv-calculated	[Cv-calc]	.....	.....	.....	
.....						factors:					
CONTROL VALVE DATA:						gas ratio	[XTP]	.....			
Cv-selected	[Cv]	.....					[XT-min]	.....			
	data at:	Q-	Qd	Q+		gas expansion	[Y]	.....			
gas ratio	[XT]	.....	.....	.....		pipe geometry	[FP]	.....			
body size inlet	[d1]	.....			mm	rel flow coeff	[α-sel]	.....			
body outlet diam	[d2]	.....			mm	CV authority	[γd]	.....			
rangeability	[R]	.....					[γ-]	.....			
CV action flow to:		open / close				relative Gain	[at γd]	.....			
characteristic :		linear / equal					[at γ-]	.....			
.....						**FLOW CONDITION:**					
.....						• turbulent					
.....						• choked					

*Information normally supplied by purchaser

	Sheet No. con'd on sheet No.
Eng. by :	TAG No.
Principal :	Req. No.

Control valve calculation form: incompressible fluids - DEP 32.36.01.42-Gen., 11/88

Data/requisition sheet (cont. sheet) for CONTROL VALVE CALCULATION FORM: INCOMPRESSIBLE FLUIDS	Design book No.* : page Contr. Job No. : M E S C No. :

SYSTEM CONDITION:						**FLUID DATA:**					
upstream terminal pressure		[PA]	.....		bar abs	flow rate Q- = ... Qd = ... Q+ = ...					kg/s
							data at:	Q-	Qd	Q+	unit
pump shut-off pressure		[PAB]	.....		bar abs	inlet pressure	[P1]	.....	.....	.....	bar abs
downstream terminal pressure		[PB]	.....		bar abs	outlet pressure	[P2]	.....	.....	.....	bar abs
differential static head		[Ph]	.....		bar			.....	.....	.....	
			.....			pressure drop	[ΔP]	.....	.....	.....	bar
DYNAMIC PRESSURE DIFFERENTIAL		[Pt]	.....		bar	density (✱)	[ρ]	.....	.....	.....	kg/m³
						viscosity (✱)	[η]	.....	.....	.....	mPa.s
	data at:	Q-	Qd	Q+	unit	temperature		.....	.....	.....	degr C
PUMP DROOP	[Pp]	.....	.....	.....	bar						
friction loss:						Qs/Qd		.....			
before CV		.....	.....	.....	bar	vapour pressure	[Pvap]	.....			bar
after CV		.....	.....	.....	bar	critical pressure	[Pc]	.....			bar
TOTAL		.....	.....	.....		(✱) at control valve inlet condition					
FRICTION LOSS	[Ps]	.....	.....	.....	bar	**CALCULATED DATA:**					
							data at:	Q-	Qd	Q+	unit
		internal pipe diam / wall thickness				Cv-calculated		.....	.....	.....	
upstream pipe	[D1]	..... /			mm	Reynolds number	[Rev]	.....	.....	.....	
downstream pipe	[D2]	..... /			mm	Reynolds corr.	[FR]	.....	.....	.....	
pipe material		.....									
line no.		.....				vena contracta	[Pven]	.....			bar
PEF no.		.....					[XF-min]	.....			
CONTROL VALVE DATA:							[FL-min]	.....			
Cv-selected	[Cv]	.....					[FLP]	.....			
	data at:	Q-	Qd	Q+	unit	pipe geometry	[FP]	.....			
Characteristic press ratio	[XF.]	.....	.....	.....		rel flow coeff	[α-sel]	.....			
Press recovery	[FL]	.....	.....	.....		CV authority	[γd]	.....			
Style modifier	[Fd]	.....					[γ-]	.....			
body size inlet	[d1]	.....			mm	relative Gain	[at γd]	.....			
body size outlet	[d2]	.....			mm		[at γ-]	.....			
rangeability	[R]	.....				**FLOW CONDITION:**					
CV action flow to:		open / close				• laminar		• cavitation			
characteristic :		linear / equal				• transitional		• flashing			
.....						• turbulent		• choked			

*Information normally supplied by purchaser

	Sheet No. con'd on sheet No.
Eng. by :	TAG No.
Principal :	Req. No.

DEP 32.36.01.42-Gen. 11/88

3. INSTRUMENT INSTALLATIONS

INDEX

	Summary of instrument process connections (9 Sheets)	DEP 32.37.00.80-Gen., 08/88
	Summary of instrument installation materials (23 Sheets)	DEP 32.37.02.80-Gen., 12/89
Amended per Circular 44/92	Instrument impulse lines `Metric version" (52 Sheets)	DEP 32.37.02.81-Gen., 7/92
Amended per Circular 44/92	Instrument impulse lines "Imperial version" (52 Sheets)	DEP 32.37.02.82-Gen., 7/92
	Instrument air lines (18 sheets)	DEP 32.37.02.83-Gen., 12/89
	Instrument nameplates (5 sheets)	DEP 32.37.02.84-Gen., 09/89

Cover sheet - DEP 32.37.00.80-Gen., sheet 1 08/88

SUMMARY OF INSTRUMENT PROCESS CONNECTIONS

Section	Sheet(s)	Subject
1	1	Cover sheet
2	201-	Index of sheets
3	301-302	General
4	401-	Analysers, sundry instruments
5	501-	Flow instruments
6	601-	Level instruments
7	701-	Pressure instruments
8	801-	Temperature instruments
9	901-	Control valves

Related drawings:

T . . . . . Instrument Piping
T . . . . . .

Made by :	Date:	Title:	Issue				
Checked by :	Date:	**Summary of Instrument Process Connections**	Date				
Appr. by :	Date:	Section 1: Cover sheet	By				
LOCATION:		PLANT :	Project & group No.:				
Eng. by : Principal :			Sheet No. 1 cont'd on sheet No. 201 Drawing No. T				

DEP 32.37.00.80 - Gen sheet 1, 08/88

Index of sheets - DEP 32.37.00.80-Gen., sheet 2 08/88

Sheet	Issue/Revision					
	0	A	B	C	D	E

Sheet	Issue/Revision					
	0	A	B	C	D	E

Sheet	Issue/Revision					
	0	A	B	C	D	E

Sheet	Issue/Revision					
	0	A	B	C	D	E

Made by :	Date:	Title:	Issue				
Checked by :	Date:	**Summary of Instrument Process Connections**	Date				
Appr. by :	Date:	Section 2: Index of sheets	By				
LOCATION:		PLANT :	Project & group No.:				
Eng. by :			Sheet No. 201	cont'd on sheet No. 301			
Principal :			Drawing No. T				

DEP 32.37.00.80 - Gen sheet 2, 08/88

General - DEP 32.37.00.80-Gen., sheet 3 08/88

STANDARD ABBREVATIONS

General

Piping data		Special requirements	
H	= Horizontal	IP	= Instrument piping
V	= Vertical		

Analysers sundry instruments

Flow instruments

Instrument type		Flange type	
O	= Orifice plate	OF	= Orifice flanges - Flange tappings
VT	= Venturi tube	OC	= Orifice flanges - Corner tappings
PD	= Positive displacement meter	RTJ	= Ring-type joint orifice carrier
T	= Turbine meter	M..	= Meter run for DN....pipe
VM	= Vortex meter		=
RO	= Restriction orifice plate		=
			=

Level instruments

Instrument type		Special requirements	
DE	= Displacer - External	SW	= Stilling well
DI	= Displacer - Internal	PP	= Purge pipe
DP	= Differential-pressure transmitter		=
SI	= Level switch - Internal		=
SE	= Level switch - External		=
	=		=
	=		=

Pressure instruments

Temperature instruments

Element mounting		Element type	
TF	= Thermowell - Flanged	TM	= Thermometer in well
TT	= Thermowell - Threated	TS	= Thermometer surface mounting
TW	= Thermowell - Welding	F...	= Filled system, ...mm 10 for TW
SE	= Surface mounting - Equipment	G...	= Gauge, bi-metal ....mm 10 for TW
SF	= Surface mounting - Furnace tube		=
	=		=
	=		=
	=		=

Control Valves

Valve connections			
F	= Flanged	S	= Flangeless
W	= Weld ends	A	= Angle valve
	=		=
	=		=

Made by :	Date:	Title:	Issue					
Checked by :	Date:	**Summary of Instrument Process Connections**	Date					
Appr. by :	Date:	Section 3 General	By					
LOCATION:		PLANT:	Project & group No.:					
Eng. by : Principal :			Sheet No. 301 cont'd on sheet No. 302 Drawing No. T					

DEP 32.37.00.80 - Gen sheet 3, 08/88

Analysers, sundry instruments - DEP 32.37.00.80-Gen., sheet 4 08/88

Instr. tag number	Equipment/piping data					Instrument data	
	Equipment line number	Nozzle horizontal or vertical	Connection(s)			Type, connection, etc.	Special require-ments
			Size	Rating	Piping class		

Flow instruments - DEP 32.37.00.80-Gen., sheet 5 08/88

Instr. tag number	Piping data						Instrument data					Special requirements
	Line number	Size	Line horizontal or vertical	Piping class	Straight length (Note 2)		Instr. type	Flanges			Face to face dimension mm (Note 1)	
					Up-stream	Down-stream		Size	Rating	Type		

NOTES: 1. For orifice plates, the column 'face to face dimension' represents the orifice plate thickness.
2. Straight length expressed in multiples of pipe diameter (D).

Made by :	Date:	Title:	Issue					
Checked by :	Date:	**Summary of Instrument Process Connections**	Date					
Appr. by :	Date:	Section 5: Flow instruments	By					
LOCATION:		PLANT :	Project & group No.:					
Eng. by :			Sheet No. 501 cont'd on sheet No.					
Principal :			Drawing No. T					

DEP 32.37.00.80 - Gen sheet 5, 08/88

Level instruments - DEP 32.37.00.80-Gen., sheet 6 08/88

Instr. tag number	Equipment data					Instrument data		
	Equipment number	Connections			Piping class	Instr. type	Required connection(s)	Special require-ments
		Size	Rating	Centre-to-centre				

Made by :	Date:	Title:				Issue				
Checked by :	Date:	**Summary of Instrument Process Connections**				Date				
Appr. by :	Date:	Section 6: Level instruments				By				
LOCATION:		PLANT :				Project & group No.:				
Eng. by :						Sheet No. 601 cont'd on sheet No.				
Principal :						Drawing No. T				

Pressure Instruments - DEP 32.37.00.80-Gen., sheet 7 08/88

Instr. tag number	Equipment/piping data					Instrument data	
	Equipment line number	Nozzle horizontal or vertical	Connections		Piping class	Type, connection, etc.	Special requirements
			Size	Rating			

Temperature instruments - DEP 32.37.00.80-Gen., sheet 8 08/88

Instr. tag number	Equipment/piping data					Instrument data				
	Equipment line number	Nozzle horizontal or vertical	Thermowell			Element			Head extension length mm	Special requirements
			Length	ID		Type	Length mm	Dia. mm		

Control valves - DEP 32.37.00.80-Gen., sheet 9 08/88

Instr. tag number	Piping data					Valve data				
	Line number	Line horizontal or vertical	Size	Rating	Piping class	Face-to-face dimension mm	Body size	Rating	Trim size (Note 1)	Special require-ments

NOTE 1. State trim size only when different from body size. This information is required for correct sizing of by-pass valve

Made by :	Date:	Title:	Issue					
Checked by :	Date:	**Summary of Instrument Process Connections**	Date					
Appr. by :	Date:	Section 9: Control valves	By					
LOCATION:		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. 901 cont'd on sheet No. Drawing No. T					

DEP 32.37.00.80 - Gen sheet 9, 08/88

Table of contents - DEP 32.37.02.80-Gen., sheet 1 12/89

COVER SHEET

	Section	Items	Sheet (s)
Table of contents	1	-	101
Index and issue sheet	2	-	201
Notes	3	-	301-
List	4	-	
- Instrument components	4.1	001-100	401-402
- Accessories for cables	4.2	101-300	403-406
- Conduit and conduit fittings	4.3	301-400	407-408
- Line pipe and tubing	4.4	401-500	409-410
- Instrument valves	4.5	501-600	411-412
- Pipe fittings	4.6	601-700	413-414
- Compression fittings S.S. and C.S.	4.7	701-800	415-416
- Compression fittings brass	4.8	801-900	417-418
- General materials	4.9	901-999	419-420
Specification	5		501
Quantities	6		601

Approved by: / Issue:	Sign.	Date	Sign.	Date	Sign.	Date	Sign.	Date	Sign.	Date	Sign.	Date	Sign.	Date

Made by :	Date :	Title : **SUMMARY OF INSTRUMENT INSTALLATION MATERIALS**	
Checked by :	Date :	Section 1: Table of contents	
LOCATION :		PLANT :	Project & group No. :
Eng . by :			Sheet No. 101 cont'd on sheet No. 201
Principal :			Drawing No. T

DEP 32.37.02.80 - Gen., sheet 1, 12/89

Index on issue sheet - DEP 32.37.02.80-Gen., sheet 2 12/89

Sheet No	Issue	Date	Issue	Date	Issue	Date	Issue	Date	Issue	Date

Notes - DEP 32.37.02.80-Gen., sheet 3 12/89

3.1 GENERAL

This document lists item and MESC numbers of instrument installation materials, which have been selected by the principal.

3.2 DEVIATIONS

Deviations from this list require the written approval of the principal.

3.3 DEFICIENCIES

When during the engineering stage it appears that the list is not complete the contractor shall inform the principal immediately in writing, giving details of the deficiency in the list together with a proposal for approval by the principal.

3.4 STATUS

The list shall be treated as confidential and shall not be disclosed to any manufacturer or other third party.

3.5 MODIFICATION TO THE LIST BY THE PRINCIPAL

During the project phase, the principal reserves the right to make modifications to the list, which shall be negotiable with the contractor.

3.6 USE OF ITEM NUMBERS

The item numbers given in this list shall be indicated on instrument installation drawings as well as in the summary of instrument installation materials.

3.7 REQUISITIONING OF MATERIALS

Contractor shall verify the MESC- numbers as given in this list against the latest MESC sheets for correctness. In case of deviations the MESC sheets are overruling.
The contractor shall inform the principal in writing of these deviations.

3.8 CONTRACTOR

The contractor shall enter the materials actually applied for the project on Summary of Instrument Installation Materials - Specification. (Section 5).
The total amount of materials shall be filled-in on the list "quantities". (Section 6).

Made by :	Date :	Title : **SUMMARY OF INSTRUMENT INSTALLATION MATERIALS**	
Checked by :	Date :	Section 3 : Notes	
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Eng . by : Principal :			Sheet No.301 cont'd on sheet No. Drawing No. T

Instrument components - DEP 32.37.02.80-Gen., sheet 4 12/89

Issue	Item No.	Description			MESC	Notes
		Size	Type	Material		
	001					
	002					
	003					
	004					
	005					
	006	2 in. NPT	Instrument air filter.		60.98.33.160.1	
	007	2 in. NPT	Instrument air filter (tr. bowl)		60.98.33.860.1	
	008					
	009					
	010					
	011	1/4 in. NPT	Instrument air filter regulator		60.98.3X.XXX.X	1)
	012					
	013	1/2 in. NPT	Instrument air regulator		60.98.35.730.1	
	014					
	015					
	016	2 in. NPT	Instrument air regulator assembly		60.98.35.900.1	
	017					
	018					
	019					
	020					
	021					
	022					
	023					
	024					
	025					
	026					
	027					
	028					
	029					
	030	DN15 x 1/2 in. NPT	Isolate/vent gauge block - smooth finish -(LPR)	AISI 316	60.98.55.200.1	
	031	DN15 x 1/2 in. NPT	Isolate/vent gauge block - smooth finish -(HPR)	AISI 316	60.98.55.210.1	
	032	DN15 x G1/2 in.	Isolate/vent gauge block - smooth finish -(LPR)	AISI 316	60.98.55.220.1	
	033	DN15 x G1/2 in.	Isolate/vent gauge block - smooth finish -(HPR)	AISI 316	60.98.55.230.1	
	034	DN15 x 1/2 in. NPT	Syphon isolate/vent gauge block - smooth finish -(LPR)	AISI 316	60.98.55.300.1	
	035	DN15 x 1/2 in. NPT	Syphon isolate/vent gauge block - smooth finish -(HPR)	AISI 316	60.98.55.310.1	
	036	DN15 x G1/2 in.	Syphon isolate/vent gauge block - smooth finish -(LPR)	AISI 316	60.98.55.320.1	
	037	DN15 x G1/2 in.	Syphon isolate/vent gauge block - smooth finish -(HPR)	AISI 316	60.98.55.330.1	
	038	10 mm	Single isolate/vent block (dp model)	AISI 316	60.98.56.235.1	
	039	3/8 in.	Single isolate/vent block (dp model)	AISI 316	60.98.56.237.1	
	040					
	041	10 mm	Double isolate/vent block	AISI 316	60.98.56.215.1	
	042	3/8 in.	Double isolate/vent block	AISI 316	60.98.56.217.1	
	043					
	044	10 mm	Single isolate/vent block	AISI 316	60.98.56.225.1	
	045	3/8 in.	Single isolate/vent block	AISI 316	60.98.56.227.1	
	046					
	047	10 mm	Double isolate/equalize/vent block	AISI 316	60.98.56.205.1	
	048	3/8 in.	Double isolate/equalize/vent block	AISI 316	60.98.56.207.1	
	049					
	050	10 mm x 1/2 in. NPT M.	Isolate/vent block	AISI 316	60.98.56.305.1	

Notes:
1) Type as per locally prefered supplier/type

Made by :	Date :	Title : **SUMMARY OF INSTRUMENT INSTALLATION MATERIALS**	
Checked by :	Date :	Section 4 : List 4.1 Instrument components	
LOCATION :		PLANT :	Project & group No. :
Eng . by :			Sheet No.401 cont'd on sheet No.
Principal :			Drawing No. T

Instrument components - DEP 32.37.02.80-Gen., sheet 5 12/89

Issue	Item No.	Description			MESC	Notes
		Size	Type	Material		
	051	10 mm x 1/2 in. NPT F	Isolate/vent block	AISI 316	60.98.56.315.1	
	052	10 mm x G1/2 in.	Isolate/vent block	AISI 316	60.98.56.317.1	
	053	3/8 in. x 1/2 in. NPT M	Isolate/vent block	AISI 316	60.98.56.325.1	
	054	3/8 in. x 1/2 in. NPT F	Isolate/vent block	AISI 316	60.98.56.335.1	
	055	3/8 in. x G 1/2 in.	Isolate/vent block	AISI 316	60.98.56.337.1	
	056					
	057	10 mm	Manifold steam tracing block	AISI 316	60.98.70.010.1	
	058					
	059					
	060	-	Manifold electrical heater assembly	AISI 316	60.98.70.050.1	
	061	3/8 in.	Manifold steam tracing block	AISI 316	60.98.70.110.1	
	062					
	063					
	064	-	Anti tamper key	AISI 316	60.98.56.905.1	
	065					
	066	10 mm	Single purge filter block with vent valve	AISI 316	60.98.70.210.1	
	067					
	068	3/8 in.	Single purge filter block with vent valve	AISI 316	60.98.70.310.1	
	069					
	070	10 mm	Double purge filter block with vent valve	AISI 316	60.98.70.220.1	
	071					
	072	3/8 in.	Double purge filter block with vent valve	AISI 316	60.98.70.320.1	
	073					
	074	10 mm	Seal pot with vent valve	AISI 316	60.98.70.510.1	
	075					
	076	3/8 in.	Seal pot with vent valve	AISI 316	60.98.70.610.1	
	077					
	078					
	079					
	080					
	081	6 mm	Filling connector	AISI 316	60.98.90.106.1	
	082	1/4 in.	Filling connector	AISI 316	60.98.90.107.1	
	083	G 1/4 A in.	Port protector	AISI 316	60.98.90.207.1	
	084	1/4 in. NPT	Port protector	Brass	60.98.90.217.1	
	085					
	086	-	Blind kidney flange	AISI 316	60.98.90.307.1	
	087	10 mm	Purge orifice nipple	AISI 316	60.98.90.710.1	1)
	088					
	089					
	090	3/8 in.	Purge orifice nipple	AISI 316	60.98.90.810.1	1)
	091					
	092	330 x 280 mm	Mounting plate L-shape	AISI 316	60.98.91.105.1	2)
	093	330 x 150 mm	Mounting plate rectangular	AISI 316	60.98.91.118.1	4)
	094					
	095	-	Protective shade	Non - Metallic	60.98.91.205.1	
	096	-	Body enclosure	Non - Metallic	60.98.91.305.1	
	097					
	098	120 x 122 mm	Test connection box	Polyester	60.98.98.025.1	3)
	099					
	100					

Notes:
1) See standard drawing S-37.805
2) See standard drawing S-37.813
3) See standard drawing S-37.612
4) See standard drawing S-37.814

Made by :	Date :	Title : **SUMMARY OF INSTRUMENT INSTALLATION MATERIALS**
Checked by :	Date :	Section 4 : List 4.1 Instrument components
LOCATION :	PLANT :	
Eng. by :		Sheet No.402 cont'd on sheet No.
Principal :		Drawing No. T

Accessoires for cables - DEP 32.37.02.80-Gen., sheet 6 12/89

Issue	Item No.	Description			MESC	Notes
		Size	Type	Material		
	101	0.7 mm dia.	Binding wire	Tinned steel	68.01.08.146.1	
	102					
	103	1.5 mm sq.	Single core stranded installation wire - grey	Cu/PVC	68.13.14.516.1	
	104	2.5 mm sq.	Single core stranded installation wire - grey	Cu/PVC	68.13.14.520.1	
	105					
	106	38 mm x 9 m	Spacer tape		68.76.36.432.1	
	107	38 mm x 33 m	Insulating tape	PVC	68.76.36.450.1	
	108	A	Resin No.12	Epoxy	68.76.48.102.1	
	109	B	Resin No.12	Epoxy	68.76.48.106.1	
	110	C	Resin No.12	Epoxy	68.76.48.110.1	
	111	25 - 70 mm sq.	Earthing clamp for 2 in. pipe	Cu	68.77.02.102.1	
	112					
	113	0.5 - 1.2 mm sq.	Cable lug,diameter screw 4.0 mm	Cu - Sn plated	68.78.90.105.1	
	114					
	115	1.5 - 2.5 mm sq.	Cable lug,diameter screw 4.0 mm	Cu - Sn plated	68.78.90.111.1	
	116	1.5 - 2.5 mm sq.	Through connector	Cu - Sn plated	68.78.90.351.1	1)
	117					
	118					
	119					
	120					
	121	0.5 mm sq.	Wire pin - orange	Cu - Sn plated	68.78.90.460.1	
	122	0.75 mm sq.	Wire pin - white	Cu - Sn plated	68.78.90.461.1	
	123	1.0 mm sq.	Wire pin - yellow	Cu - Sn plated	68.78.90.462.1	
	124	1.5 mm sq.	Wire pin - red	Cu - Sn plated	68.78.90.463.1	
	125	2.5 mm sq.	Wire pin - blue	Cu - Sn plated	68.78.90.464.1	
	126					
	127	0.25 -1.6 mm	Wire pin	Cu - Sn plated	68.78.90.482.1	
	128	1.0 - 2.6 mm	Wire pin	Cu - Sn plated	68.78.90.484.1	
	129					
	130					
	131					
	132					
	133					
	134					
	135					
	136	0.25 - 1.6 mm sq.	Fork lug, diameter screw 2.6 mm	Cu - Sn plated	68.78.90.532.1	
	137	0.25 - 1.6 mm sq.	Fork lug, diameter screw 3.5 mm	Cu - Sn plated	68.78.90.533.1	
	138	0.25 - 1.6 mm sq.	Fork lug, diameter screw 4.0 mm	Cu - Sn plated	68.78.90.536.1	
	139	0.25 - 1.6 mm sq.	Fork lug, diameter screw 5.0 mm	Cu - Sn plated	68.78.90.540.1	
	140					
	141	1.0 - 2.6 mm sq.	Fork lug, diameter screw 3.5 mm	Cu - Sn plated	68.78.90.550.1	
	142	1.0 - 2.6 mm sq.	Fork lug, diameter screw 4.0 mm	Cu - Sn plated	68.78.90.553.1	
	143	1.0 - 2.6 mm sq.	Fork lug, diameter screw 5.0 mm	Cu - Sn plated	68.78.90.556.1	
	144					
	145					
	146	0.25 - 1.6 mm sq.	Through connector with installation support	Cu - Sn plated	68.78.90.611.1	
	147	1.0 - 2.6 mm sq.	Through connector with installation support	Cu - Sn plated	68.78.90.631.1	
	148					
	149					
	150					

Notes:
1) For sleeving see item 286

Made by :	Date :	Title : **SUMMARY OF INSTRUMENT INSTALLATION MATERIALS**
Checked by :	Date :	Section 4 : List 4.2 Accessories for cables
LOCATION :	PLANT :	Project & group No. :
Eng. by : Principal :		Sheet No.403 cont'd on sheet No. Drawing No. T

Accessoires for cables - DEP 32.37.02.80-Gen., sheet 7 12/89

Issue	Item No.	Description			MESC	Notes
		Size	Type	Material		
	151	0.8 - 1.7 mm	Cable marker set of figures 0 - 9	Plastic		
	152	1.7 - 2.5 mm	Cable marker set of figures 0 - 9	Plastic	68.79.02.542.1	
	153					
	154					
	155					
	156	16 - 20 mm	Clamp for one cable	Galv. st	68.80.50.420.1	
	157	20 - 24 mm	Clamp for one cable	Galv. st	68.80.50.424.1	
	158	24 - 28 mm	Clamp for one cable	Galv. st	68.80.50.428.1	
	159	26 - 30 mm	Clamp for one cable	Galv. st	68.80.50.430.1	
	160	30 - 34 mm	Clamp for one cable	Galv. st	68.80.50.434.1	
	161	16 - 20 mm	Clamp for two cables	Galv. st	68.80.50.470.1	
	162	20 - 24 mm	Clamp for two cables	Galv. st	68.80.50.474.1	
	163	26 - 30 mm	Clamp for two cables	Galv. st	68.80.50.478.1	
	164					
	165	24 - 28 mm	Clamp for one cable	Galv. st	68.80.50.490.1	
	166					
	167	8 mm	Cable stips (coils of 30 m)	Nylon	68.80.50.730.1	
	168	8 mm	Studs (1000 pieces)	Nylon	68.80.50.734.1	
	169					
	170					
	171					
	172					
	173					
	174	21 mm max.	Cable ties	Nylon		
	175	30 mm max.	Cable ties	Nylon		
	176					
	177					
	178	16 - 22 mm	Cable spacer	Polystyrene	68.80.54.011.1	
	179	24 - 30 mm	Cable spacer	Polystyrene	68.80.54.015.1	
	180	32 - 38 mm	Cable spacer	Polystyrene	68.80.54.019.1	
	181	18 - 20 mm	Cable end spacer	Polystyrene	68.80.54.051.1	
	182	22 - 24 mm	Cable end spacer	Polystyrene	68.80.54.053.1	
	183	26 - 28 mm	Cable end spacer	Polystyrene	68.80.54.055.1	
	184	30 - 32 mm	Cable end spacer	Polystyrene	68.80.54.057.1	
	185	34 - 36 mm	Cable end spacer	Polystyrene	68.80.54.059.1	
	186					
	187					
	188					
	189					
	190					
	191					
	192					
	193					
	194					
	195					
	196					
	197					
	198					
	199					
	200					

Notes:

Made by :	Date :	Title : **SUMMARY OF INSTRUMENT INSTALLATION MATERIALS**	
Checked by :	Date :	Section 4 : List 4.2 Accessories for cables	
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Accessoires for cables - DEP 32.37.02.80-Gen., sheet 8 12/89

Issue	Item No.	Description			MESC	Notes
		Size	Type	Material		
	201	7 - 12.5 mm	Cable gland with 3/8 in. BSPP thr.	Brass-Ni pl.	68.90.56.003.1	
	202	7.5 - 13.5 mm	Cable gland with 1/2 in. BSPP thr.	Brass-Ni pl.	68.90.56.004.1	
	203	8 - 15.5 mm	Cable gland with 5/8 in. BSPP thr.	Brass-Ni pl.	68.90.56.005.1	
	204	12 - 17.5 mm	Cable gland with 3/4 in. BSPP thr.	Brass-Ni pl.	68.90.56.006.1	
	205	16 - 23.5 mm	Cable gland with 1 in. BSPP thr.	Brass-Ni pl.	68.90.56.008.1	
	206	23 - 30.5 mm	Cable gland with 11/4 in. BSPP thr.	Brass-Ni pl.	68.90.56.011.1	
	207	31 - 36 mm	Cable gland with 11/2 in. BSPP thr.	Brass-Ni pl.	68.90.56.012.1	
	208					
	209					
	210					
	211	3/8 in. BSPP.	Locknut, for item 201	Brass-Ni pl.	68.90.56.123.1	
	212	1/2 in. BSPP.	Locknut, for item 202	Brass-Ni pl.	68.90.56.124.1	
	213	5/8 in. BSPP.	Locknut, for item 203	Brass-Ni pl.	68.90.56.125.1	
	214	3/4 in. BSPP.	Locknut, for item 204	Brass-Ni pl.	68.90.56.126.1	
	215	1 in. BSPP.	Locknut, for item 205	Brass-Ni pl.	68.90.56.128.1	
	216	1 1/4 in. BSPP.	Locknut, for item 206	Brass-Ni pl.	68.90.56.130.1	
	217	1 1/2 in. BSPP.	Locknut, for item 207	Brass-Ni pl.	68.90.56.132.1	
	218					
	219					
	220					
	221	3.5 - 6 mm	Cable gland with locknut PG 7	Nylon	68.90.56.462.1	
	222	6 - 8 mm	Cable gland with locknut PG 9	Nylon	68.90.56.464.1	
	223	8 - 10 mm	Cable gland with locknut PG 11	Nylon	68.90.56.466.1	
	224	10 - 12 mm	Cable gland with locknut PG 13.5	Nylon	68.90.56.468.1	
	225	12 - 14 mm	Cable gland with locknut PG 16	Nylon	68.90.56.470.1	
	226	14 - 18 mm	Cable gland with locknut PG 21	Nylon	68.90.56.472.1	
	227	18 - 24 mm	Cable gland with locknut PG 29	Nylon	68.90.56.474.1	
	228	24 - 30 mm	Cable gland with locknut PG 36	Nylon	68.90.56.476.1	
	229	30 - 35 mm	Cable gland with locknut PG 42	Nylon	68.90.56.478.1	
	230					
	231	2.5 - 6 mm sq.	Terminal strip (12-way)	Polyamide	68.90.76.112.1	
	232					
	233					
	234					
	235					
	236	0.5 - 2.5 mm sq.	Rail mounted terminal, blue	Melamine	68.80.76.142.1	
	237	1..5 mm thick	End section, for item 236	Melamine	68.80.76.143.1	
	238	2.5 mm thick	Partition, for item 236	Melamine	68.80.76.144.1	
	239					
	240					
	241		Jumper-bar 2 poles, for item 236, 246 and 251	Brass	68.80.76.146.1	
	242		Jumper-bar 3 poles, for item 236, 246 and 251	Brass	68.80.76.147.1	
	243		Jumper-bar 4 poles, for item 236, 246 and 251	Brass	68.80.76.148.1	
	244					
	245					
	246	0.5 - 2.5 mm sq.	Rail mounted terminal, yellow	Melamine	68.80.76.152.1	
	247	1.5 mm thick	End section, for item 246	Melamine	68.80.76.154.1	
	248	2.5 mm thick	Partition, for item 246	Melamine	68.80.76.155.1	
	249					
	250					

Notes:

Made by :	Date :	Title : **SUMMARY OF INSTRUMENT INSTALLATION MATERIALS**
Checked by :	Date :	Section 4 : List 4.2 Accessories for cables

LOCATION :	PLANT :	Project & group No. :
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Principal :		Drawing No. T

Accessoires for cables - DEP 32.37.02.80-Gen., sheet 9 12/89

Issue	Item No.	Description			MESC	Notes
		Size	Type	Material		
	251	0.5 - 2.5 mm sq	Rail mounted terminal, grey	Melamine	68.80.76.162.1	
	252	1.5 mm thick	End section, for item 251	Melamine	68.80.76.163.1	
	253	2.5 mm thick	Partition, for item 251	Melamine	68.80.76.164.1	
	254					
	255					
	256	0.5 - 10 mm sq	Rail mounted fused terminal	Melamine	68.80.76.172.1	
	257	3 mm thick	End section, for item 256	Melamine	68.80.76.173.1	
	258					
	259					
	260					
	261					
	262					
	263					
	264					
	265					
	266	0.5 - 4.0 mm sq	Rail mounted test terminal	Melamine	68.80.76.192.1	
	267	1.5 mm thick	End section, for item 266	Melamine	68.80.76.194.1	
	268					
	269					
	270					
	271	8.5 mm thick	End bracket	Melamine	68.80.76.202.1	1)
	272					
	273					
	274					
	275	2 m	Rail TS - 32	Steel- Zn plated	68.80.76.214.1	
	276		Marking tag's for max. 50 terminals, unmarked	Plastic	68.80.76.220.1	
	277		Marking ink, black for item 276	ink	68.80.76.226.1	
	278					
	279					
	280					
	281	2 m	Rail MS - 32	Galv. st.	68.80.76.826.1	
	282					
	283		Mounting support for rail	Galv. st.	68.80.76.828.1	
	284		Mounting support for rail < 30 degr.	Galv. st.	68.80.76.830.1	
	285					
	286		Sleeving, for item 116	PVC	68.80.76.508.1	
	287					
	288					
	289	10 mm	Adhesive tape	PVC	68.80.76.391.1	
	290	19 mm	Adhesive tape	PVC	68.80.76.395.1	
	291	Dia. 5.2 x 25 mm	Fuse links with ind. 1.6 A orange	Insulat. material	68.80.76.390.1	2)
	292	Dia. 5.2 x 25 mm	Fuse links with ind. 2 A blue	Insulat. material	68.80.76.392.1	2)
	293	Dia. 5.2 x 25 mm	Fuse links with ind. 2.5 A yellow	Insulat. material	68.80.76.394.1	2)
	294	Dia. 5.2 x 25 mm	Fuse links with ind. 4 A brown	Insulat. material	68.80.76.396.1	2)
	295	Dia. 5.2 x 25 mm	Fuse links with ind. 6.3 A green	Insulat. material	68.80.76.398.1	2)
	296					
	297					
	298					
	299					
	300					

Notes:

1) For items 236, 246, 256 and 266

2) For item 256

Made by :	Date :	Title : **SUMMARY OF INSTRUMENT INSTALLATION MATERIALS**
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LOCATION :	PLANT :	Project & group No. :
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Conduit and conduit fittings - DEP 32.37.02.80-Gen., sheet 10 12/89

Issue	Item No.	Description			MESC	Notes
		Size	Type	Material		
	301	M - 20	Conduit	Galv. st	70.13.04.020.1	
	302	M - 25	Conduit	Galv. st	70.13.04.025.1	
	303	M - 32	Conduit	Galv. st	70.13.04.032.1	
	304					
	305					
	306	M - 20	Conduit saddle	Galv. st	70.29.65.020.1	
	307	M - 25	Conduit saddle	Galv. st	70.29.65.025.1	
	308	M - 32	Conduit saddle	Galv. st	70.29.65.032.1	
	309					
	310					
	311					
	312					
	313					
	314					
	315					
	316					
	317					
	318					
	319					
	320					
	321	M - 20	Inspection bend	Galv. iron	70.41.03.220.1	
	322	M - 25	Inspection bend	Galv. iron	70.41.03.225.1	
	323	M - 32	Inspection bend	Galv. iron	70.41.03.232.1	
	324	M - 20	Conduit box - through type	Galv. iron	70.41.05.310.1	
	325	M - 20	Conduit box - tee type	Galv. iron	70.41.05.322.1	
	326	M - 25	Conduit box - through type	Galv. iron	70.41.05.360.1	
	327	M - 25	Conduit box - tee type	Galv. iron	70.41.05.372.1	
	328	M - 20	Coupling	Galv. iron	70.41.09.020.1	
	329	M - 25	Coupling	Galv. iron	70.41.09.025.1	
	330	M - 32	Coupling	Galv. iron	70.41.09.032.1	
	331	M - 20	Flanged coupling	Galv. iron	70.41.09.220.1	
	332	M - 25	Flanged coupling	Galv. iron	70.41.09.225.1	
	333	M - 32	Flanged coupling	Galv. iron	70.41.09.232.1	
	334	M - 20	Union screwed	Galv. iron	70.41.09.320.1	
	335	M - 25	Union screwed	Galv. iron	70.41.09.325.1	
	336	M - 32	Union screwed	Galv. iron	70.41.09.332.1	
	337	M - 20	Lock nut	Galv. iron	70.41.42.020.1	
	338	M - 25	Lock nut	Galv. iron	70.41.42.025.1	
	339	M - 32	Lock nut	Galv. iron	70.41.42.032.1	
	340					
	341	M - 20 x 25 mm	Nipple - short type	Galv. st	70.41.50.020.1	
	342	M - 25 x 28 mm	Nipple - short type	Galv. st	70.41.50.025.1	
	343	M - 32 x 32 mm	Nipple - short type	Galv. st	70.41.50.032.1	
	344	M - 20 x 52 mm	Nipple - long type	Galv. st	70.41.50.020.1	
	345	M - 25 x 58 mm	Nipple - long type	Galv. st	70.41.50.025.1	
	346	M - 32 x 62 mm	Nipple - long type	Galv. st	70.41.50.032.1	
	347	M - 20	Plug - hexagonal	Galv. iron	70.41.57.020.1	
	348	M - 25	Plug - hexagonal	Galv. iron	70.41.57.025.1	
	349	M - 32	Plug - hexagonal	Galv. iron	70.41.57.032.1	
	350	M - 25 x 20	Reducer - external / internal	Galv. iron	70.41.61.016.1	

Notes:

Made by :	Date :	Title : **SUMMARY OF INSTRUMENT INSTALLATION MATERIALS**	
Checked by :	Date :	Section 4 : List 4.3 Conduit and conduit fittings	
LOCATION :		PLANT :	Project & group No. :
Eng . by :			Sheet No. 407 cont'd on sheet No.
Principal :			Drawing No. T

Conduit and conduit fittings - DEP 32.37.02.80-Gen., sheet 11 12/89

Issue	Item No.	Description			MESC	Notes
		Size	Type	Material		
	351	M - 32 x 20	Reducer - external / internal	Galv. st	70.41.61.026.1	
	352	M - 32 x 25	Reducer - external / internal	Galv. st	70.41.61.028.1	
	353					
	354					
	355					
	356					
	357					
	358					
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	360					
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Notes:

Made by :	Date :	Title : **SUMMARY OF INSTRUMENT INSTALLATION MATERIALS**
Checked by :	Date :	Section 4 : List 4.3 Conduit and conduit fittings

LOCATION :	PLANT :	Project & group No. :
Eng. by : Principal :		Sheet No.408 cont'd on sheet No. Drawing No. T

Line pipe and tubing - DEP 32.37.02.80-Gen., sheet 12 12/89

Issue	Item No.	Description			MESC	Notes
		Size	Type	Material		
	401	1/4 in.	Line pipe schedule 80	CS	74.13.10.008.1	
	402	1/2 in.	Line pipe schedule 80	CS	74.13.10.018.1	
	403	1 in.	Line pipe schedule 80	CS	74.13.10.038.1	
	404					
	405	2 in.	Line pipe schedule 40	CS	74.13.12.069.1	
	406	1/2 in.	Line pipe schedule 40 S	AISI 316	74.36.23.018.1	
	407	1 in.	Line pipe schedule 40 S	AISI 316	74.36.23.034.1	
	408					
	409	2 in.	Line pipe schedule 40 S	AISI 316	74.36.23.058.1	
	410	3 in.	Line pipe schedule 10 S	AISI 316	74.36.23.065.1	
	411					
	412					
	413					
	414	16 mm OD	Tubing - wall thickness 2 mm	CS	74.48.28.181.1	
	415					
	416					
	417	1/4 in. OD	Tubing - wall thickness 0.049 in.	AISI 316	74.48.50.035.1	
	418					
	419	3/8 in. OD	Tubing - wall thickness 0.065 in.	AISI 316	74.48.50.055.1	
	420					
	421					
	422	6 mm OD	Tubing - wall thickness 1 mm	AISI 316	74.48.50.111.1	
	423					
	424	10 mm OD	Tubing - wall thickness 1.5 mm	AISI 316	74.48.50.121.1	
	425					
	426					
	427					
	428					
	429					
	430					
	431					
	432	1/4 in. OD	Tubing - wall thickness 0.036 in.	Cu	74.66.22.244.1	
	433					
	434	6 mm OD	Tubing - wall thickness 1 mm	Cu	74.66.22.264.1	
	435					
	436					
	437					
	438					
	439					
	440					
	441					
	442	1/4 in. OD	Tubing - black PVC sheated, wall thickness 0.036 in.	Cu	74.66.22.354.1	
	443					
	444	6 mm OD	Tubing - black PVC sheated, wall thickness 1mm	Cu	74.66.22.374.1	
	445					
	446					
	447					
	448					
	449					
	450					

Notes:

Made by :	Date :	Title : **SUMMARY OF INSTRUMENT INSTALLATION MATERIALS**	
Checked by :	Date :	Section 4 : List 4.4 Line pipe and tubing	
LOCATION :	PLANT :	Project & group No. :	
Eng . by : Principal :		Sheet No.409 cont'd on sheet No. Drawing No. T	

DEP 32.37.02.80 - Gen., sheet 12, 12/89

Line pipe and tubing - DEP 32.37.02.80-Gen., sheet 13 12/89

Issue	Item No.	Description			MESC	Notes
		Size	Type	Material		
	451					
	452	1/4 in. OD	Tubing - black	Polyethyl.	74.86.60.001.1	
	453					
	454	6 mm OD	Tubing - black	Polyethyl.	74.86.60.101.1	
	455					
	456					
	457	1/4 in. OD	Tubing - black (fire detection)	Polyethyl.	74.86.60.151.1	
	458					
	459	6 mm OD	Tubing - black (fire detection)	Polyethyl.	74.86.60.161.1	
	460					
	461					
	462					
	463					
	464					
	465					
	466					
	467					
	468					
	469					
	470					
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	472					
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Notes:

Made by :	Date :	Title : **SUMMARY OF INSTRUMENT INSTALLATION MATERIALS**	
Checked by :	Date :	Section 4 : List 4.4 Line pipe and tubing	
LOCATION :		PLANT :	Project & group No. :
Eng . by :			Sheet No.410 cont'd on sheet No.
Principal :			Drawing No. T

Instrument valves - DEP 32.37.02.80-Gen., sheet 14 12/89

Issue	Item No.	Description			MESC	Notes
		Size	Type	Material		
	501					
	502					
	503	1/4 in. NPT	Ball valve - screwed	Brass	77.07.00.001.1	
	504					
	505					
	506					
	507					
	508	1.2 in. NPT	Ball valve - screwed	CS	77.01.00.003.1	
	509					
	510					
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	524					
	525	1/2 in. NPT	Ball valve - screwed	SS	77.04.00.003.1	
	526					
	527	1/4 in. NPT	Needle valve - screwed	SS	77.34.08.001.1	
	528	1/2 in. NPT	Needle valve - screwed	SS	77.34.08.003.1	
	529					
	530	DN 50 (2 in.)	Ball valve - flanged	CS	77.00.00.008.1	
	531	DN 80 (3 in.)	Ball valve - flanged	CS	77.00.00.010.1	
	532	DN 50 (2 in.)	Ball valve - flanged	SS	77.03.08.008.1	
	533					
	534	3/8 in.	Needle valve - compression type	SS	77.34.09.002.1	
	535	10 mm	Needle valve - compression type	SS	77.34.09.052.1	
	536					
	537					
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	541					
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Notes:

Made by :	Date :	Title : **SUMMARY OF INSTRUMENT INSTALLATION MATERIALS**	
Checked by :	Date :	Section 4 : List 4.5 Instrument valves	
LOCATION :		PLANT :	Project & group No. :
Eng. by :			Sheet No.411 cont'd on sheet No.
Principal :			Drawing No. T

Instrument valves - DEP 32.37.02.80-Gen., sheet 15 12/89

Issue	Item No.	Description			MISC	Notes
		Size	Type	Material		
	551					
	552					
	553					
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Notes:

Made by :	Date :	Title : **SUMMARY OF INSTRUMENT INSTALLATION MATERIALS**	
Checked by :	Date :	Section 4 : List 4.5 Instrument valves	
LOCATION :		PLANT :	Project & group No. :
Eng . by :			Sheet No.412 cont'd on sheet No.
Principal :			Drawing No. T

Pipe fittings - DEP 32.37.02.80-Gen., sheet 16 12/89

Issue	Item No.	Description			MESC	Notes
		Size	Type	Material		
	601	1/4 in. NPT	Coupling - screwed	Bronze	76.01.28.004.1	
	602	1/2 in. NPT	Coupling - screwed	Bronze	76.01.28.008.1	
	603					
	604	1/4 in. NPT x 40 mm	Nipple - screwed	Brass	76.01.56.441.1	
	605	1/4 in. NPT x 100 mm	Nipple - screwed	Brass	76.01.56.444.1	
	606	1/2 in. NPT x 50 mm	Nipple - screwed	Brass	76.01.56.482.1	
	607	1/2 in. NPT x 100 mm	Nipple - screwed	Brass	76.01.56.484.1	
	608					
	609	1/4 in. NPT	Plug - screwed	Bronze	76.01.66.104.1	
	610	1/2 in. NPT	Plug - screwed	Bronze	76.01.66.108.1	
	611	1/2 x 1/4 in. NPT	Conc. reducer - Bushing - screwed	Bronze	76.01.14.081.1	
	612	1/4 in. NPT	Union - screwed	Bronze	76.01.91.004.1	
	613	1/2 in. NPT	Union - screwed	Bronze	76.01.91.008.1	
	614					
	615	1/2 x 1/4 in. NPT	Bushing - screwed	CS	76.05.14.081.1	
	616	1/4 in. NPT	Cap - screwed	CS	76.05.18.104.1	
	617	1/2 in. NPT	Cap - screwed	CS	76.05.18.108.1	
	618					
	619	1/4 in. NPT	Coupling - screwed	CS	76.05.28.104.1	
	620	1/2 in. NPT	Coupling - screwed	CS	76.05.28.108.1	
	621	1/4 in. NPT	Elbow 90° - screwed	CS	76.05.39.104.1	
	622	1/2 in. NPT	Elbow 90° - screwed	CS	76.05.39.108.1	
	623					
	624	1/4 in. NPT x 38 mm	Pipe nipple - screwed	CS	76.05.56.441.1	
	625	1/4 in. NPT x 102 mm	Pipe nipple - screwed	CS	76.05.56.444.1	
	626	1/2 in. NPT x 51 mm	Pipe nipple - screwed	CS	76.05.56.482.1	
	627	1/2 in. NPT x 102 mm	Pipe nipple - screwed	CS	76.05.56.484.1	
	628					
	629	1/4 in. NPT	Plug - screwed	CS	76.05.66.004.1	
	630	1/2 in. NPT	Plug - screwed	CS	76.05.66.008.1	
	631	1/2 x 1/4 in. NPT	Conc. reducer - screwed	CS	76.05.70.081.1	
	632					
	633					
	634	1/4 in. NPT	Tee - screwed	CS	76.05.84.104.1	
	635	1/2 in. NPT	Tee - screwed	CS	76.05.84.108.1	
	636					
	637					
	638	1/4 in. NPT	Union - screwed	CS	76.05.91.004.1	
	639	1/2 in. NPT	Union - screwed	CS	76.05.91.008.1	
	640					
	641					
	642					
	643					
	644					
	645					
	646	1/2 in. NPT x 76 mm	Pipe nipple - screwed / bevelled, schedule 40 S	AISI 316	76.09.57.332.1	
	647					
	648	1 in. NPT x 76 mm	Pipe nipple - screwed / bevelled, schedule 40 S	AISI 316	76.09.57.352.1	
	649					
	650	2 in. NPT x 76 mm	Pipe nipple - screwed / bevelled, schedule 40 S	AISI 316	76.09.57.381.1	

Notes:

Made by :	Date :	Title : **SUMMARY OF INSTRUMENT INSTALLATION MATERIALS**
Checked by :	Date :	Section 4 : List 4.6 Pipe fittings

LOCATION :	PLANT :	Project & group No. :
Eng. by :		Sheet No. 413 cont'd on sheet No.
Principal :		Drawing No. T

Pipe fittings - DEP 32.37.02.80-Gen., sheet 17 12/89

Issue	Item No.	Description			MESC	Notes
		Size	Type	Material		
	651	1/4 in. NPT x 35 mm	Hex pipe nipple - screwed	AISI 316	76.09.56.001.1	
	652	1/2 in. NPT x 45 mm	Hex pipe nipple - screwed	AISI 316	76.09.56.031.1	
	653					
	654					
	655					
	656					
	657					
	658					
	659					
	660					
	661					
	662					
	663	1/2 in. NPT x 51 mm	Pipe nipple - screwed,schedule 40S	AISI 316	76.09.56.131.1	
	664					
	665	1/2 in. NPT x 102 mm	Pipe nipple - screwed,schedule 40S	AISI 316	76.09.56.133.1	
	666					
	667					
	668	DN 50 (2 in.)	Elbow 90°, schedule 40 S	AISI 316	76.33.46.336.1	
	669					
	670					
	671					
	672	DN 50 (2 in.)	Stub end, schedule 40 S	AISI 316	76.33.54.336.1	
	673					
	674	DN 80 (3 in.)	Stub end, schedule 10 S	AISI 316	76.33.54.354.1	
	675					
	676					
	677	DN 50 x 25	Conc. reducer, schedule 40 S	AISI 316	76.33.69.636.1	
	678					
	679	DN 80 x 50	Conc. reducer, schedule 40 S	AISI 316	76.33.69.686.1	
	680					
	681					
	682					
	683	DN 50 (2 in.)	Tee, schedule 40 S	AISI 316	76.33.84.336.1	
	684					
	685	DN 50 (2 in.)	Flange - blind	CS	76.62.10.070.1	
	686					
	687					
	688	DN 50 (2 in.)	Flange - lap - joint	CS	76.62.20.220.1	
	689					
	690	DN 80 (3 in.)	Flange - lap - joint	CS	76.62.20.222.1	
	691					
	692	DN 50 (2 in.)	Flange - blind	AISI 316	76.65.10.670.1	
	693					
	694					
	695					
	696					
	697					
	698					
	699					
	700					

Notes:

Made by :	Date :	Title : **SUMMARY OF INSTRUMENT INSTALLATION MATERIALS**	
Checked by :	Date :	Section 4 : List 4.6 Pipe fittings	
LOCATION :		PLANT :	Project & group No. :
Eng . by : Principal :			Sheet No.414 cont'd on sheet No. Drawing No. T

Compression fittings s.s. and c.s - DEP 32.37.02.80-Gen., sheet 18 12/89

Issue	Item No.	Description			MESC	Notes
		Size	Type	Material		
	701					
	702					
	703					
	704					
	705					
	706					
	707					
	708					
	709					
	710					
	711					
	712					
	713					
	714					
	715					
	716					
	717					
	718					
	719					
	720					
	721					
	722					
	723	10 mm x DN 15	Lap - joint compression fitting	AISI 316	76.39.05.006.1	
	724					
	725					
	726					
	727	3/8 in. x DN 15	Lap - joint compression fitting	AISI 316	76.39.05.106.1	
	728					
	729					
	730					
	731	6 mm x G 1/4A in.	Male connector, compression type	AISI 316	76.39.25.003.1	
	732	6 mm x 1/4 in. NPT	Male connector, compression type	AISI 316	76.39.25.043.1	
	733	6 mm x 1/2 in. NPT	Male connector, compression type	AISI 316	76.39.25.047.1	
	734					
	735	10 mm x G 1/4A in.	Male connector, compression type	AISI 316	76.39.25.007.1	
	736	10mm x 1/4 in. NPT	Male connector, compression type	AISI 316	76.39.25.063.1	
	737	10mm x 1/2 in. NPT	Male connector, compression type	AISI 316	76.39.25.065.1	
	738					
	739	1/4 x 1/4 in. NPT	Male connector, compression type	AISI 316	76.39.27.043.1	
	740	1/4 x 1/2 in. NPT	Male connector, compression type	AISI 316	76.39.27.047.1	
	741					
	742	3/8 x G 1/4A in.	Male connector, compression type	AISI 316	76.39.27.007.1	
	743	3/8 x 1/4 in. NPT	Male connector, compression type	AISI 316	76.39.27.063.1	
	744	3/8 x 1/2 in. NPT	Male connector, compression type	AISI 316	76.39.27.065.1	
	745					
	746	6 mm	Union elbow, compression type, 90 deg.	AISI 316	76.39.42.043.1	
	747	10 mm	Union elbow, compression type, 90 deg.	AISI 316	76.39.42.065.1	
	748					
	749	1/4 in.	Union elbow, compression type, 90 deg.	AISI 316	76.39.44.043.1	
	750	3/8 in.	Union elbow, compression type, 90 deg.	AISI 316	76.39.44.065.1	

Notes:

Made by :	Date :	Title : **SUMMARY OF INSTRUMENT INSTALLATION MATERIALS**
Checked by :	Date :	Section 4 : List 4.7 Compression fittings s.s. and c.s.
LOCATION :	PLANT :	Project & group No. :
Eng . by :		Sheet No.415 cont'd on sheet No.
Principal :		Drawing No. T

Compression fittings s.s. and c.s. - DEP 32.37.02.80-Gen., sheet 19 12/89

Issue	Item No.	Description			MESC	Notes
		Size	Type	Material		
	751					
	752					
	753					
	754					
	755	1/4 in.	Plug, compression type	AISI 316	76.39.67.040.1	
	756	3/8 in.	Plug, compression type	AISI 316	76.39.67.060.1	
	757	6 mm	Plug, compression type	AISI 316	76.39.67.240.1	
	758	10 mm	Plug, compression type	AISI 316	76.39.67.260.1	
	759					
	760					
	761	6 mm	Union tee, compression type	AISI 316	76.39.83.243.1	
	762	10 mm	Union tee, compression type	AISI 316	76.39.83.265.1	
	763					
	764					
	765	1/4 in.	Union tee, compression type	AISI 316	76.39.85.043.1	
	766	3/8 in.	Union tee, compression type	AISI 316	76.39.85.063.1	
	767					
	768	6 mm	Union, compression type	AISI 316	76.39.89.043.1	
	769	10 mm	Union, compression type	AISI 316	76.39.89.063.1	
	770					
	771	1/4 in.	Union, compression type	AISI 316	76.39.91.043.1	
	772	3/8 in.	Union, compression type	AISI 316	76.39.91.063.1	
	773					
	774	6 mm	Bulkhead union, compression type	AISI 316	76.39.93.043.1	
	775	10 mm	Bulkhead union, compression type	AISI 316	76.39.93.063.1	
	776					
	777	1/4 in.	Bulkhead union, compression type	AISI 316	76.39.95.043.1	
	778	3/8 in.	Bulkhead union, compression type	AISI 316	76.39.95.063.1	
	779					
	780					
	781					
	782					
	783	16 mm x 1/2 in. NPT	Male connector, compression type	CS	76.39.24.277.1	
	784					
	785					
	786	16 mm	Union elbow, compression type, 90°	CS	76.39.41.280.1	
	787					
	788					
	789	16 mm	Union tee, compression type	CS	76.39.82.180.1	
	790					
	791					
	792	16 mm	Union, compression type	CS	76.39.88.280.1	
	793					
	794					
	795	16 mm	Plug for compression type fittings	CS	76.39.67.380.1	
	796					
	797					
	798					
	799					
	800					

Notes:

Made by :	Date :	Title : **SUMMARY OF INSTRUMENT INSTALLATION MATERIALS**
Checked by :	Date :	Section 4 : List 4.7 Compression fittings s.s. and c.s.
LOCATION :	PLANT :	Project & group No. :
Eng . by :		Sheet No. 416 cont'd on sheet No.
Principal :		Drawing No. T

Compression fittings brass - DEP 32.37.02.80-Gen., sheet 20 12/89

Issue	Item No.	Description			MESC	Notes
		Size	Type	Material		
	801					
	802					
	803	6 mm x 1/4 in. NPT	Male connector, compression type	Brass	76.40.24.041.1	
	804					
	805					
	806					
	807					
	808					
	809					
	810	6 mm x 1/4 in. NPT	Female connector, compression type	Brass	76.40.24.241.1	
	811					
	812					
	813	1/4 x 1/4 in. NPT	Male connector, compression type	Brass	76.40.26.041.1	
	814					
	815	3/8 x 1/2 in. NPT	Male connector, compression type	Brass	76.40.26.064.1	
	816					
	817					
	818					
	819					
	820	1/4 x 1/4 in. NPT	Female connector, compression type	Brass	76.40.26.241.1	
	821					
	822	6 mm x 1/4 in. NPT	Male elbow, compression type, 90°	Brass	76.40.37.041.1	
	823					
	824					
	825					
	826					
	827	1/4 x 1/4 in. NPT	Male elbow, compression type, 90°	Brass	76.40.39.141.1	
	828					
	829					
	830					
	831					
	832	10 mm	Union elbow, compression type, 90°	Brass	76.40.41.006.1	
	833					
	834	3/8 in.	Union elbow, compression type, 90°	Brass	76.40.43.006.1	
	835					
	836					
	837	6 mm	Union tee, compression type	Brass	76.40.82.004.1	
	838					
	839					
	840					
	841					
	842	1/4 in.	Union tee, compression type	Brass	76.40.84.004.1	
	843					
	844					
	845					
	846	6 mm	Union, compression type	Brass	76.40.88.004.1	
	847					
	848	10 mm	Union, compression type	Brass	76.40.88.006.1	
	849					
	850					

Notes:

Made by :	Date :	Title : **SUMMARY OF INSTRUMENT INSTALLATION MATERIALS**	
Checked by :	Date :	Section 4 : List 4.8 Compression fittings brass	
LOCATION :	PLANT :	Project & group No. :	
Eng. by :		Sheet No.417 cont'd on sheet No.	
Principal :		Drawing No. T	

Compression fitting brass - DEP 32.37.02.80-Gen., sheet 21 12/89

Issue	Item No.	Description			MESC	Notes
		Size	Type	Material		
	851					
	852					
	853	G 1/8 in.	Clip-in coupling	Plastic	76.40.88.704.1	
	854					
	855					
	856					
	857	6 mm	Nut and ferrules, for item 853	Brass	76.40.88.726.2	
	858					
	859	1/4 in.	Nut and ferrules, for item 853	Brass	76.40.88.736.2	
	860					
	861					
	862	6 mm	Insert	Brass	76.40.88.746.2	
	863					
	864	1/4 in.	Insert	Brass	76.40.88.756.2	
	865					
	866					
	867	6 mm	Male run tee, compression type	Brass	76.40.88.776.1	
	868					
	869	1/4 in.	Male run tee, compression type	Brass	76.40.88.786.1	
	870					
	871					
	872					
	873					
	874					
	875					
	876	1/4 in.	Union, compression type	Brass	76.40.90.004.1	
	877					
	878	3/8 in.	Union, compression type	Brass	76.40.90.006.1	
	879					
	880					
	881	6 mm	Bulkhead union, compression type	Brass	76.40.92.104.1	
	882					
	883	10 mm	Bulkhead union, compression type	Brass	76.40.92.106.1	
	884					
	885					
	886	1/4 in.	Bulkhead union, compression type	Brass	76.40.94.104.1	
	887					
	888	3/8 in.	Bulkhead union, compression type	Brass	76.40.94.106.1	
	889					
	890					
	891	1/4 in. NPT	Quick coupling female half	Brass	73.37.22.407.1	
	892	1/4 in. NPT	Quick connection, male	Brass	73.37.22.405.1	
	893	4 mm	Dust cap, for item 892	PVC	73.37.22.604.1	
	894	4 mm	Dust plug, for item 891	PVC	73.37.22.614.1	
	895					
	896					
	897					
	898					
	899					
	900					

Notes:

Made by :	Date :	Title : **SUMMARY OF INSTRUMENT INSTALLATION MATERIALS**
Checked by :	Date :	Section 4 : List 4.8 Compression fittings brass

LOCATION :	PLANT :	Project & group No. :
Eng . by :		Sheet No.418 cont'd on sheet No.
Principal :		Drawing No. T

DEP 32.37.02.80 - Gen., sheet 21, 12/89

General materials - DEP 32.37.02.80-Gen., sheet 22 12/89

Issue	Item No.	Description			MESC	Notes
		Size	Type	Material		
	901					
	902					
	903					
	904					
	905					
	906					
	907					
	908					
	909					
	910					
	911	25 x 25 x 3 mm	Steel angle (length 6 m)	CS	78.47.01.325.1	
	912					
	913					
	914					
	915					
	916	45 x 30 x 4 mm	Steel angle (length 6 m)	CS	78.47.05.345.1	
	917					
	918					
	919					
	920					
	921					
	922					
	923					
	924					
	925					
	926					
	927					
	928					
	929					
	930					
	931	M 6 x 90 mm	Hex bolt	CS	81.01.77.130.1	
	932					
	933					
	934					
	935					
	936	M 6 x 60 mm	Foundation bolt	CS	81.26.25.101.1	
	937	M 8 x 75 mm	Foundation bolt	CS	81.26.25.106.1	
	938	M 10 x 80 mm	Foundation bolt	CS	81.26.25.111.1	
	939	M 12 x 90 mm	Foundation bolt	CS	81.26.25.131.1	
	940	M 12 x 110 mm	Foundation bolt	CS	81.26.25.133.1	
	941					
	942					
	943					
	944					
	945					
	946	1/2 in. x 55 mm	Stud bolt with 2 nuts	Alloy st.	81.38.61.152.1	
	947	1/2 in. x 65 mm	Stud bolt with 2 nuts	Alloy st.	81.38.61.154.1	
	948	1/2 in. x 70 mm	Stud bolt with 2 nuts	Alloy st.	81.38.61.155.1	
	949	1/2 in. x 80 mm	Stud bolt with 2 nuts	Alloy st.	81.38.61.157.1	
	950					

Notes:

Made by :	Date :	Title : **SUMMARY OF INSTRUMENT INSTALLATION MATERIALS**	
Checked by :	Date :	Section 4 : List 4.9 General materials	
LOCATION :	PLANT :	Project & group No. :	
Eng . by :		Sheet No.419 cont'd on sheet No.	
Principal :		Drawing No. T	

General materials - DEP 32.37.02.80-Gen., sheet 23 12/89

Issue	Item No.	Description			MESC	Notes
		Size	Type	Material		
	951	5/8 in. x 80 mm	Stud bolt with 2 nuts	Alloy steel	81.36.61.269.1	
	952	5/8 in. x 95 mm	Stud bolt with 2 nuts	Alloy steel	81.36.61.272.1	
	953					
	954	M 4	Nut, hexagon	Brass	81.44.76.010.1	
	955					
	956	M 6	Nut, hexagon	Brass	81.44.76.014.1	
	957	M 8	Nut, hexagon	Brass	81.44.76.016.1	
	958	M 10	Nut, hexagon	Brass	81.44.76.018.1	
	959					
	960	M 4 x 16 mm	Machine screw	Brass	81.62.29.691.1	
	961					
	962	M 6 x 25 mm	Machine screw	Brass	81.62.29.733.1	
	963	M 8 x 30 mm	Machine screw	Brass	81.62.29.754.1	
	964	M 10 x 40 mm	Machine screw	Brass	81.62.29.779.1	
	965					
	966					
	967					
	968					
	969					
	970					
	971	No. 6 x 6.5 mm	Self-tapping screw	St.- Ni. pl	81.66.12.004.1	
	972	No. 6 x 9.5 mm	Self-tapping screw	St.- Ni. pl	81.66.12.010.1	
	973	No. 8 x 9.5 mm	Self-tapping screw	St.- Ni. pl	81.66.12.014.1	
	974	No. 10 x 9.5 mm	Self-tapping screw	St.- Ni. pl	81.66.12.016.1	
	975					
	976					
	977					
	978					
	979					
	980					
	981	M 4	Flat washer	Brass	81.78.06.154.1	
	982					
	983	M 6	Flat washer	Brass	81.78.06.156.1	
	984	M 8	Flat washer	Brass	81.78.06.158.1	
	985	M 10	Flat washer	Brass	81.78.06.160.1	
	986	M 4	Lock washer internal/external	CS	81.78.12.158.1	
	987					
	988	M 6	Lock washer internal/external	CS	81.78.12.162.1	
	989	M 8	Lock washer internal/external	CS	81.78.12.164.1	
	990	M 10	Lock washer internal/external	CS	81.78.12.166.1	
	991	12.5 mm	Tape for thread sealing	PTFE	85.15.78.038.1	
	992	From 22 mm dia. bar	Tubing spacer	Non - metallic	-	
	993					
	994					
	995					
	996					
	997					
	998	DN 50 (2 in.)	Gasket	CAF	85.31.02.014.1	
	999	DN 80 (3 in.)	Gasket	CAF	85.31.02.018.1	

Notes:

Made by :	Date :	Title : **SUMMARY OF INSTRUMENT INSTALLATION MATERIALS**	
Checked by :	Date :	Section 4 : List 4.9 General materials	
LOCATION :	PLANT :	Project & group No. :	
Eng. by :		Sheet No. 420 cont'd on sheet No.	
Principal :		Drawing No. T	

Cover sheet - DEP 32.37.02.81-Gen., sheet 1 7/92 **(DEP Circular 44/92)**

INSTRUMENT IMPULSE LINES (METRIC VERSION)

Section	Sheets	Subject
1	101	Cover sheet
2	201 – 299	Index of sheets
3	301 – 399	Index of instruments
4	401 –	Components
5	501 – 505	Mounting supports
6	601 – 699	Flow instruments
7	701 – 799	Level instruments
8	801 – 899	Pressure instruments
9	901 – 999	Miscellaneous instruments (Note 3)
10	1001 – 1099	Tracing of instruments
11	1101 – 1199	Thermal expansion Requirements for excessive movement of pipes
12	1201 – 1299	Requirements for vibrating pipes

Engineering notes

1. Guidance on selection of the particular "hook–up" sheet for various services is given in DEP 32.37.10.11–Gen.

2. For guidance during the preparation of the set of drawings for instrument impulse lines, the following pages show the general arrangement of the sheets, as well as a number of typical examples of drawings.
   For further details, see DEP 32.37.10.11–Gen.

3. When miscellaneous instruments (other than for flow, level, pressure, temperature) must be included, these shall be shown on sheets numbered sequentially from 901 up to 999, as needed.

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue				
Checked by:	Date:	METRIC VERSION	Date				
Appr. by :	Date:	Section 1 – Cover sheet	By				
LOCATION :		PLANT :	Project & group No.:				
Eng. by : Principal :			Sheet No. 101 Drawing No. T				

DEP 32.37.02.81 – Gen.. sheet 1. 7/92

Index of sheets - DEP 32.37.02.81-Gen., sheet 2 7/92 **(DEP Circular 44/92)**

Sheet No.	Issue	Revisions date				Sheet No.	Issue	Revisions date			
	0	A	B	C	D		0	A	B	C	D

Index of instruments - DEP 32.37.02.81-Gen., sheet 3 7/92 **(DEP Circular 44/92)**

Tag No.	Quantity	Mounting Support Type	Mounting Support Size	Impulse lines Sheet No.	Proctecting facilities (See below)	Remarks

Components - DEP 32.37.02.81-Gen., sheet 4 7/92 **(DEP Circular 44/92)**

Issue	Mat. item	Size or connection	Description	Material	MESC
	030	DN 15 x 1/2 in. NPT	Isolate/vent gauge block – smooth finish – (LPR)	AISI 316	60.98.55.200.1
	031	DN 15 x 1/2 in. NPT	Isolate/vent gauge block – smooth finish – (HPR)	AISI 316	60.98.55.210.1
	032	DN 15 x G 1/2 in.	Isolate/vent gauge block – smooth finish – (LPR)	AISI 316	60.98.55.220.1
	033	DN 15 x G 1/2 in.	Isolate/vent gauge block – smooth finish – (HPR)	AISI 316	60.98.55.230.1
	034	DN 15 x 1/2 in. NPT	Syphon isolate/vent gauge block – smooth finish – (LPR)	AISI 316	60.98.55.300.1
	035	DN 15 x 1/2 in. NPT	Syphon isolate/vent gauge block – smooth finish – (HPR)	AISI 316	60.98.55.310.1
	036	DN 15 x G 1/2 in.	Syphon isolate/vent gauge block – smooth finish – (LPR)	AISI 316	60.98.55.320.1
	037	DN 15 x G 1/2 in.	Syphon isolate/vent gauge block – smooth finish – (HPR)	AISI 316	60.98.55.330.1
	038	10 mm	Single isolate/vent block (DP model)	AISI 316	60.98.56.235.1
	041	10 mm	Double isolate/vent block	AISI 316	60.98.56.215.1
	044	10 mm	Single isolate/vent block	AISI 316	60.98.56.225.1
	047	10 mm	Double isolate/equalize/vent block	AISI 316	60.98.56.205.1
	050	10mm x 1/2 in.NPT M.	Isolate/vent block	AISI 316	60.98.56.305.1
	051	10mm x 1/2 in.NPT F.	Isolate/vent block	AISI 316	60.98.56.315.1
	052	10mm x G1/2 in.	Isolate/vent block	AISI 316	60.98.56.317.1
	057	10 mm	Manifold steam tracing block	AISI 316	60.98.70.010.1
	060	–	Manifold electrical heater assembly	AISI 316	60.98.70.050.1
	064	–	Anti Tamper Key	AISI 316	60.98.56.905.1
	066	10 mm	Single purge filter block with vent valve	AISI 316	60.98.70.210.1
	070	10 mm	Double purge filter block with vent valve	AISI 316	60.98.70.220.1
	074	10 mm	Seal pot with vent valve	AISI 316	60.98.70.510.1
	081	6 mm	Filling connector	AISI 316	60.98.90.106.1
	083	G 1/4 A in.	Port protector	AISI 316	60.98.90.207.1
	086	–	Blind kidney flange	AISI 316	60.98.90.307.1
	087	10 mm	Purge orifice nipple	AISI 316	60.98.90.710.1
	092	330 x 280 mm	Mounting plate L-shape	AISI 316	60.98.91.105.1
	093	330 x 150 mm	Mounting plate rectangular	AISI 316	60.98.91.118.1
	095	–	Protective shade	Non metallic	60.98.91.205.1
	096	–	Body enclosure	Non metallic	60.98.91.305.1
	407	DN 25 (1 in.)	Line pipe sched. 40 S	AISI 316	74.36.23.034.1
	424	10 mm OD	Tubing – wall thickness 1.5 mm	AISI 316	74.48.50.121.1
	527	1/4 in. NPT	Needle valve – screwed	AISI 316	77.34.08.001.1
	528	1/2 in. NPT	Needle valve – screwed	AISI 316	77.34.08.003.1
	651	1/4 in. NPT x 35 mm	Hex pipe nipple – screwed	AISI 316	76.09.56.001.1
	652	1/2 in. NPT x 45 mm	Hex pipe nipple – screwed	AISI 316	76.09.56.031.1
	723	10 mm x DN 15	Lapped joint compression fitting – smooth finish	AISI 316	76.39.05.006.1
	735	10 mm x G 1/4 A in.	Male connector compression type	AISI 316	76.39.25.007.1
	736	10 mm x 1/4 in. NPT	Male connector compression type	AISI 316	76.39.25.063.1
	737	10 mm x 1/2 in. NPT	Male connector compression type	AISI 316	76.39.25.065.1
	747	10 mm	Union elbow compression type	AISI 316	76.39.42.065.1
	758	10 mm	Plug compression type	AISI 316	76.39.67.260.1
	762	10 mm	Union tee compression type	AISI 316	76.39.83.265.1
	769	10 mm	Union compression type	AISI 316	76.39.89.063.1
	992	From 22 mm dia. bar	Tubing spacer	Non metallic	81.86.79.020.1

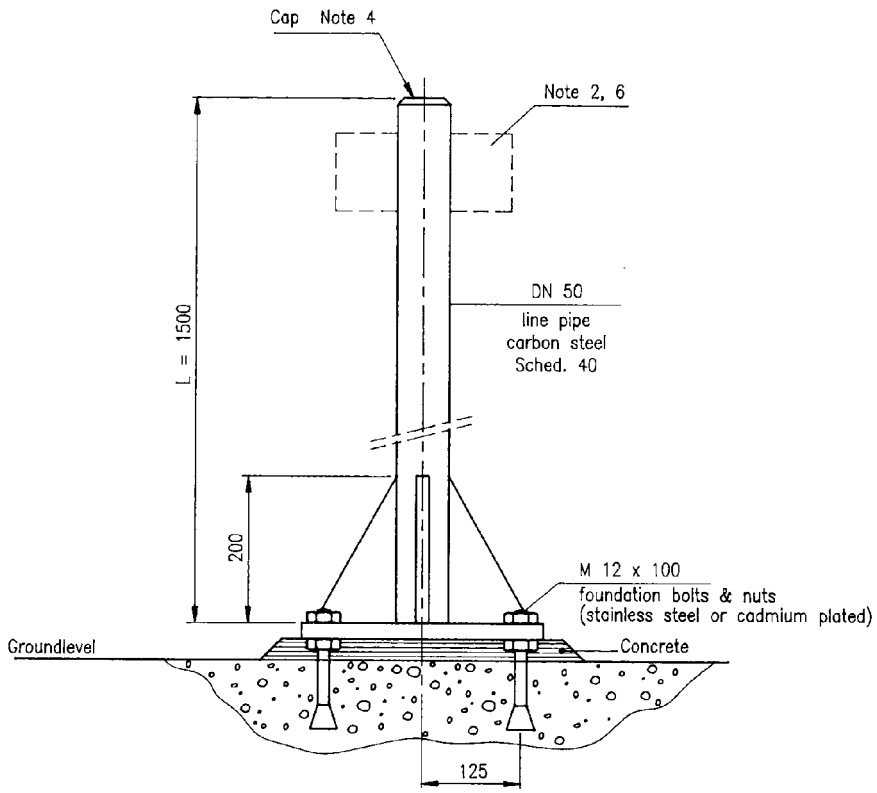
NOTE:
For complete material specification, see standard form
'Summary of instrument installation materials' DEP 32.37.02.80-Gen.

Made by :	Date:	Title : **INSTRUMENT IMPULSE LINES** METRIC VERSION	Issue					
Checked by:	Date:		Date					
Appr. by :	Date:	Section 4 – Components	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. 401 cont'd on sheet No. Drawing No. T					

Components - DEP 32.37.02.81-Gen., sheet 5 7/92 **(DEP Circular 44/92)**

Issue	Mat. item	Size or connection	Description	Material	MESC

Mounting supports - DEP 32.37.02.81-Gen., sheet 6 7/92 **(DEP Circular 44/92)**



TYPE S1
FOR CONCRETE FLOORS

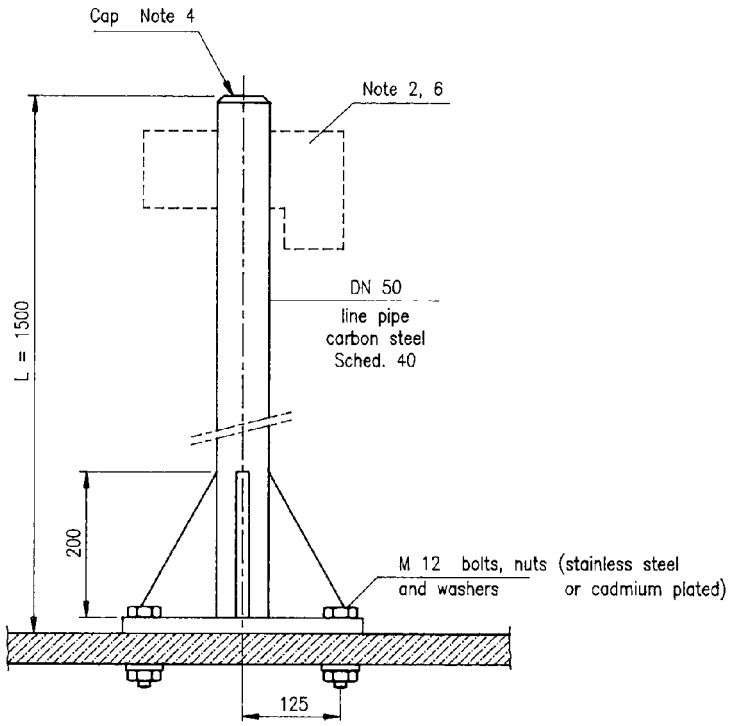
NOTES:

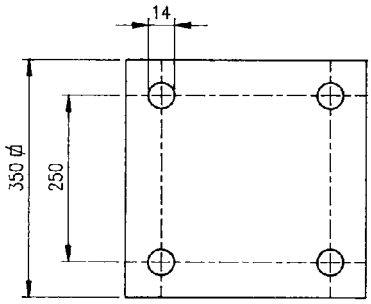
1) Plates and strips carbon steel 10 mm thick.
2) For dimensions of mounting plate, see S–37813 or S–37.814.
3) Finish: after shotblasting a preserving agent shall be applied as per requistion.
4) Cap material: ☐ plastic or ☐ carbon steel
5) Dimensions in millimetres.
6) Mounting plates are supplied separately and shall be fixed to the support at the construction site.

Made by :	Date:	Title : **INSTRUMENT IMPULSE LINES**	Issue					
Checked by:	Date:	METRIC VERSION	Date					
Appr. by :	Date:	Section 5 – Mounting supports	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. 501 cont'd on sheet No. Drawing No. T					

DEP 32.37.02.81 – Gen., sheet 6, 7/92

Mounting supports - DEP 32.37.02.81-Gen., sheet 7 7/92 **(DEP Circular 44/92)**





TYPE S2
FOR GRATING AND STEEL PLATFORMS

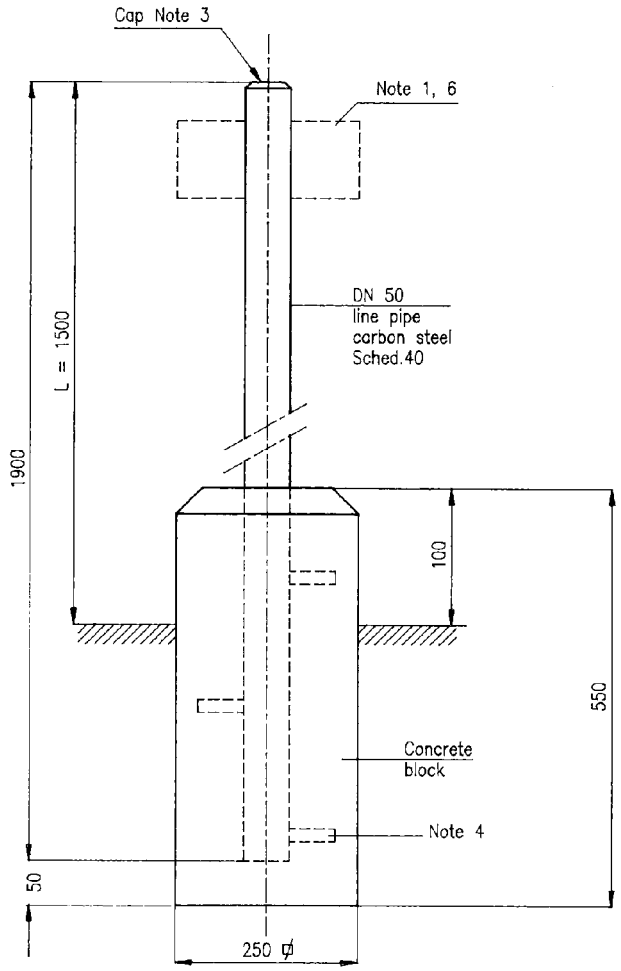
NOTES:

1) Plates and strips carbon steel 10 mm thick.
2) For dimensions of mounting plate, see S–37.813 or S–37.814.
3) Finish: after shotblasting a preserving agent shall be applied as per requistion.
4) Cap material: ☐ plastic or ☐ carbon steel
5) Dimensions in millimetres.
6) Mounting plates are supplied separately and shall be fixed to the support at the construction site.

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	METRIC VERSION	Date					
Appr. by :	Date:	Section 5 – Mounting supports	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. 502 cont'd on sheet No. Drawing No. T					

DEP 32.37.02.81 – Gen., sheet 7, 7/92

Mounting supports - DEP 32.37.02.81-Gen., sheet 8 7/92 **(DEP Circular 44/92)**



TYPE S3
FOR UNPAVED AREAS

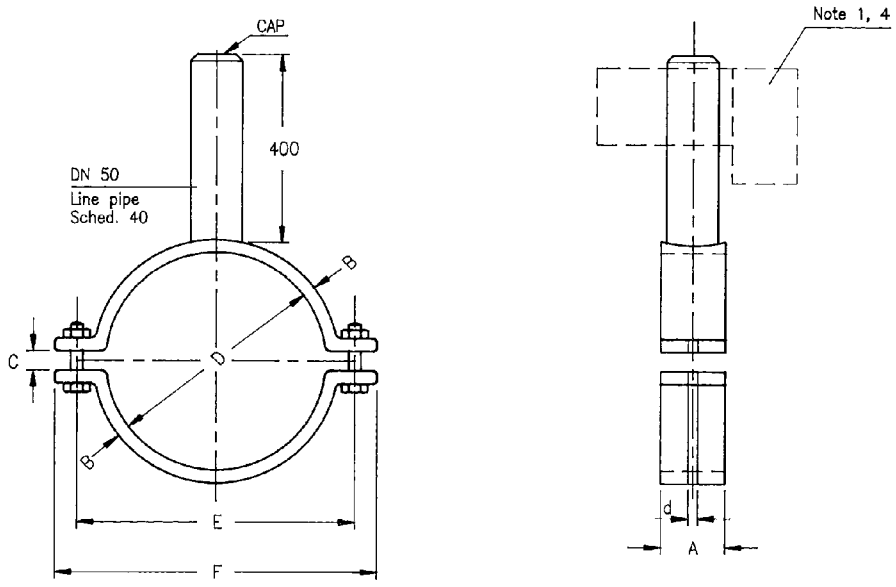
NOTES:

1) For dimensions of mounting plate, see S – 37.813 or S – 37.814.
2) Finish: after shotblasting a preserving agent shall be applied as per requisition.
3) Cap material : □ plastic or □ carbon steel.
4) Anchor strips welded to support.
5) Dimensions in milimetres.
6) Mounting plates are supplied separately and shall be fixed to the support at the construction site.

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	METRIC VERSION	Date					
Appr. by :	Date:	Section 5 – Mounting supports	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. 503 cont'd on sheet No. Drawing No. T					

DEP 32.37.02.81 – Gen., sheet 8, 7/92

Mounting supports - DEP 32.37.02.81-Gen., sheet 9 7/92 **(DEP Circular 44/92)**



TYPE S4

STRAIGHT SUPPORT FOR LINE MOUNTING

(RESTRICTED USE, SEE DEP 32.37.10.11 – Gen.)

NOTES:

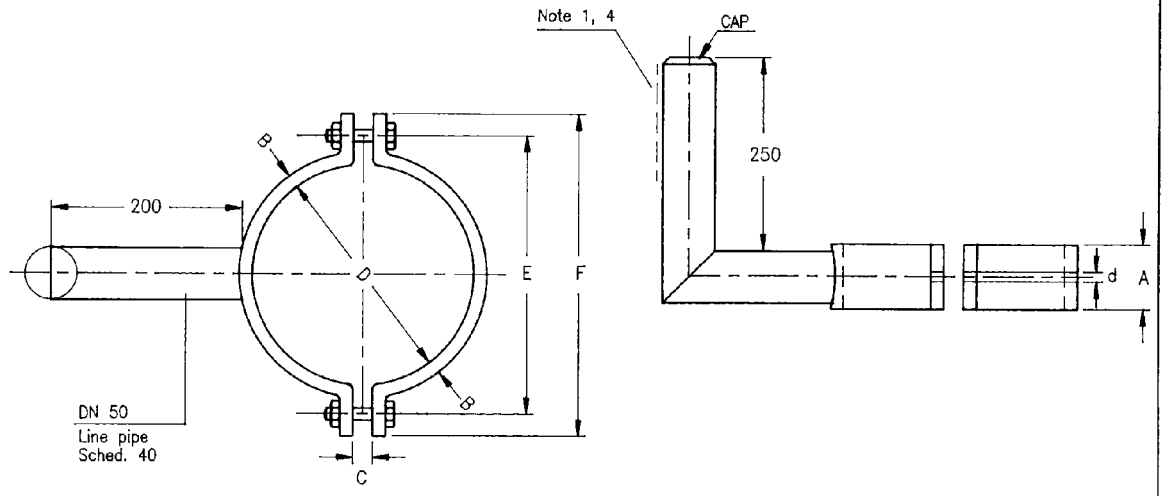
1) For dimensions of mounting plate, see S–37.813 or S–37.814.
2) Material of clamps : carbon steel
   Cap : ☐ plastic or ☐ carbon steel
   Line pipe : carbon steel
   Bolts and nuts : unified black hexagon, heavy series.
3) Finish : after shotblasting a preserving agent shall be applied as per requisition.
4) Mounting plates are supplied separately and shall be fixed to the support at the construction site.

Nom line size	Dimensions in millimetres							Bolt data
	A	B	C	D	E	F	Bolt hole d	
DN 100	65	5	12	117	180	230	22	M20 x 45
DN 150		8		171	250	300		M20 x 50
DN 200				223	300	350		
DN 250	75	10	20	277	360	410		M20 x 65
DN 300				328	420	470		
DN 350		12		360	460	510		M20 x 70
DN 400				410	520	570		
DN 450				462	570	620		
DN 500				512	620	670		
DN 600	90		24	615	720	780	28	M24 x 80

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES		Issue				
Checked by:	Date:	METRIC VERSION		Date				
Appr. by :	Date:	Section 5 – Mounting supports		By				
LOCATION :		PLANT :		Project & group No.:				
Eng. by :				Sheet No. 504 cont'd on sheet No.				
Principal :				Drawing No. T				

DEP 32.37.02.81 – Gen., sheet 9, 7/92

Mounting supports - DEP 32.37.02.81-Gen., sheet 10 7/92 **(DEP Circular 44/92)**



TYPE S5
ANGLE SUPPORT FOR LINE MOUNTING
(RESTRICTED USE, SEE DEP 32.37.10.11 – Gen.)

NOTES:

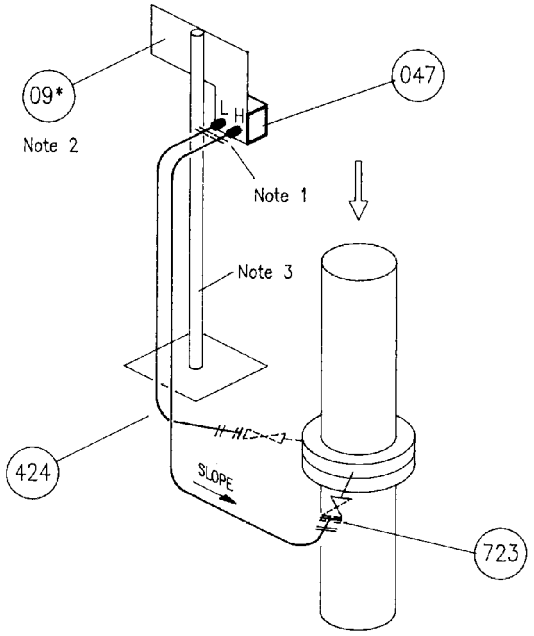
1) For dimensions of mounting plate, see S–37.813 or S–37.814.
2) Material of clamps : carbon steel
   Cap : ☐ plastic or ☐ carbon steel
   Line pipe : carbon steel
   Bolts and nuts : unified black hexagon, heavy series.
3) Finish : after shotblasting a preserving agent shall be applied as per requisition.
4) Mounting plates are supplied separately and shall be fixed to the support at the construction site.

Nom line size	Dimensions in millimetres							Bolt data
	A	B	C	D	E	F	Bolt hole d	
DN 100	65	5	12	117	180	230	22	M20 x 45
DN 150		8		171	250	300		M20 x 50
DN 200				223	300	350		
DN 250	75	10	20	277	360	410		M20 x 65
DN 300				328	420	470		
DN 350		12		360	460	510		M20 x 70
DN 400				410	520	570		
DN 450				462	570	620		
DN 500				512	620	670		
DN 600	90		24	615	720	780	28	M24 x 80

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES METRIC VERSION		Issue			
Checked by:	Date:			Date			
Appr. by :	Date:	Section 5 – Mounting supports		By			
LOCATION :		PLANT :		Project & group No.:			
Eng. by : Principal :				Sheet No. 505 cont'd on sheet No. Drawing No. T			

DEP 32.37.02.81 – Gen., sheet 10, 7/92

Flow instruments - DEP 32.37.02.81-Gen., sheet 11 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1
3) This support is typical.
   For selected type see section 3

Item	Quantity	Size or connection	Description	Material	MESC
047	1	10 mm	Double isolate /equalize / vent block	SS	60.98.56.205.1
09.*	1	–	mounting plate L-shape /rectangular	SS	60.98.91
424	3 m	10 mm OD	Tubing – Wall thickness 1.5 mm	SS	74.48.50.121.1
723	2	10 mm x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.006.1

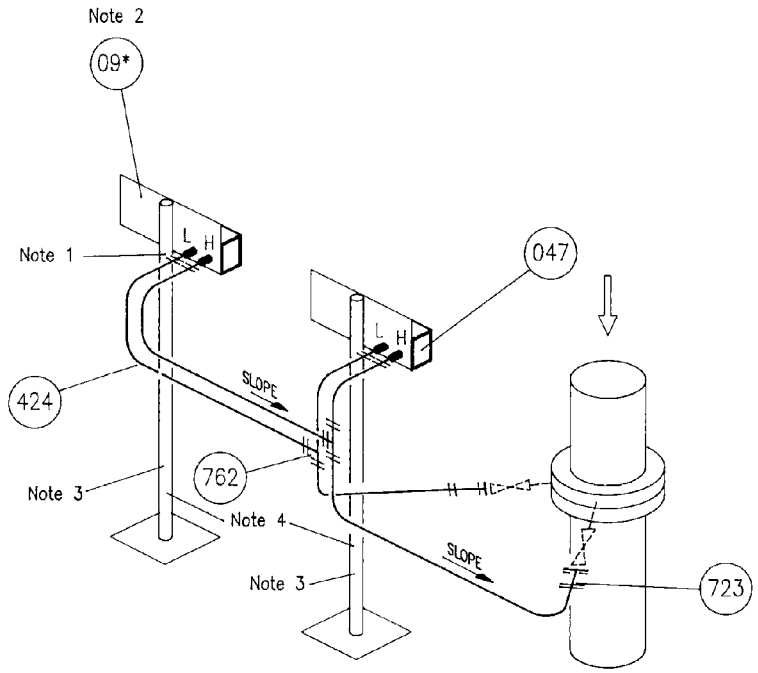
GAS FLOW
FLOW IN EITHER DIRECTION

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES		Issue				
Checked by:	Date:	METRIC VERSION		Date				
Appr. by :	Date:	Section 6 – Flow instruments		By				
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.81 – Gen., sheet 11, 7/92

Flow instruments - DEP 32.37.02.81-Gen., sheet 12 7/92 **(DEP Circular 44/92)**

Tag No.



NOTES:

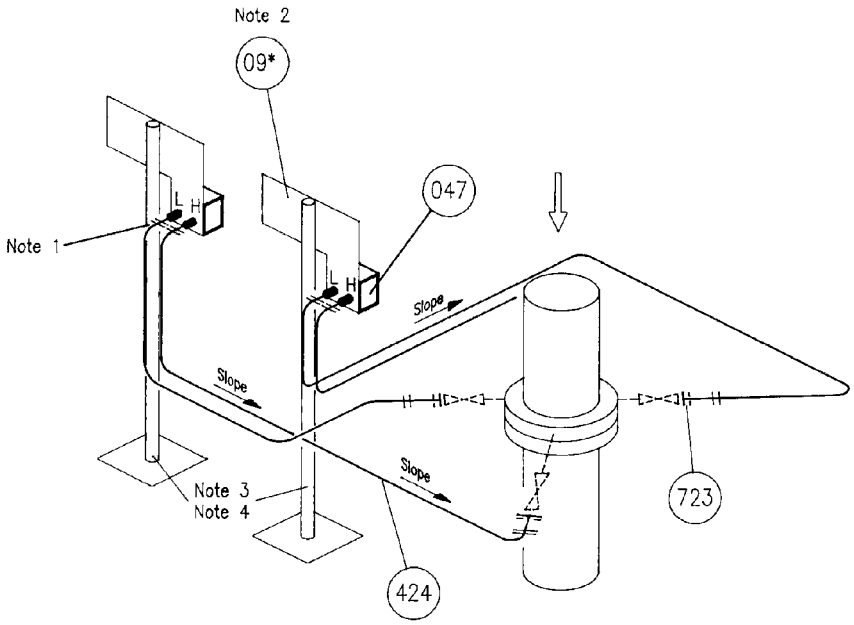
1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1
3) This support is typical. For this application, also a pipe support may be considered. (For restrictions see DEP 32.37.10.11 – Gen.)
4) Instruments either mounted on separate supports or on one support.

Item	Quantity	Size or connection	Description	Material	MESC
047	2	10 mm	Double isolate /equalize / vent block	SS	60.98.56.205.1
09.*	2	–	Mounting plate L–shape /rectangular	SS	60.98.91
424	4 m	10 mm OD	Tubing – Wall thickness 1.5 mm	SS	74.48.50.121.1
723	2	10 mm x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.006.1
762	2	10 mm	Union tee compression type	SS	76.39.83.265.1

GAS FLOW
DUAL RANGE TRANSMITTERS
FLOW IN EITHER DIRECTION

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	METRIC VERSION	Date					
Appr. by :	Date:	Section 6 – Flow instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

Flow instruments - DEP 32.37.02.81-Gen., sheet 13 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1
3) This support is typical. For this application, also a pipe support may be considered. (For restrictions see DEP 32.37.10.11 – Gen.)
4) Instruments either mounted on separate supports or on one support.

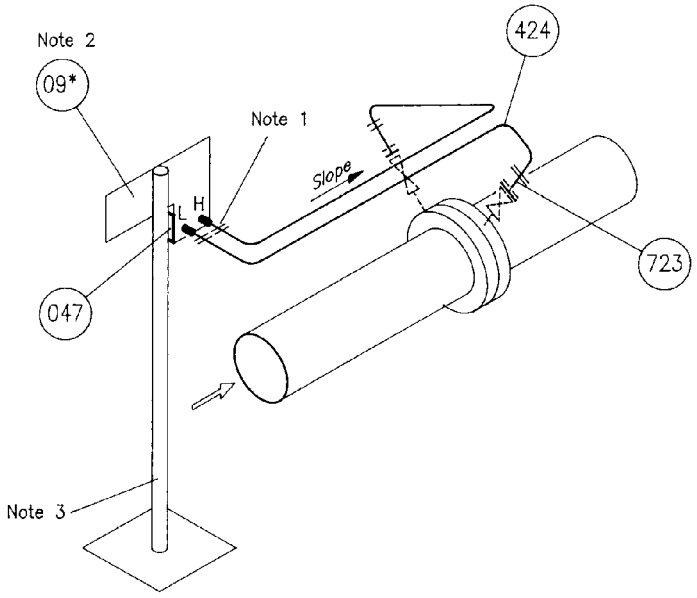
Item	Quantity	Size or connection	Description	Material	MESC
047	2	10 mm	Double isolate /equalize / vent block	SS	60.98.56.205.1
09.*	2	–	Mounting plate L–shape /rectangular	SS	60.98.91
424	6 m	10 mm OD	Tubing – Wall thickness 1.5 mm	SS	74.48.50.121.1
723	4	10 mm x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.006.1

GAS FLOW
CONTROL/EMERGENCY – 2 TRANSMITTERS
FLOW IN EITHER DIRECTION

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	METRIC VERSION	Date					
Appr. by :	Date:	Section 6 – Flow instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

Flow instruments - DEP 32.37.02.81-Gen., sheet 14 7/92 **(DEP Circular 44/92)**

Tag No.



NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1.
3) This support is typical. For selected type see section 3.

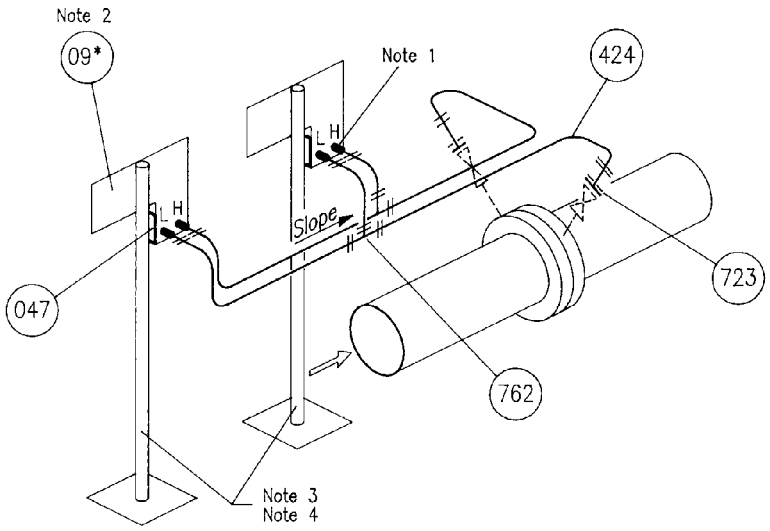
Item	Quantity	Size or connection	Description	Material	MESC
047	1	10 mm	Double isolate / equalize / vent block	SS	60.98.56.205.1
09.*	1	–	Mounting plate L–shape / rectangular	SS	60.98.91.
424	3 m	10 mm OD	Tubing – Wall thickness 1.5 mm	SS	74.48.50.121.1
723	2	10 mm x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.006.1

GAS FLOW

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES		Issue				
Checked by:	Date:	METRIC VERSION		Date				
Appr. by :	Date:	Section 6 – Flow instruments		By				
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.81 – Gen., sheet 14, 7/92

Flow instruments - DEP 32.37.02.81-Gen., sheet 15 7/92 **(DEP Circular 44/92)**



NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1
3) This support is typical. For this application, also a pipe support may be considered. (For restrictions see DEP 32.37.10.11 – Gen.)
4) Instruments either mounted on separate supports or on one support.

Tag No.

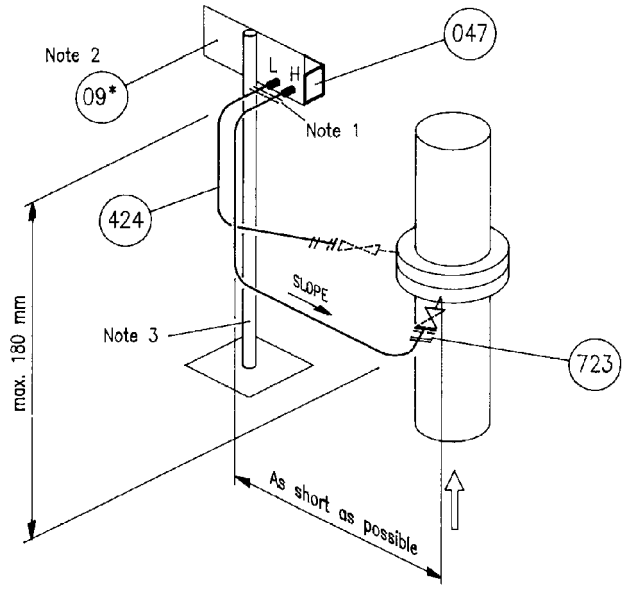
Item	Quantity	Size or connection	Description	Material	MESC
047	2	10 mm	Double isolate /equalize / vent block	SS	60.98.56.205.1
09.*	2	–	Mounting plate L-shape /rectangular	SS	60.98.91
424	4 m	10 mm OD	Tubing – Wall thickness 1.5 mm	SS	74.48.50.121.1
723	2	10 mm x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.006.1
762	2	10 mm	Union tee compression type	SS	76.39.83.265.1

GAS FLOW
2 TRANSMITTERS

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	METRIC VERSION	Date					
Appr. by :	Date:	Section 6 – Flow instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.81 – Gen., sheet 15, 7/92

Flow instruments - DEP 32.37.02.81-Gen., sheet 16 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1
3) This support is typical. For this application, also a pipe support may be considered. (For restrictions see DEP 32.37.10.11 – Gen.)

Item	Quantity	Size or connection	Description	Material	MESC
047	1	10 mm	Double isolate /equalize / vent block	SS	60.98.56.205.1
09.*	1	–	Mounting plate L–shape /rectangular	SS	60.98.91
424	3 m	10 mm OD	Tubing – Wall thickness 1.5 mm	SS	74.48.50.121.1
723	2	10 mm x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.006.1

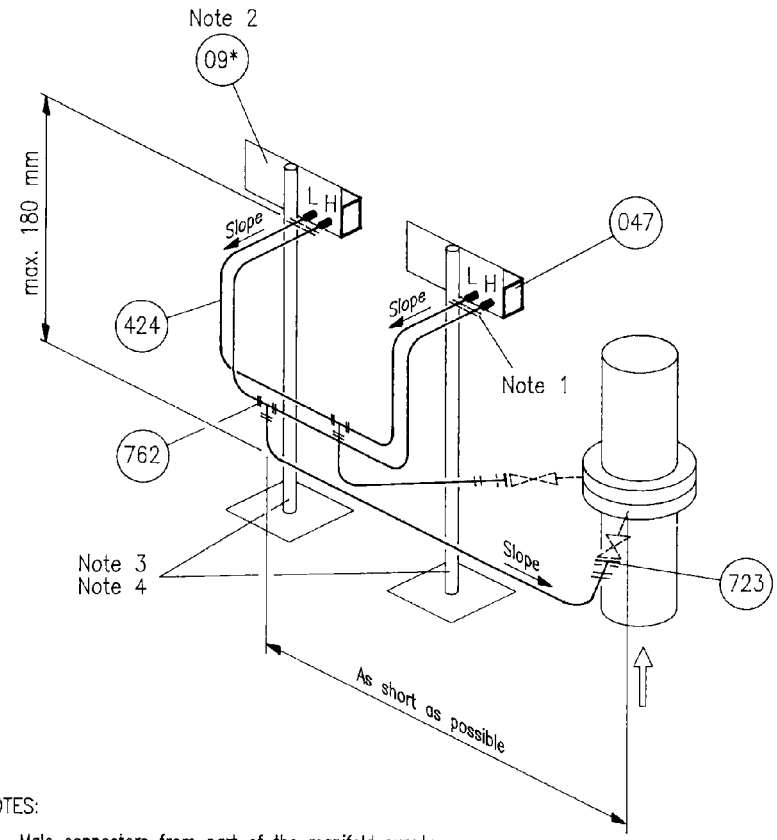
LIQUID FLOW – CLOSE COUPLED
UPWARD FLOW ONLY

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue		
Checked by:	Date:	METRIC VERSION	Date		
Appr. by :	Date:	Section 6 – Flow instruments	By		
LOCATION :		PLANT :	Project & group No.:		
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T		

DEP 32.37.02.81 – Gen., sheet 16, 7/92

Flow instruments - DEP 32.37.02.81-Gen., sheet 17 7/92 **(DEP Circular 44/92)**

Tag No.



NOTES:

1) Male connectors from part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1.
3) This support is typical. For this application, also a pipe support may be considered. (For restrictions see DEP 32.37.10.11 – Gen.)
4) Instruments either mounted on separate supports or on one support.

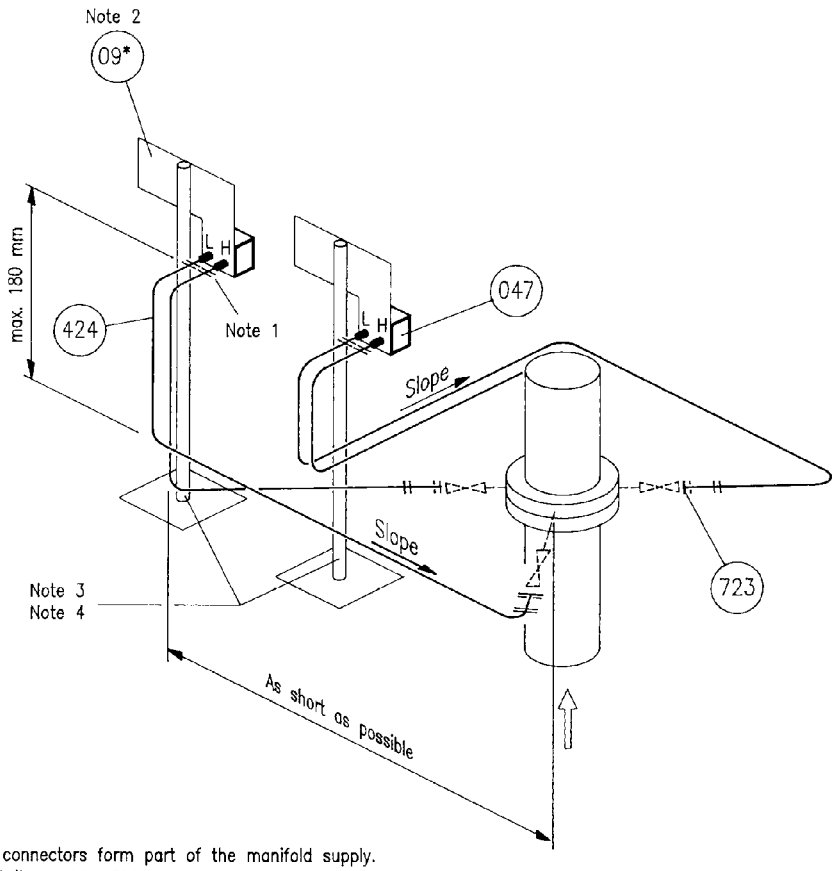
Item	Quantity	Size or connection	Description	Material	MESC
047	2	10 mm	Double isolate / equalize / vent block	SS	60.98.56.205.1
09.*	2	–	Mounting plate L-shape / rectangular	SS	60.98.91.
424	4 m	10 mm OD	Tubing – Wall thickness 1.5 mm	SS	74.48.50.121.1
723	2	10 mm x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.006.1
762	2	10 mm	Union tee compression type	SS	76.39.83.265.1

LIQUID FLOW – CLOSE COUPLED
DUAL RANGE TRANSMITTERS
UPWARD FLOW ONLY

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue		
Checked by:	Date:	METRIC VERSION	Date		
Appr. by :	Date:	Section 6 – Flow instruments	By		
LOCATION :		PLANT :	Project & group No.:		
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T		

DEP 32.37.02.81 – Gen., sheet 17, 7/92

Flow instruments - DEP 32.37.02.81-Gen., sheet 18 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1
3) This support is typical. For this application, also a pipe support may be considered. (For restrictions see DEP 32.37.10.11 – Gen.)
4) Instruments either mounted on separate supports or on one support.

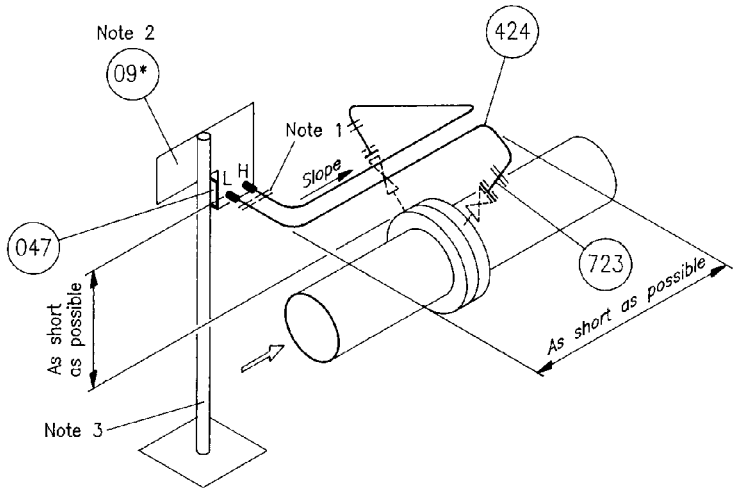
Item	Quantity	Size or connection	Description	Material	MESC
047	2	10 mm	Double isolate /equalize / vent block	SS	60.98.56.205.1
09.*	2	–	Mounting plate L–shape /rectangular	SS	60.98.91
424	6 m	10 mm OD	Tubing – Wall thickness 1.5 mm	SS	74.48.50.121.1
723	4	10 mm x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.006.1

LIQUID FLOW – CLOSE COUPLED
CONTROL/EMERGENCY – 2 TRANSMITTERS
UPWARD FLOW ONLY

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	METRIC VERSION	Date					
Appr. by :	Date:	Section 6 – Flow instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.81 – Gen., sheet 18, 7/92

Flow instruments - DEP 32.37.02.81-Gen., sheet 19 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1.
3) This support is typical. For this application, also a pipe support may be considered. (For restriction see DEP 32.37.10.11 – Gen.)

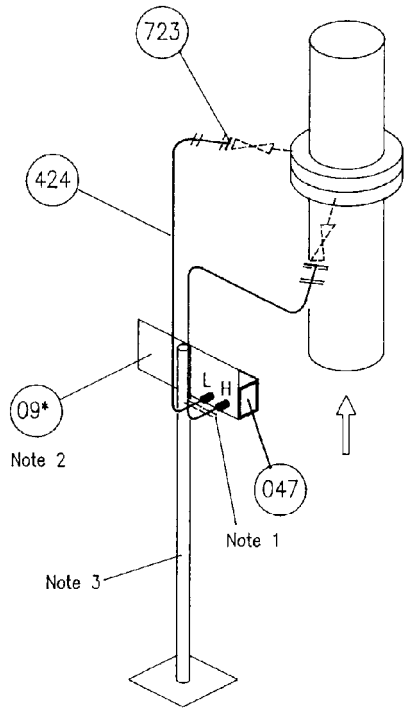
Item	Quantity	Size or connection	Description	Material	MESC
047	1	10 mm	Double isolate / equalize / vent block	SS	60.98.56.205.1
09.*	1	–	Mounting plate L-shape / rectangular	SS	60.98.91.
424	3 m	10 mm OD	Tubing – Wall thickness 1.5 mm	SS	74.48.50.121.1
723	2	10 mm x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.006.1

LIQUID FLOW – CLOSE COUPLED

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	METRIC VERSION	Date					
Appr. by :	Date:	Section 6 – Flow instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.81 – Gen., sheet 19, 7/92

Flow instruments - DEP 32.37.02.81-Gen., sheet 20 7/92 **(DEP Circular 44/92)**



NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1
3) This support is typical.
   For selected type see section 3

Tag No.

Item	Quantity	Size or connection	Description	Material	MESC
047	1	10 mm	Double isolate /equalize / vent block	SS	60.98.56.205.1
09.*	1	–	Mounting plate L-shape /rectangular	SS	60.98.91
424	3 m	10 mm OD	Tubing – Wall thickness 1.5 mm	SS	74.48.50.121.1
723	2	10 mm x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.006.1

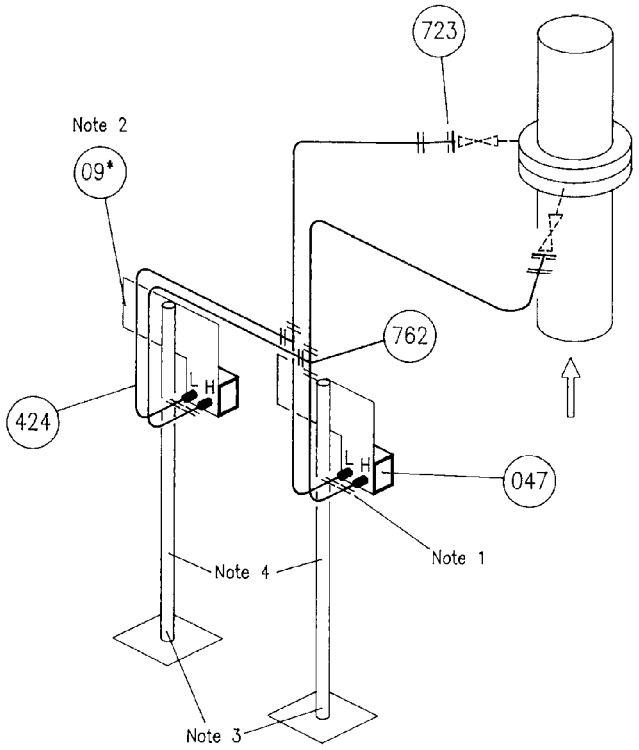
LIQUID FLOW – REMOTE MOUNTING
UPWARD FLOW ONLY

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue		
Checked by:	Date:	METRIC VERSION	Date		
Appr. by :	Date:	Section 6 – Flow instruments	By		
LOCATION :		PLANT :	Project & group No.:		
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T		

DEP 32.37.02.81 – Gen., sheet 20, 7/92

Flow instruments - DEP 32.37.02.81-Gen., sheet 21 7/92 **(DEP Circular 44/92)**

Tag No.



NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1
3) This support is typical.
   For selected type see section 3
4) Instruments either mounted on separate supports or on one support.

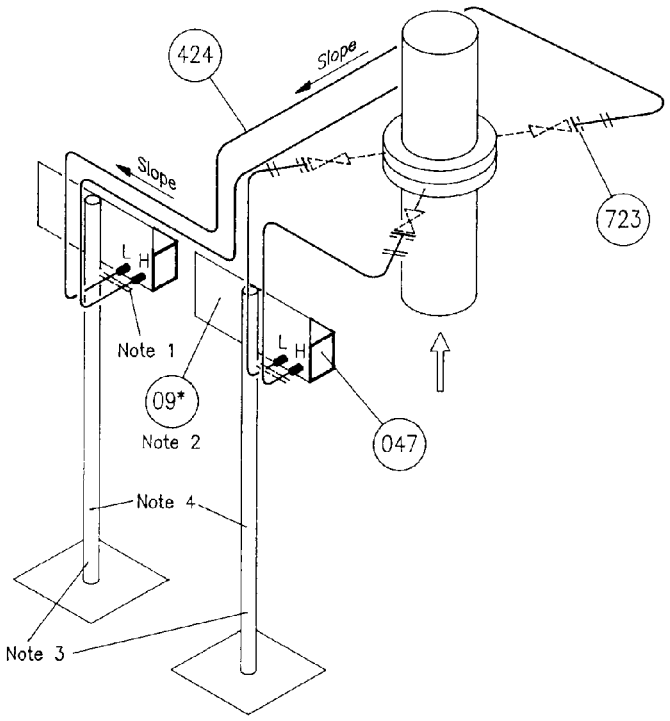
Item	Quantity	Size or connection	Description	Material	MESC
047	2	10 mm	Double isolate /equalize / vent block	SS	60.98.56.205.1
09.*	2	–	Mounting plate L–shape /rectangular	SS	60.98.91
424	4 m	10 mm OD	Tubing – Wall thickness 1.5 mm	SS	74.48.50.121.1
723	2	10 mm x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.006.1
762	2	10 mm	Union tee compression type	SS	76.39.83.265.1

LIQUID FLOW – REMOTE MOUNTING
DUAL RANGE TRANSMITTERS
UPWARD FLOW ONLY

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES		Issue				
Checked by:	Date:	METRIC VERSION		Date				
Appr. by :	Date:	Section 6 – Flow instruments		By				
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.81 – Gen., sheet 21, 7/92

Flow instruments - DEP 32.37.02.81-Gen., sheet 22 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1.
3) This support is typical. For selected type see section 3.
4) Instruments either mounted on separate supports or on one support.

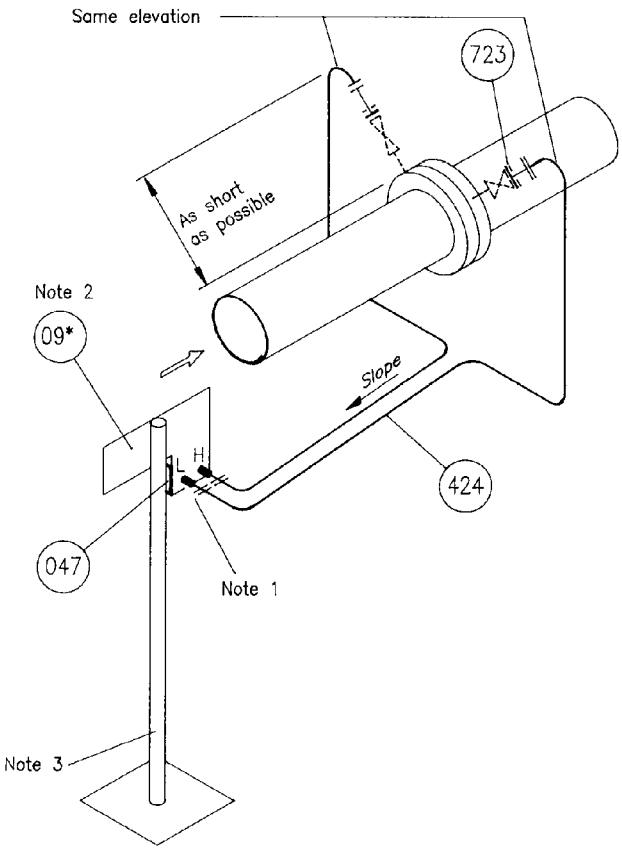
Item	Quantity	Size or connection	Description	Material	MESC
047	2	10 mm	Double isolate / equalize / vent block	SS	60.98.56.205.1
09.*	2	–	Mounting plate L-shape / rectangular	SS	60.98.91.
424	6 m	10 mm OD	Tubing – Wall thickness 1.5 mm	SS	74.48.50.121.1
723	4	10 mm x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.006.1

LIQUID FLOW – REMOTE MOUNTING
CONTROL/EMERGENCY – 2 TRANSMITTRES
UPWARD FLOW ONLY

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue		
Checked by:	Date:	METRIC VERSION	Date		
Appr. by :	Date:	Section 6 – Flow instruments	By		
LOCATION :		PLANT :	Project & group No.:		
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T		

DEP 32.37.02.81 – Gen., sheet 22, 7/92

Flow instruments - DEP 32.37.02.81-Gen., sheet 23 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1.
3) This support is typical. For selected type see section 3.

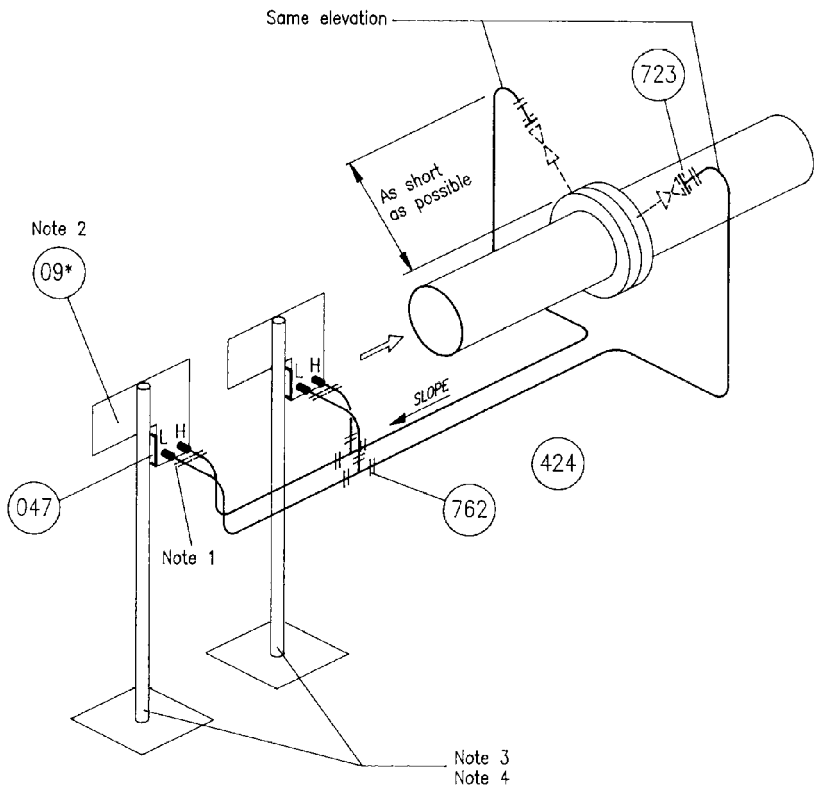
Item	Quantity	Size or connection	Description	Material	MESC
047	1	10 mm	Double isolate / equalize / vent block	SS	60.98.56.205.1
09.*	1	–	Mounting plate L-shape / rectangular	SS	60.98.91.
424	3 m	10 mm OD	Tubing – Wall thickness 1.5 mm	SS	74.48.50.121.1
723	2	10 mm x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.006.1

LIQUID FLOW – REMOTE MOUNTING

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	METRIC VERSION	Date					
Appr. by :	Date:	Section 6 – Flow instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.81 – Gen., sheet 23, 7/92

Flow instruments - DEP 32.37.02.81-Gen., sheet 24 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1
3) This support is typical. For this application, also a pipe support may be considered. (For restrictions see DEP 32.37.10.11 – Gen.)
4) Instruments either mounted on separate supports or on one support.

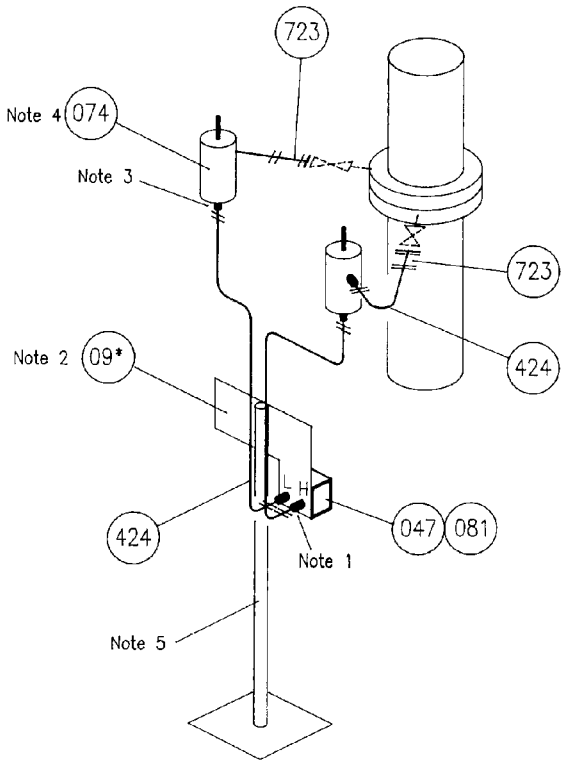
Item	Quantity	Size or connection	Description	Material	MESC
047	2	10 mm	Double isolate /equalize / vent block	SS	60.98.56.205.1
09.*	2	–	Mounting plate L–shape /rectangular	SS	60.98.91
424	4 m	10 mm OD	Tubing – Wall thickness 1.5 mm	SS	74.48.50.121.1
723	2	10 mm x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.006.1
762	2	10 mm	Union tee compression type	SS	76.39.83.265.1

LIQUID FLOW – REMOTE MOUNTING
2 TRANSMITTERS

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue		
Checked by:	Date:	METRIC VERSION	Date		
Appr. by :	Date:	Section 6 – Flow instruments	By		
LOCATION :		PLANT :	Project & group No.:		
Eng. : Principal :			Sheet No. cont'd on sheet No. Drawing No. T		

DEP 32.37.02.81 – Gen., sheet 24, 7/92

Flow instruments - DEP 32.37.02.81-Gen., sheet 25 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1
3) Male connectors form a part of the seal pot supply.
4) Seal pots (items 074) shall be at the same elevation and well supported.
5) This support is typical.
   For selected type see section 3.

Item	Quantity	Size or connection	Description	Material	MESC
047	1	10 mm	Double isolate /equalize / vent block	SS	60.98.56.205.1
074	2	10 mm	Seal pot with vent valve	SS	60.98.70.510.1
081	2	6 mm	Filling connector	SS	60.98.90.106.1
09.*	1	–	Mounting plate L-shape / rectangular	SS	60.98.91
424	3 m	10 mm OD	Tubing – Wall thickness 1.5 mm	SS	74.48.50.121.1
723	2	10 mm x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.006.1

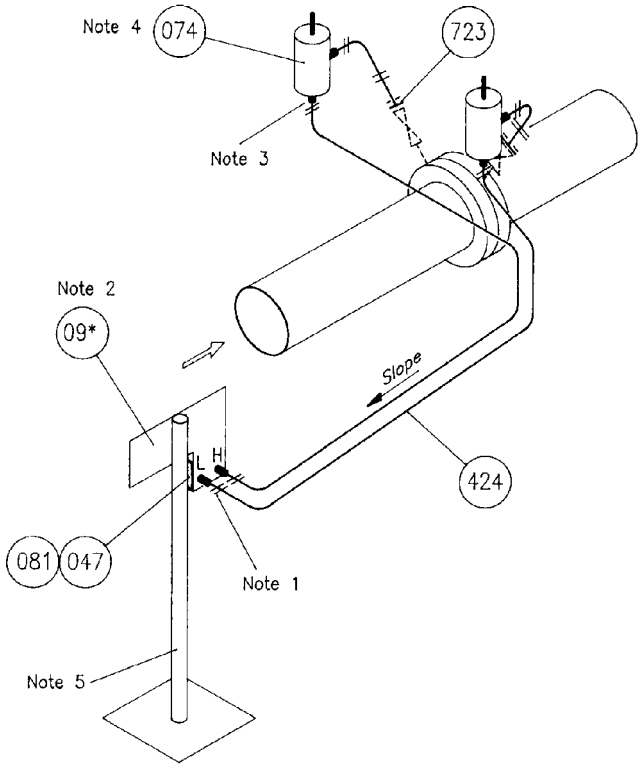
STEAM FLOW

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	METRIC VERSION	Date					
Appr. by :	Date:	Section 6 – Flow instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.81 – Gen., sheet 25, 7/92

Flow instruments - DEP 32.37.02.81-Gen., sheet 26 7/92 **(DEP Circular 44/92)**

Tag No.



NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1.
3) Male connectors form a part of the sealpot supply.
4) Seal pots (item 074) shall be at the same elevation and well supported.
5) This support is typical. For selected type see section 3.

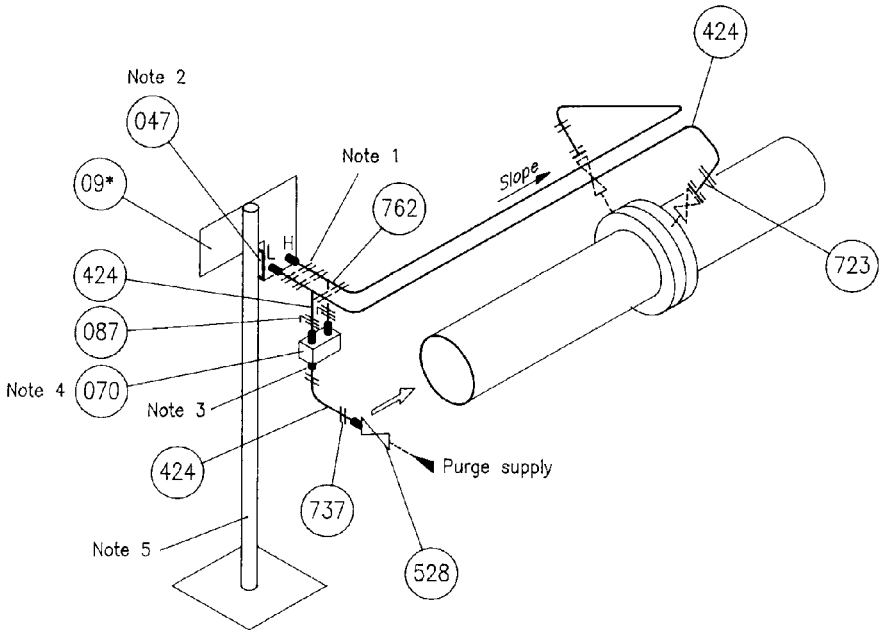
Item	Quantity	Size or connection	Description	Material	MESC
047	1	10 mm	Double isolate / equalize / vent block	SS	60.98.56.205.1
074	2	10 mm	Seal pot with vent valve	SS	60.98.70.510.1
081	2	6 mm	Filling connector	SS	60.98.90.106.1
09.*	1	–	Mounting plate L-shape / rectangular	SS	60.98.91.
424	3 m	10 mm OD	Tubing – Wall thickness 1.5 mm	SS	74.48.50.121.1
723	2	10 mm x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.006.1

STEAM FLOW

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue		
Checked by:	Date:	METRIC VERSION	Date		
Appr. by :	Date:	Section 6 – Flow instruments	By		
LOCATION :		PLANT :	Project & group No.:		
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T		

DEP 32.37.02.81 – Gen., sheet 26, 7/92

Flow instruments - DEP 32.37.02.81-Gen., sheet 27 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

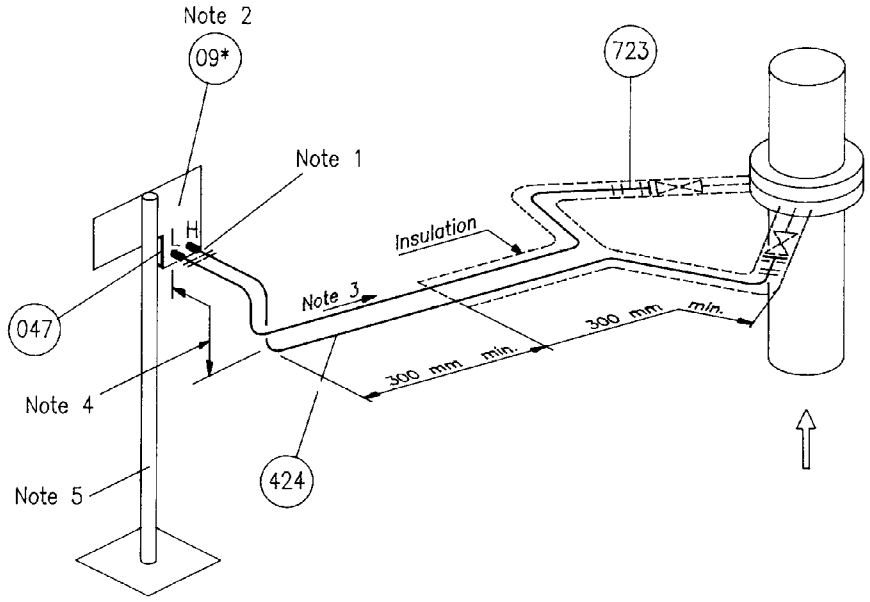
1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1.
3) Male connectors form a part of the purge filter block supply.
4) Bracket of purge filter block (item 070) shall be bolted to mounting support.
5) This support is typical. For selected type see section 3.

Item	Quantity	Size or connection	Description	Material	MESC
047	1	10 mm	Double isolate / equalize / vent block	SS	60.98.56.205.1
070	1	10 mm	Double purge filter block with vent valve	SS	60.98.70.220.1
087	2	10 mm	Purge orifice nipple	SS	60.98.90.710.1
09.*	1	–	Mounting plate L–shape / rectangular	SS	60.98.91.
424	3 m	10 mm OD	Tubing – Wall thickness 1.5 mm	SS	74.48.50.121.1
528	1	1/2 in. NPT	Needle valve – screwed	SS	77.34.08.003.1
723	2	10 mm x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.006.1
737	1	10 mm x 1/2 in. NPT	Male connector compression type	SS	76.39.25.065.1
762	2	10 mm	Union tee compression type	SS	76.39.83.265.1
			EXTERNAL PURGE		

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue		
Checked by:	Date:	METRIC VERSION	Date		
Appr. by :	Date:	Section 6 – Flow instruments	By		
LOCATION :		PLANT :	Project & group No.:		
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T		

DEP 32.37.02.81 – Gen., sheet 27, 7/92

Flow instruments - DEP 32.37.02.81-Gen., sheet 28 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

1) Male connectors from part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1.
3) Slope 1:10 to 1:20 and at same elevation.
4) This distance as short as possible.
5) This support is typical.
   For selected type see section 3

Item	Quantity	Size or connection	Description	Material	MESC
047	1	10 mm	Double isolate / equalize / vent block	SS	60.98.56.205.1
09.*	1	–	Mounting plate L-shape / rectangular	SS	60.98.91.
424	4 m	10 mm OD	Tubing – Wall thickness 1.5 mm	SS	74.48.50.121.1
723	2	10 mm x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.006.1

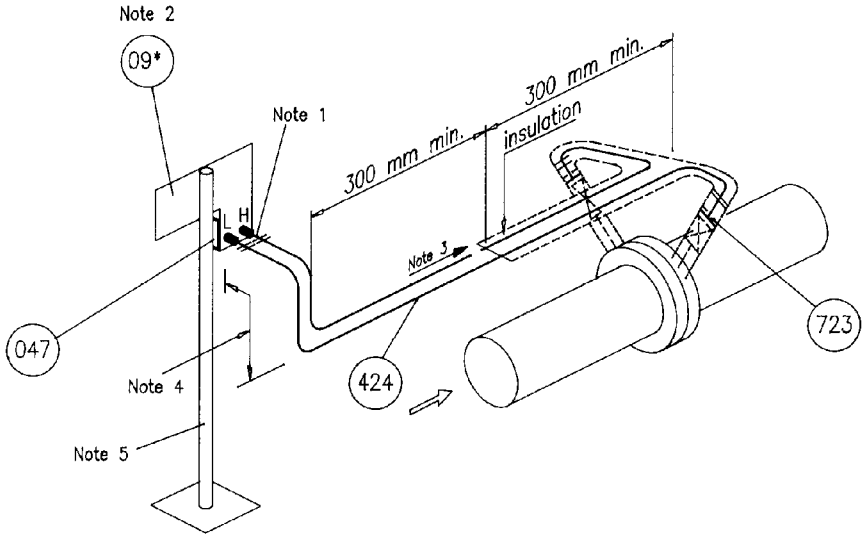
LIQUID FLOW – SELF PURGE
CRYOGENIC-LPG
UPWARD FLOW ONLY

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	METRIC VERSION	Date					
Appr. by :	Date:	Section 6 – Flow instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. : Principal :			Sheet No. 605 cont'd on sheet No. 606 Drawing No. T					

DEP 32.37.02.81. – Gen., sheet 28, 7/92

Flow instruments - DEP 32.37.02.81-Gen., sheet 29 7/92 **(DEP Circular 44/92)**

Tag No.



NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1
3) Slope 1:10 to 1:20 and at same elevation.
4) This distance as short as possible.
5) This support is typical.
   For selected type see section 3.

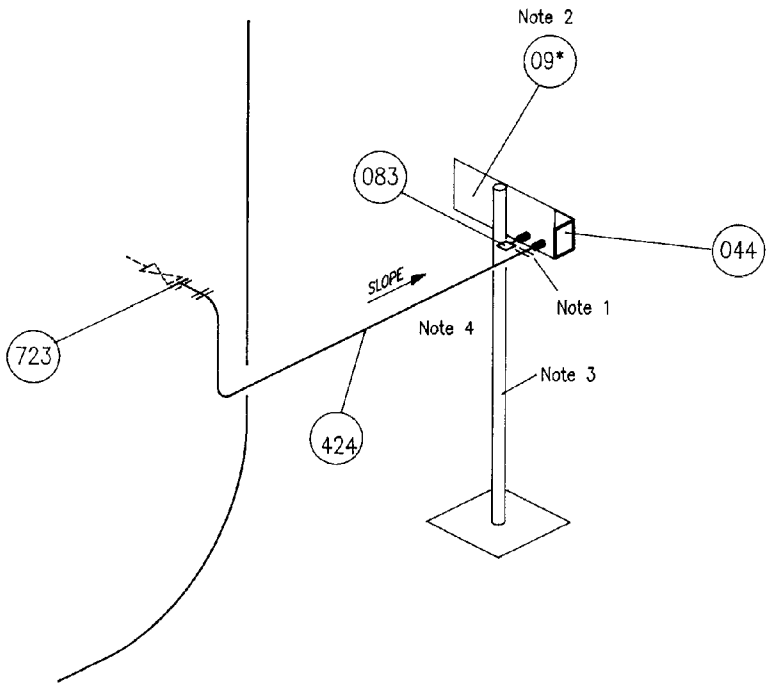
Item	Quantity	Size or connection	Description	Material	MESC
047	1	10 mm	Double isolate /equalize / vent block	SS	60.98.56.205.1
09.*	1	–	Mounting plate L-shape /rectangular	SS	60.98.91
424	4 m	10 mm OD	Tubing – Wall thickness 1.5 mm	SS	74.48.50.121.1
723	2	10 mm x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.006.1

LIQUID FLOW CRYOGENIC-LPG
SELF PURGE

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	METRIC VERSION	Date					
Appr. by :	Date:	Section 6 – Flow instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.81 – Gen., sheet 29, 7/92

Level instruments - DEP 32.37.02.81-Gen., sheet 30 7/92 **(DEP Circular 44/92)**



NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1
3) This support is typical.
   For selected type see section 3.
4) D.P. transmitter to be mounted as close as possible to bottom tapping.

Item	Quantity	Size or connection	Description	Material	MESC
044	1	10 mm	Single isolate / vent block	SS	60.98.56.225.1
083	1	G 1/4 A	Port protector	SS	60.98.90.207.1
09.*	1	–	Mounting plate L-shape /rectangular	SS	60.98.91
424	2 m	10 mm OD	Tubing – Wall thickness 1.5 mm	SS	74.48.50.121.1
723	1	10 mm x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.006.1

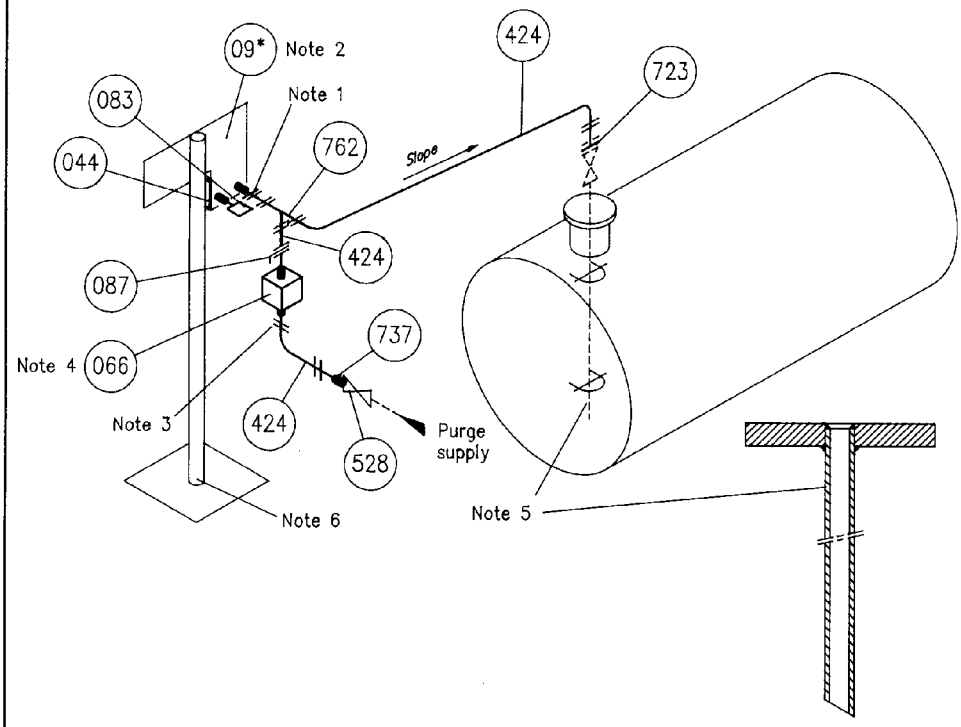
OPEN VESSEL

Tag No.

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue		
Checked by:	Date:	METRIC VERSION	Date		
Appr. by :	Date:	Section 7 – Level instruments	By		
LOCATION :		PLANT :	Project & group No.:		
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T		

DEP 32.37.02.81 – Gen., sheet 30, 7/92

Level instruments - DEP 32.37.02.81-Gen., sheet 31 7/92 **(DEP Circular 44/92)**



Tag No.

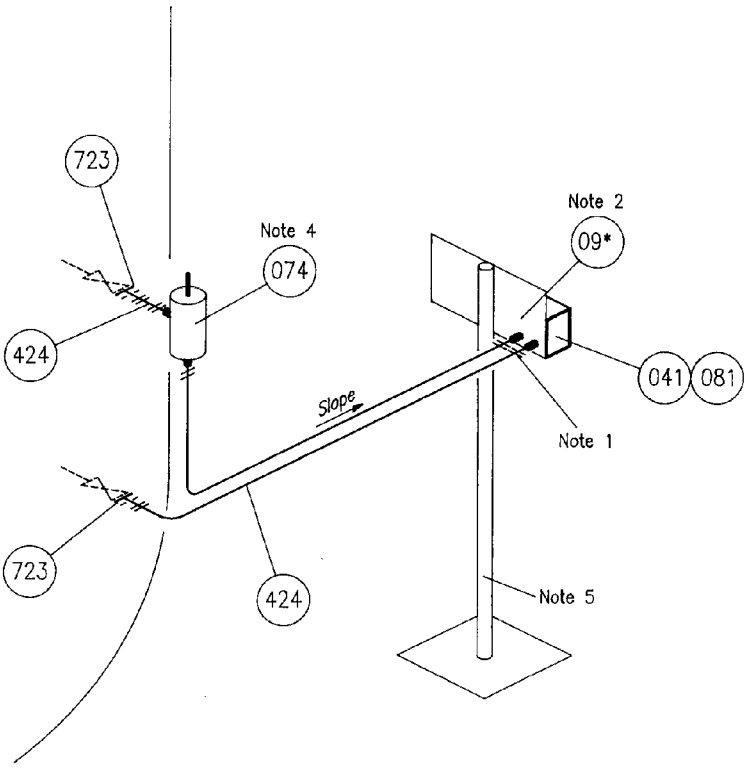
NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1.
3) Male connectors form a part of the purge filter block supply.
4) Bracket of purge filter block (item 066) shall be bolted to mounting support.
5) Purge pipe to be provided by mechanical eng. and to be supported / clamped inside the vessel at intervals of 1 m.
6) This support is typical. For selected type see section 3.

Item	Quantity	Size or connection	Description	Material	MESC
044	1	10 mm	Single isolate / vent block	SS	60.98.56.225.1
066	1	10 mm	Single purge filter block with vent valve	SS	60.98.70.210.1
083	1	G 1/4 A	Part protector	SS	60.98.90.207.1
087	1	10 x 5 mm	Purge orifice nipple	SS	60.98.90.710.1
09.*	1	–	Mounting plate L-shape / rectangular	SS	60.98.91.
424	3 m	10 mm OD	Tubing – Wall thickness 1.5 mm	SS	74.48.50.121.1
528	1	1/2 in. NPT	Needle valve – screwed	SS	77.34.08.003.1
723	1	10 mm x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.006.1
737	1	10 mm x 1/2 in. NPT	Male connector compression type	SS	76.39.25.065.1
762	1	10 mm	Union tee compression type	SS	76.39.83.265.1
			EXTERNAL PURGE (OPEN VESSEL)		

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	METRIC VERSION	Date					
Appr. by :	Date:	Section 7 – Level instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

Level instruments - DEP 32.37.02.81-Gen., sheet 32 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1or item 093 MESC 60.98.91.118.1.
3) Male connectors shall form a part of the seal pot supply.
4) Seal pot (item 074) to be well supported.
5) This support is typical. For selected type see section 3.
6) D.P. transmitter to be mounted as close as possible to bottom tapping.

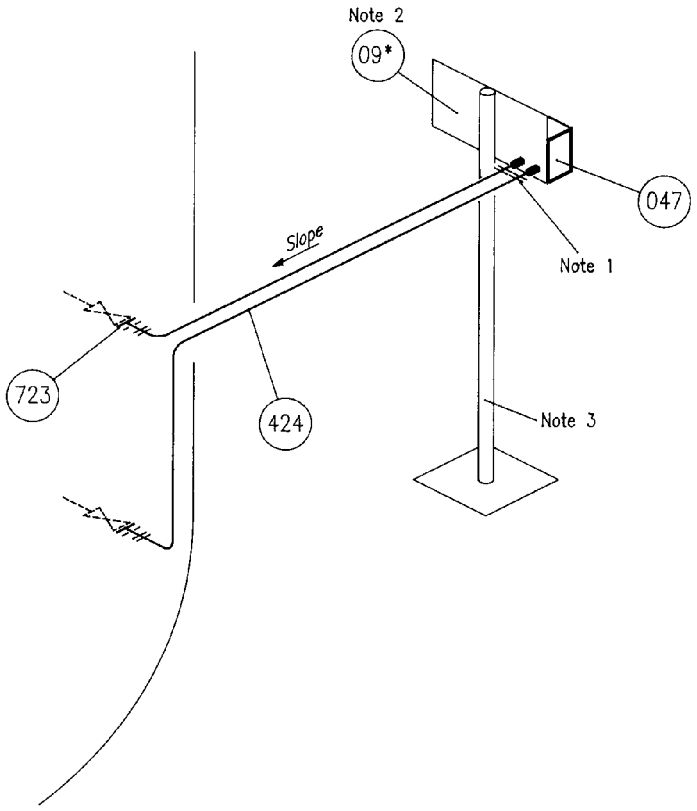
Item	Quantity	Size or connection	Description	Material	MESC
041	1	10 mm	Double isolate / vent block	SS	60.98.56.215.1
074	1	10 mm	Seal pot with vent valve	SS	60.98.70.510.1
081	1	6 mm	Filling connector	SS	60.98.90.106.1
09.*	1	–	Mounting plate L-shape / rectangular	SS	60.98.91.
424	3 m	10 mm OD	Tubing – Wall thickness 1.5 mm	SS	74.48.50.121.1
723	2	10 mm x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.006.1

WET LEG
CLOSED VESSEL

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	METRIC VERSION	Date					
Appr. by :	Date:	Section 7 – Level instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.81 – Gen., sheet 32, 7/92

Level instruments - DEP 32.37.02.81-Gen., sheet 33 7/92 **(DEP Circular 44/92)**



Tag No.

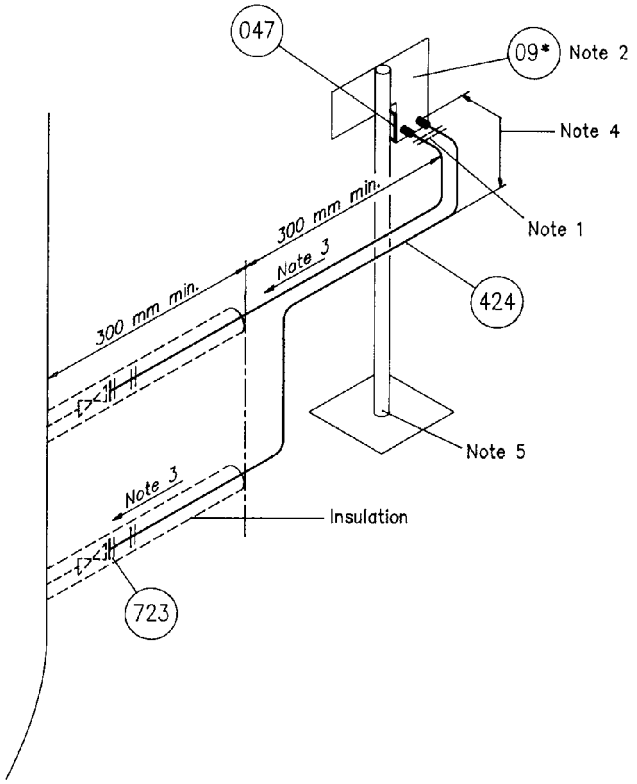
NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1or item 093 MESC 60.98.91.118.1.
3) This support is typical. For selected type see section 3.

Item	Quantity	Size or connection	Description	Material	MESC
047	1	10 mm	Double isolate / equalize / vent block	SS	60.98.56.205.1
09.*	1	–	Mounting plate L-shape / rectangular	SS	60.98.91.
424	3 m	10 mm OD	Tubing – Wall thickness 1.5 mm	SS	74.48.50.121.1
723	2	10 mm x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.006.1
			SELF PURGE CLOSED VESSEL		

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES		Issue				
Checked by:	Date:	METRIC VERSION		Date				
Appr. by :	Date:	Section 7 – Level instruments		By				
LOCATION :		PLANT :		Project & group No.:				
Eng. by : Principal :				Sheet No. cont'd on sheet No. Drawing No. T				

Level instruments - DEP 32.37.02.81-Gen., sheet 34 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

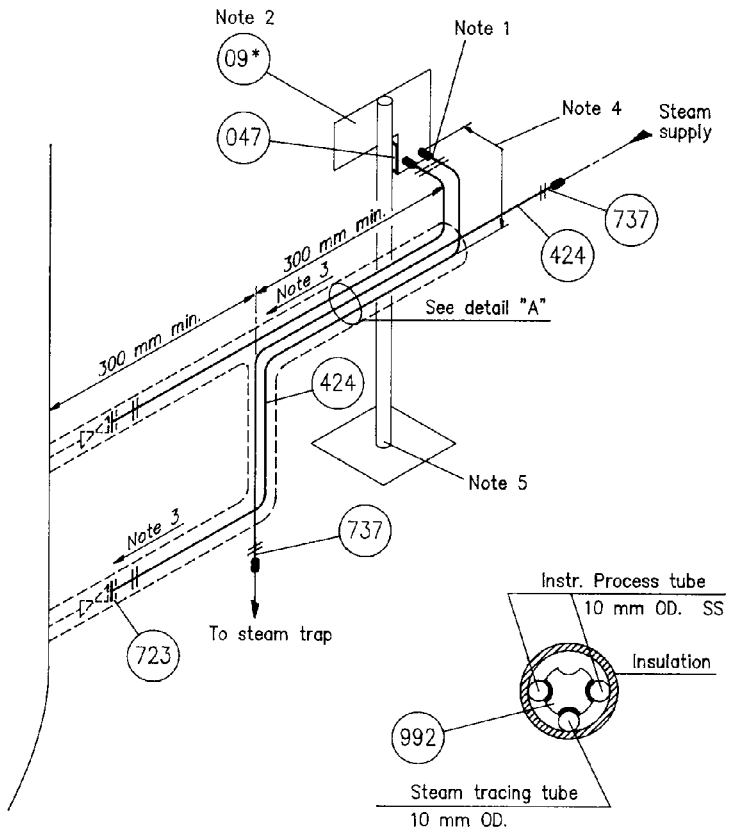
1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1.
3) Slope 1:10 to 1:20.
4) This distance as short as possible.
5) This support is typical. For selected type see section 3.

Item	Quantity	Size or connection	Description	Material	MESC
047	1	10 mm	Double isolate / equalize / vent block	SS	60.98.56.205.1
09.*	1	–	Mounting plate L–shape / rectangular	SS	60.98.91.
424	3 m	10 mm OD	Tubing – Wall thickness 1.5 mm	SS	74.48.50.121.1
723	2	10 mm x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.006.1

SELF PURGE
CRYOGENIC LIQUID(LPG)
CLOSED VESSEL

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	METRIC VERSION	Date					
Appr. by :	Date:	Section 7 – Level instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

Level instruments - DEP 32.37.02.81-Gen., sheet 35 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1.
3) Slope 1:10 to 1:20.
4) This distance as short as possible.
5) This support is typical. For selected type see section 3.

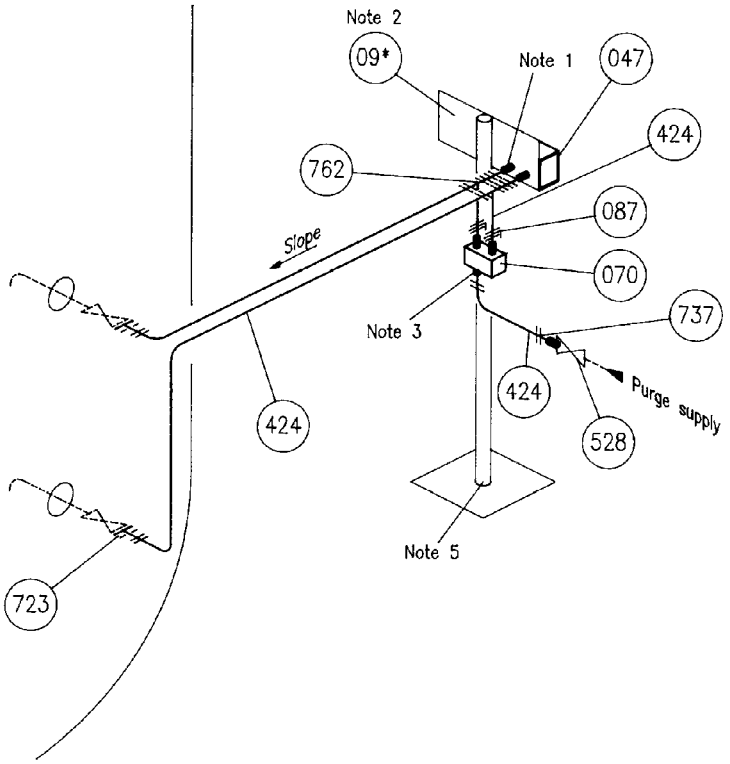
Item	Quantity	Size or connection	Description	Material	MESC
047	1	10 mm	Double isolate / equalize / vent block	SS	60.98.56.205.1
09.*	1	–	Mounting plate L–shape / rectangular	SS	60.98.91.
424	6 m	10 mm OD	Tubing – Wall thickness 1.5 mm	SS	74.48.50.121.1
723	2	10 mm x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.006.1
737	2	10 mm x 1/2 in. NPT	Male compression type	SS	76.39.25.065.1
992	14	From 22 mm dia. bar	Tubing spacer	N–metallic	81.86.79.020.1

SELF PURGE
CRYOGENIC LIQUID(LPG)
CLOSED VESSEL

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	METRIC VERSION	Date					
Appr. by :	Date:	Section 7 – Level instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.81 – Gen., sheet 35, 7/92

Level instruments - DEP 32.37.02.81-Gen., sheet 36 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

1) Male connectors form part ot the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1.
3) Male connectors form part of the purge filter block supply.
4) Bracket of purge filter block (item 070) shall be bolted to mounting support.
5) This support is typical.
   For selected type see section 3.

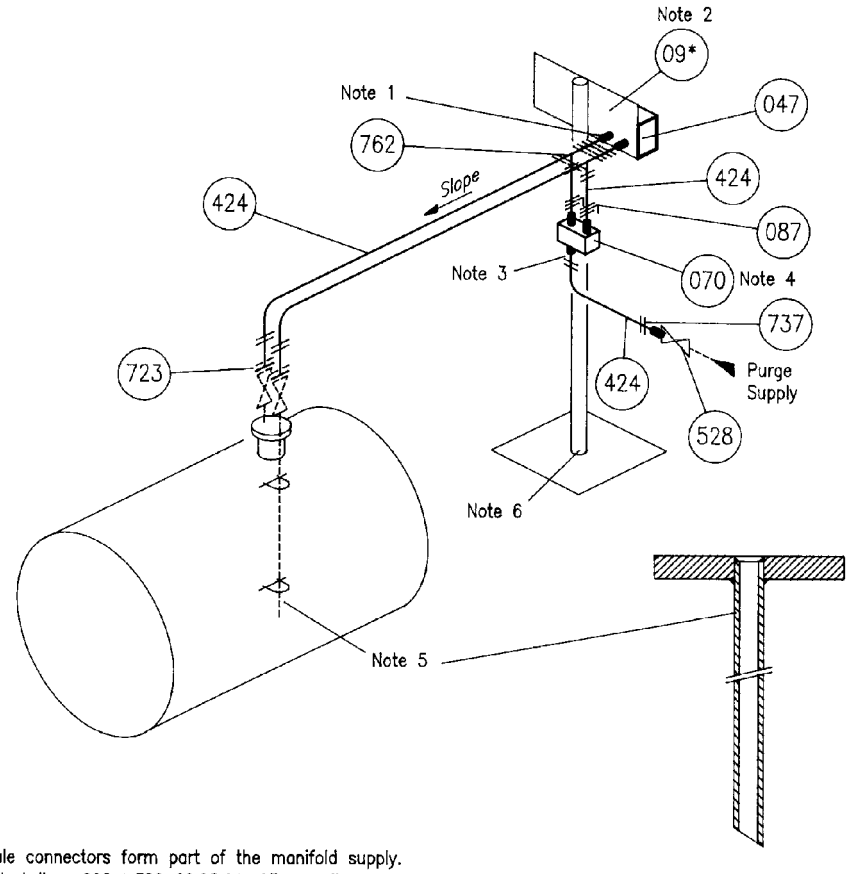
Item	Quantity	Size or connection	Description	Material	MESC
047	1	10 mm	Double isolate / equalize / vent block	SS	60.98.56.205.1
070	1	10 mm	Double purge filter block with vent valve	SS	60.98.70.220.1
087	2	10 mm	Purge orifice nipple	SS	60.98.90.710.1
09.*	1	–	Mounting plate L–shape / rectangular	SS	60.98.91.
424	6 m	10 mm OD	Tubing – Wall thickness 1.5 mm	SS	74.48.50.121.1
528	1	1/2 in. NPT	Needle valve – screwed	SS	77.34.08.003.1
723	2	10 mm x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.006.1
737	1	10 mm x 1/2 in. NPT	Male connector compression type	SS	76.39.25.065.1
762	2	10 mm	Union tee compression type	SS	76.39.83.265.1

EXTERNAL PURGE
CLOSED VESSEL

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	METRIC VERSION	Date					
Appr. by :	Date:	Section 7 – Level instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.81 – Gen., sheet 36, 7/92

Level instruments - DEP 32.37.02.81-Gen., sheet 37 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1.
3) Male connectors form part of the purge filter block supply.
4) Bracket of purge filter block (item 070) shall be bolted to mounting support.
5) Purge pipe to be provided by mechanical and to be supported / clamped inside the vessel at intervals of 1 m.
6) This support is typical. For selected type see section 3.

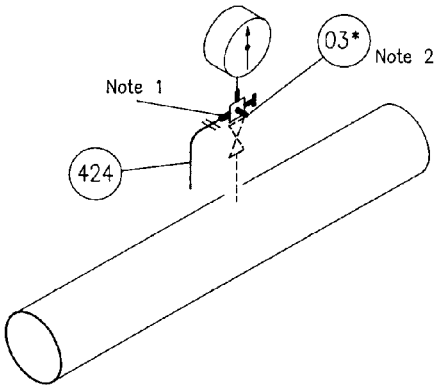
Item	Quantity	Size or connection	Description	Material	MESC
047	1	10 mm	Double isolate / equalize / vent block	SS	60.98.56.205.1
070	1	10 mm	Double purge filter block with vent	SS	60.98.70.220.1
087	2	10 mm	Purge orifice nipple	SS	60.98.90.710.1
09.*	1	–	Mounting plate L-shape / rectangular	SS	60.98.91.
424	6 m	10 mm OD	Tubing – Wall thickness 1.5 mm	SS	74.48.50.121.1
528	1	1/2 in. NPT	Needle valve – screwed	SS	77.34.08.003.1
723	2	10 mm x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.006.1
737	1	10mm x 1/2 in. NPT	Male connector compression type	SS	76.39.25.065.1
762	2	10 mm	Union tee compression type	SS	76.39.83.265.1

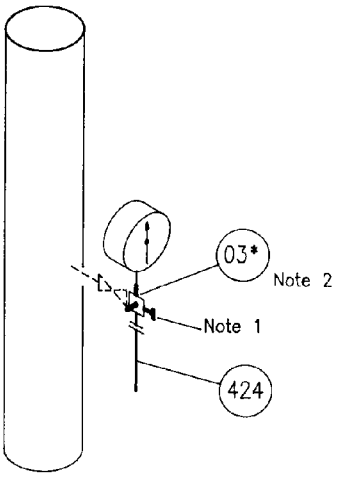
EXTERNAL PURGE
CLOSED VESSEL

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	METRIC VERSION	Date					
Appr. by :	Date:	Section 7 – Level instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.81 – Gen., sheet 37, 7/92

Pressure instruments - DEP 32.37.02.81-Gen., sheet 38 7/92 **(DEP Circular 44/92)**





NOTES :

1) Male connectors form part of gauge block supply.
2) Select item 030 MESC 60.98.55.200.1
   item 031 MESC 60.98.55.210.1
   item 032 MESC 60.98.55.220.1
   item 033 MESC 60.98.55.230.1
   In accordance with flange rating and pressure gauge connection

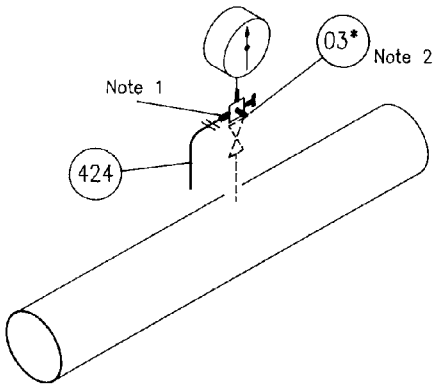
Tag No.

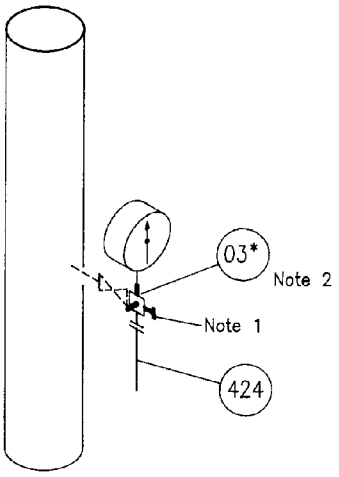
Item	Quantity	Size or connection	Description	Material	MESC
03.*	1	DN 15 x ...*	Isolate / vent gauge block – smooth finish	SS	60.98.55.
424	0.5 m	10 mm OD	Tubing – Wall thickness 1.5 mm	SS	74.48.50.121.1

LIQUID/GAS SERVICE

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES METRIC VERSION	Issue		
Checked by:	Date:		Date		
Appr. by :	Date:	Section 8 – Pressure instruments	By		
LOCATION :		PLANT :	Project & group No.:		
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T		

Pressure instruments - DEP 32.37.02.81-Gen., sheet 39 7/92 **(DEP Circular 44/92)**





NOTES :

1) Male connectors form part of gauge block supply.
2) Select item 034 MESC 60.98.55.300.1
item 035 MESC 60.98.55.310.1
item 036 MESC 60.98.55.320.1
item 037 MESC 60.98.55.330.1
In accordance with flange rating and pressure gauge connection

Tag No.

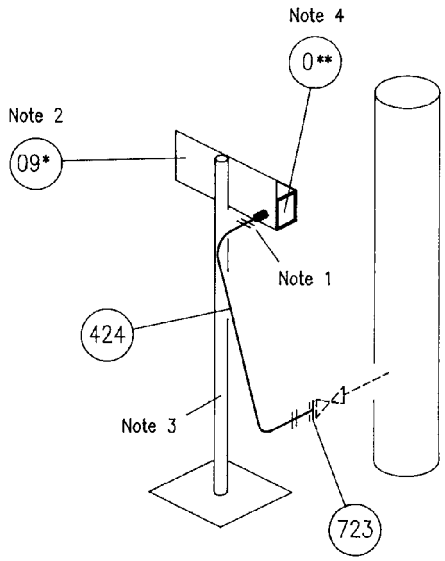
Item	Quantity	Size or connection	Description	Material	MESC
03.*	1	DN 15 x ...*	Syphon isolate / vent gauge block – smooth finish	SS	60.98.55.
424	0.5 m	10 mm OD	Tubing – Wall thickness 1.5 mm	SS	74.48.50.121.1

STEAM SERVICE

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	METRIC VERSION	Date					
Appr. by :	Date:	Section 8 – Pressure instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.81 – Gen., sheet 39, 7/92

Pressure instruments - DEP 32.37.02.81-Gen., sheet 40 7/92 **(DEP Circular 44/92)**



NOTES:

1) Male connector forms part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1
3) This support is typical.
   For selected type see section 3
4) Select item 038 MESC 60.98.56.235.1
   item 050 MESC 60.98.56.305.1
   item 051 MESC 60.98.56.315.1
   item 052 MESC 60.98.56.317.1
   In accordance with transmitter connection.

Tag No.

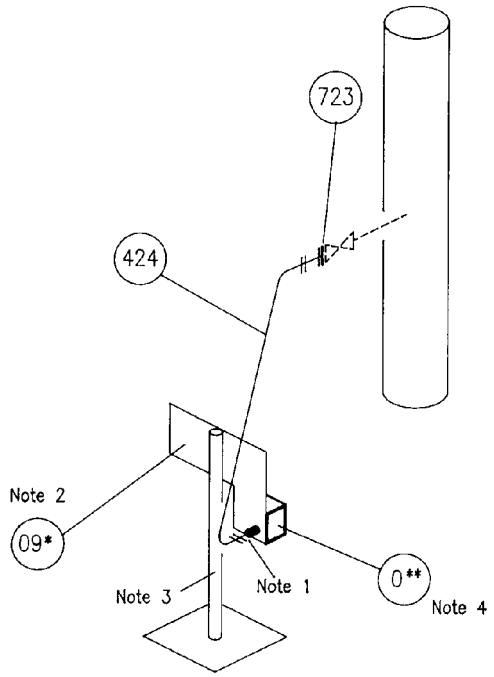
Item	Quantity	Size or connection	Description	Material	MESC
0..**	1	10 mm	Isolate / vent block	SS	60.98.56.
09.*	1	–	Mounting plate L-shape /rectangular	SS	60.98.91
424	3 m	10 mm OD	Tubing – Wall thickness 1.5 mm	SS	74.48.50.121.1
723	1	10 mm x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.006.1
			GAS SERVICE		

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	METRIC VERSION	Date					
Appr. by :	Date:	Section 8 – Pressure instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng.by :			Sheet No. cont'd on sheet No.					
Principal :			Drawing No. T					

DEP 32.37.02.81 – Gen., sheet 40, 7/92

Pressure instruments - DEP 32.37.02.81-Gen., sheet 41 7/92 **(DEP Circular 44/92)**

Tag No.



NOTES:

1) Male connector forms part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1
3) This support is typical.
   For selected type see section 3
4) Select item 038 MESC 60.98.56.235.1
   item 050 MESC 60.98.56.305.1
   item 051 MESC 60.98.56.315.1
   item 052 MESC 60.98.56.317.1
   In accordance with transmitter connection.

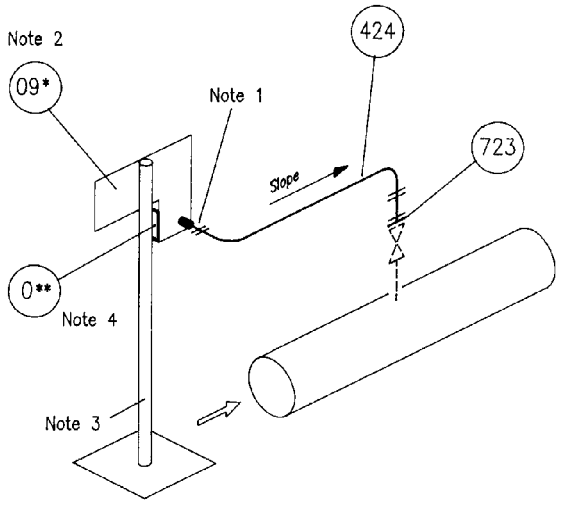
Item	Quantity	Size or connection	Description	Material	MESC
0..**	1	10 mm	Isolate / vent block	SS	60.98.56.
09.*	1	–	Mounting plate L–shape /rectangular	SS	60.98.91
424	3 m	10 mm OD	Tubing – Wall thickness 1.5 mm	SS	74.48.50.121.1
723	1	10 mm x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.006.1

LIQUID SERVICE

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	METRIC VERSION	Date					
Appr. by :	Date:	Section 8 – Pressure instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng.by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.81 – Gen., sheet 41, 7/92

Pressure instruments - DEP 32.37.02.81-Gen., sheet 42 7/92 **(DEP Circular 44/92)**



NOTES:

1) Male connector forms part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1
3) This support is typical.
   For selected type see section 3
4) Select item 038 MESC 60.98.56.235.1
   item 050 MESC 60.98.56.305.1
   item 051 MESC 60.98.56.315.1
   item 052 MESC 60.98.56.317.1
   In accordance with transmitter connection.

Tag No.

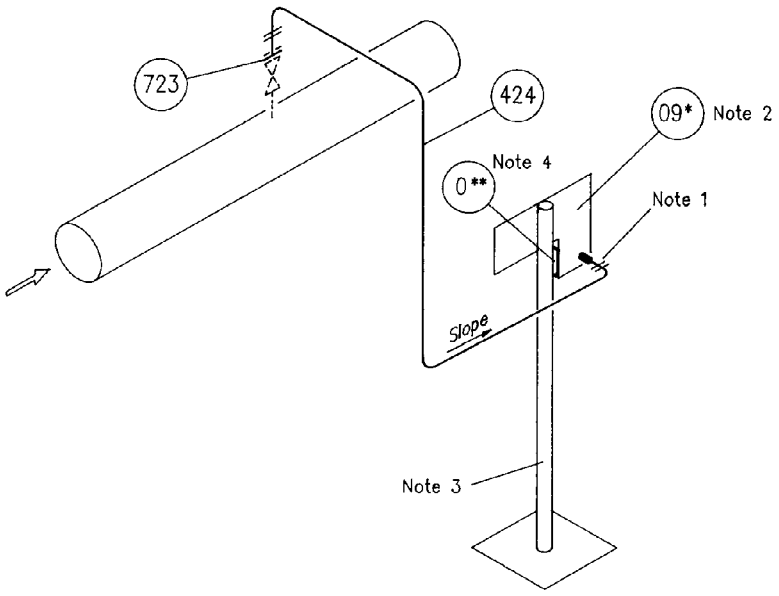
Item	Quantity	Size or connection	Description	Material	MESC
0..**	1	10 mm	Isolate / vent block	SS	60.98.56.
09.*	1	–	Mounting plate L–shape /rectangular	SS	60.98.91
424	3 m	10 mm OD	Tubing – Wall thickness 1.5 mm	SS	74.48.50.121.1
723	1	10 mm x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.006.1

GAS SERVICE

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	METRIC VERSION	Date					
Appr. by :	Date:	Section 8 – Pressure instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng.by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.38.02.81 – Gen., sheet 42, 7/92

Pressure instruments - DEP 32.37.02.81-Gen., sheet 43 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

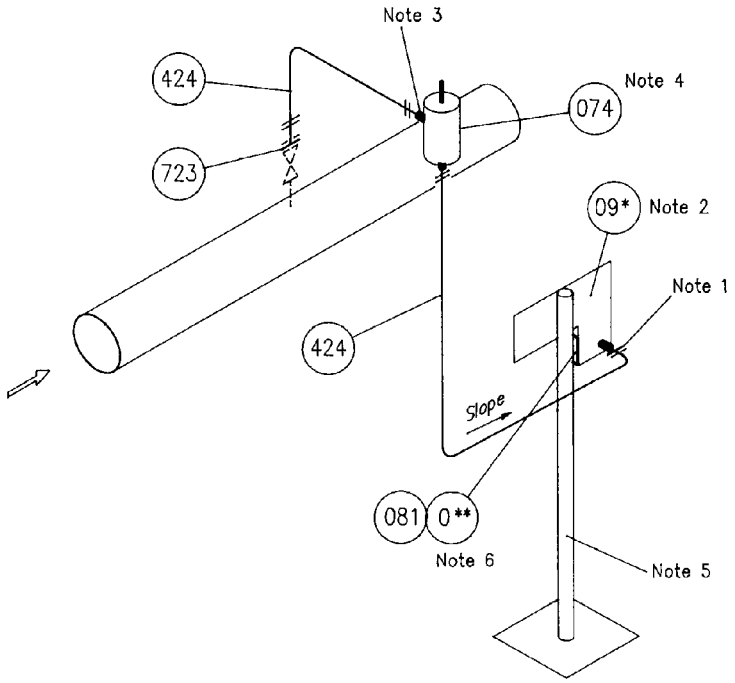
1) Male connector forms part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1.
3) This support is typical. For selected type see section 3.
4) Select item 038 MESC 60.98.56.235.1
   item 050 MESC 60.98.56.305.1
   item 051 MESC 60.98.56.315.1
   item 052 MESC 60.98.56.317.1
   in accordance with transmitter connection

Item	Quantity	Size or connection	Description	Material	MESC
0..**	1	10 mm	Single isolate / vent block	SS	60.98.56.
09.*	1	–	Mounting plate L-shape / rectangular	SS	60.98.91.
424	3 m	10 mm OD	Tubing – Wall thickness 1.5 mm	SS	74.48.50.121.1
723	1	10 mm x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.006.1
			LIQUID SERVICE		

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue		
Checked by:	Date:	METRIC VERSION	Date		
Appr. by :	Date:	Section 8 – Pressure instruments	By		
LOCATION :		PLANT :	Project & group No.:		
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T		

Pressure instruments - DEP 32.37.02.81-Gen., sheet 44 7/92 **(DEP Circular 44/92)**

Tag No.



NOTES:

1) Male connector forms part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1.
3) Male connectors form a part of the sealpot supply.
4) Seal pot (item 074) to be well supported.
5) This support is typical. For selected type see section 3.
6) Select item 038 MESC 60.98.56.235.1
   item 050 MESC 60.98.56.305.1
   item 051 MESC 60.98.56.315.1
   item 052 MESC 60.98.56.317.1
   in accordance with transmitter connection

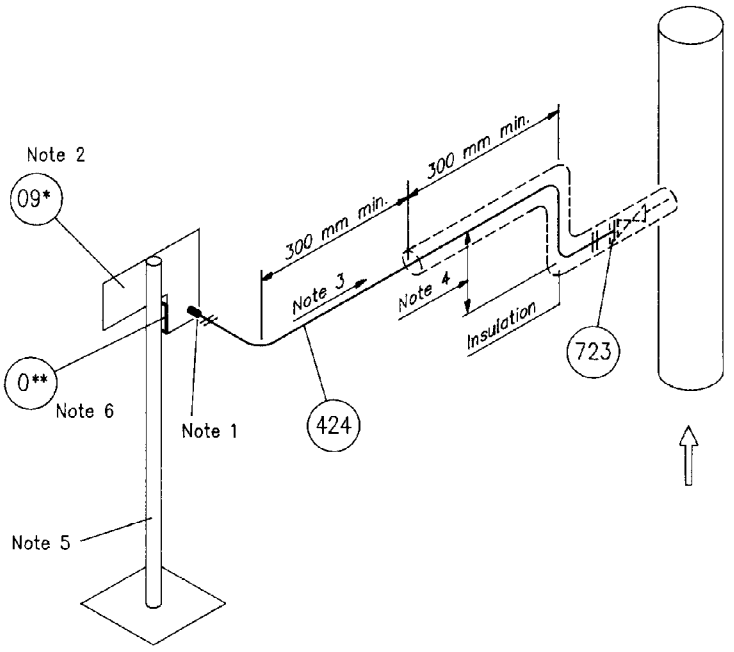
Item	Quantity	Size or connection	Description	Material	MESC
0.**	1	10 mm	Single isolate / vent block	SS	60.98.56.
074	1	10 mm	Seal pot with vent valve	SS	60.98.70.510.1
081	1	6 mm	Filling connector	SS	60.98.90.106.1
09.*	1	–	Mounting plate L-shape / rectangular	SS	60.98.91.
424	3 m	10 mm OD	Tubing – Wall thickness 1.5 mm	SS	74.48.50.121.1
723	1	10 mm x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.006.1
			STEAM SERVICE		

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue		
Checked by:	Date:	METRIC VERSION	Date		
Appr. by :	Date:	Section 8 – Pressure instruments	By		
LOCATION :		PLANT :	Project & group No.:		
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T		

DEP 32.37.02.81 – Gen., sheet 44, 7/92

Pressure instruments - DEP 32.37.02.81-Gen., sheet 45 7/92 **(DEP Circular 44/92)**

Tag No.



NOTES:

1) Male connector forms part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1.
3) Slope 1:10 to 1:20.
4) This distance as short as possible.
5) This support is typical. For selected type see section 3.
6) Select item 038 MESC 60.98.56.235.1
   item 050 MESC 60.98.56.305.1
   item 051 MESC 60.98.56.315.1
   item 052 MESC 60.98.56.317.1
   in accordance with transmitter connection

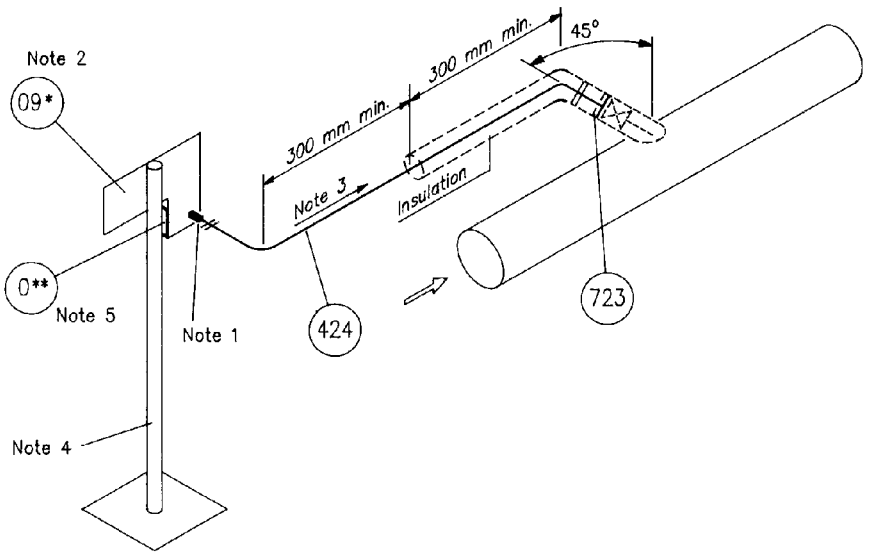
Item	Quantity	Size or connection	Description	Material	MESC
0..**	1	10 mm	Single isolate / vent block	SS	60.98.56.
09.*	1	–	Mounting plate L-shape / rectangular	SS	60.98.91.
424	3 m	10 mm OD	Tubing – Wall thickness 1.5 mm	SS	74.48.50.121.1
723	1	10 mm x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.006.1

SELF PURGE
CRYOGENIC-LPG SERVICE

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES		Issue				
Checked by:	Date:	METRIC VERSION		Date				
Appr. by :	Date:	Section 8 – Pressure instruments		By				
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.81 – Gen., sheet 45, 7/92

Pressure instruments - DEP 32.37.02.81-Gen., sheet 46 7/92 **(DEP Circular 44/92)**



NOTES:

1) Male connector forms part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1.
3) Slope 1:10 to 1:20.
4) This support is typical. For selected type see section 3.
5) Select item 038 MESC 60.98.56.235.1
   item 050 MESC 60.98.56.305.1
   item 051 MESC 60.98.56.315.1
   item 052 MESC 60.98.56.317.1
   in accordance with transmitter connection

Tag No.

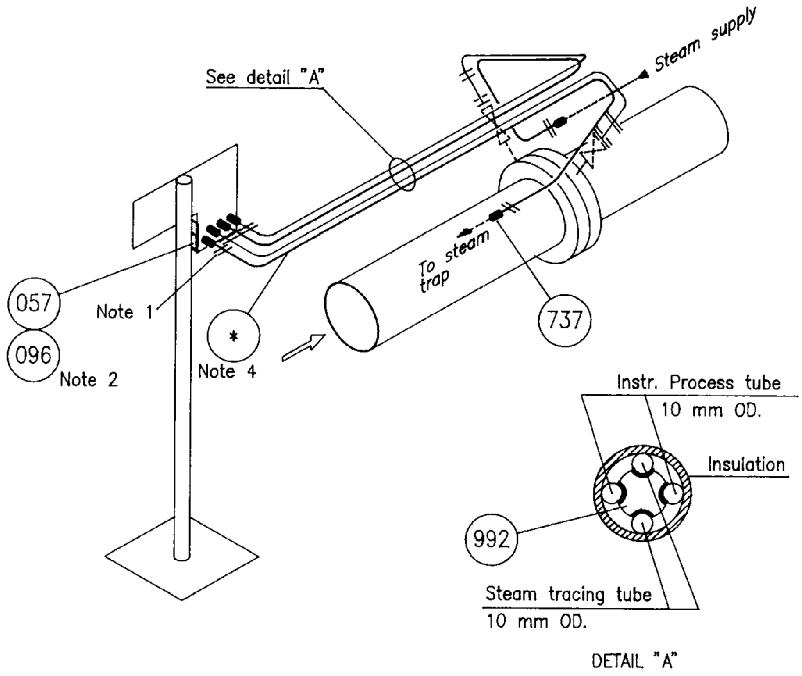
Item	Quantity	Size or connection	Description	Material	MESC
0..**	1	10 mm	Single isolate / vent block	SS	60.98.56.
09.*	1	–	Mounting plate L–shape / rectangular	SS	60.98.91.
424	3 m	10 mm OD	Tubing – Wall thickness 1.5 mm	SS	74.48.50.121.1
723	1	10 mm x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.006.1

SELF PURGE
CRYOGENIC–LPG SERVICE

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	METRIC VERSION	Date					
Appr. by :	Date:	Section 8 – Pressure instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.81 – Gen., sheet 46, 7/92

Tracing of instruments - DEP 32.37.02.81-Gen., sheet 47 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

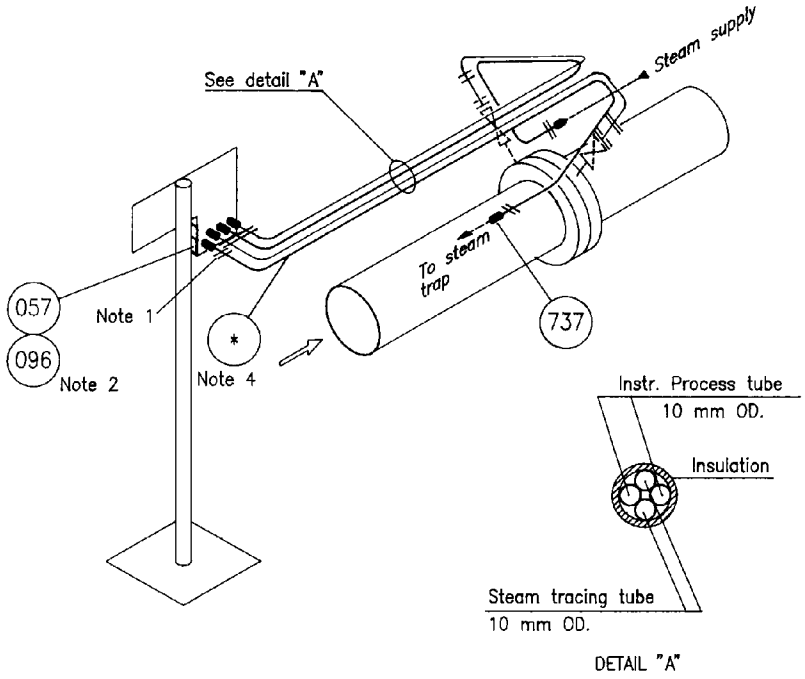
1) Male connectors form part of the manifold steam tracing block.
2) Item 096 MESC 60.98.91.305.1 shall be suitable for selected transmitter type/model number.
3) Materials listed are for heating components only.
4) For material of traced and lagged process tubing refer to DEP 32.37.10.11–Gen, section 4.1.

Item	Quantity	Size or connection	Description	Material	MESC
057	1	10 mm	Manifold steam tracing block	SS	60.98.70.010.1
096	1	–	Body enclosure	N–metallic	60.98.91.305.1
*	3 m	10 mm OD	Tubing – Wall thickness 1.5 mm		note 4)
737	2	10 mm x 1/2 in. NPT	Male connector compression type	SS	76.39.25.065.1
992	7	From 22 mm dia. bar	Tubing spacer	N–metallic	81.86.79.020.1
			WINTERIZING		

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	METRIC VERSION	Date					
Appr. by :	Date:	Section 10 – Tracing of instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

Tracing of instruments - DEP 32.37.02.81-Gen., sheet 48 7/92 **(DEP Circular 44/92)**

Tag No.



NOTES:

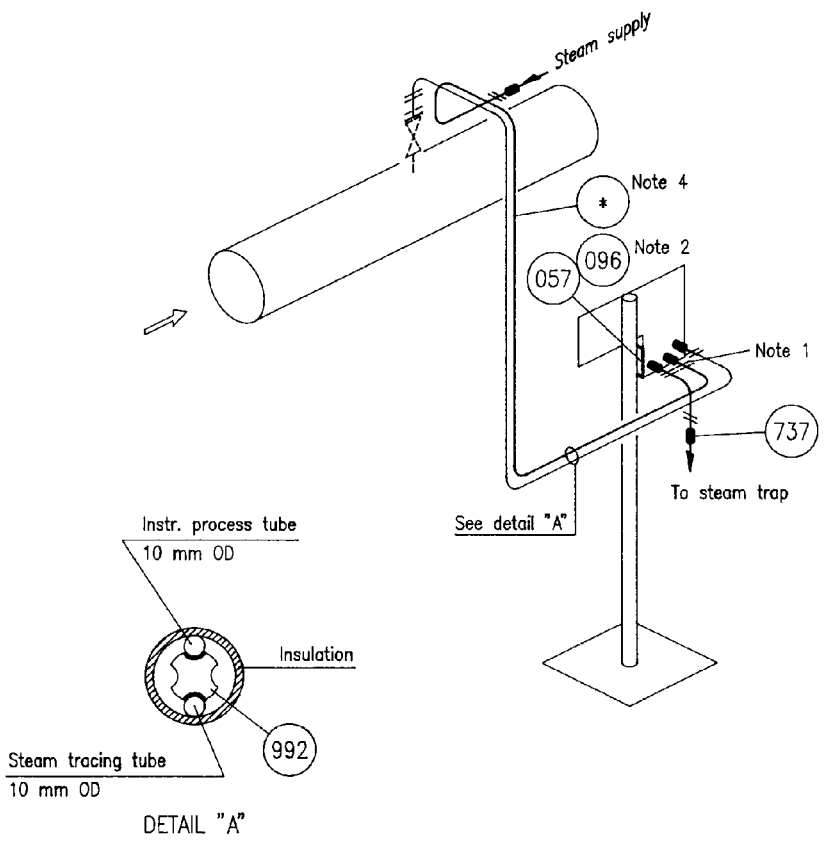
1) Male connectors form part of the manifold steam tracing block.
2) Item 096 MESC 60.98.91.305.1 shall be suitable for selected transmitter type/model number.
3) Materials listed are for heating components only.
4) For material of traced and lagged process tubing refer to DEP 32.37.10.11–Gen., section 4.1.

Item	Quantity	Size or connection	Description	Material	MESC
057	1	10 mm	Manifold steam tracing block	SS	60.98.70.010.1
096	1	–	Body enclosure	N–metallic	60.98.91.305.1
*	3 m	10 mm OD	Tubing – Wall thickness 1.5 mm		note 4)
737	2	10 mm x 1/2 in. NPT	Male connector compression type	SS	76.39.25.065.1
			TO PREVENT SOLIDIFICATION		

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	METRIC VERSION	Date					
Appr. by :	Date:	Section 10 – Tracing of instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.81 – Gen., sheet 48, 7/92

Tracing of instruments - DEP 32.37.02.81-Gen., sheet 49 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

1) Male connectors form part of the manifold steam tracing block.
2) Item 096 MESC 60.98.91.305.1 shall be suitable for selected transmitter type/model number.
3) Materials listed are for heating components only.
4) For material of traced and lagged process tubing refer to DEP 32.37.10.11-Gen., section 4.1.

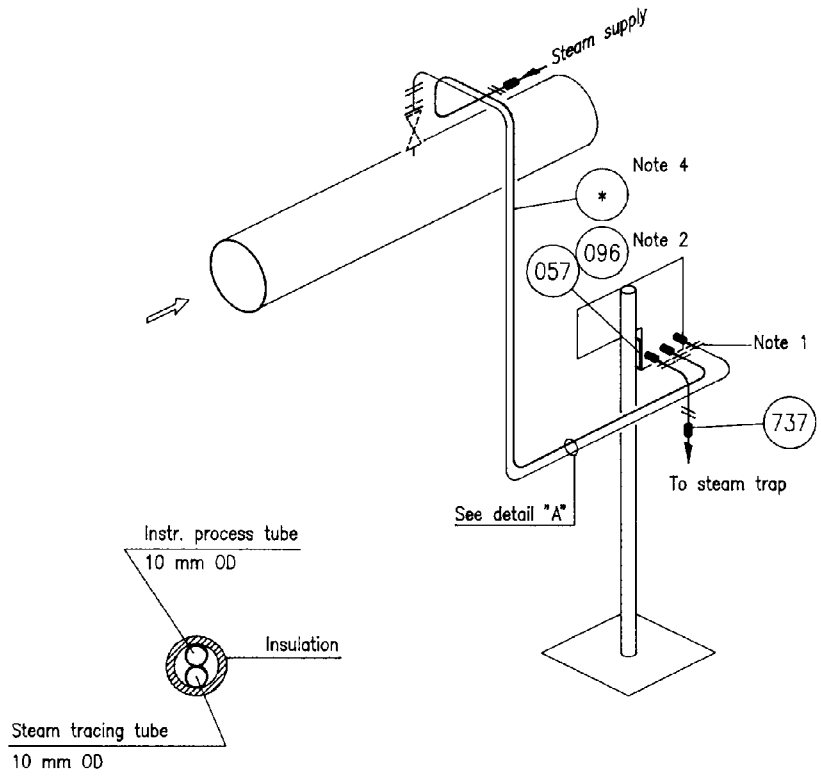
Item	Quantity	Size or connection	Description	Material	MESC
057	1	10 mm	Manifold steam tracing block	SS	60.98.70.010.1
096	1	–	Body enclosure	N-metallic	60.98.91.305.1
*	3 m	10 mm OD	Tubing – Wall thickness 1.5 mm		note 4)
737	2	10mm x 1/2 in. NPT	Male connector compression type	SS	76.39.25.065.1
992	7	From 22 mm dia. bar	Tubing spacer	N-metallic	81.86.79.020.1

WINTERIZING

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	METRIC VERSION	Date					
Appr. by :	Date:	Section 10 – Tracing of instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.81 – Gen., sheet 49, 7/92

Tracing of instruments - DEP 32.37.02.81-Gen., sheet 50 7/92 **(DEP Circular 44/92)**



DETAIL "A"

NOTES:

1) Male connectors form part of the manifold steam tracing block.
2) Item 096 MESC 60.98.91.305.1 shall be suitable for selected transmitter type/model number.
3) Materials listed are for heating components only.
4) For material of traced and lagged process tubing refer DEP 32.37.10.11-Gen., section 4.1.

Tag No.

Item	Quantity	Size or connection	Description	Material	MESC
057	1	10 mm	Manifold steam tracing block	SS	60.98.70.010.1
096	1	–	Body enclosure	N-metallic	60.98.91.305.1
*	3 m	10 mm OD	Tubing – Wall thickness 1.5 mm		note 4)
737	2	10mm x 1/2 in. NPT	Male connector compression type	SS	76.39.25.065.1

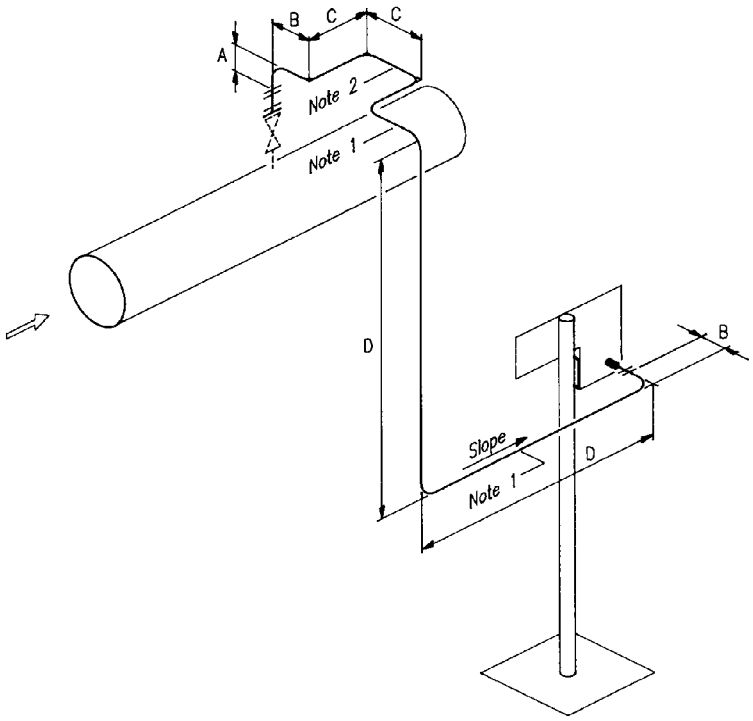
TO PREVENT SOLIDIFICATION

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	METRIC VERSION	Date					
Appr. by :	Date:	Section 10 – Tracing of instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.81 – Gen., sheet 50, 7/92

Thermal expansion - DEP 32.37.02.81-Gen., sheet 51 7/92 **(DEP Circular 44/92)**

TYPICAL HOOK–UP REQUIREMENT FOR THERMAL EXPANSION EXCESSIVE MOVEMENTS OF PIPES



Dimensions

A = 50 mm maximum
B = 100 mm maximum
C = 200 mm minimum
D = 600 mm maximum

NOTES:

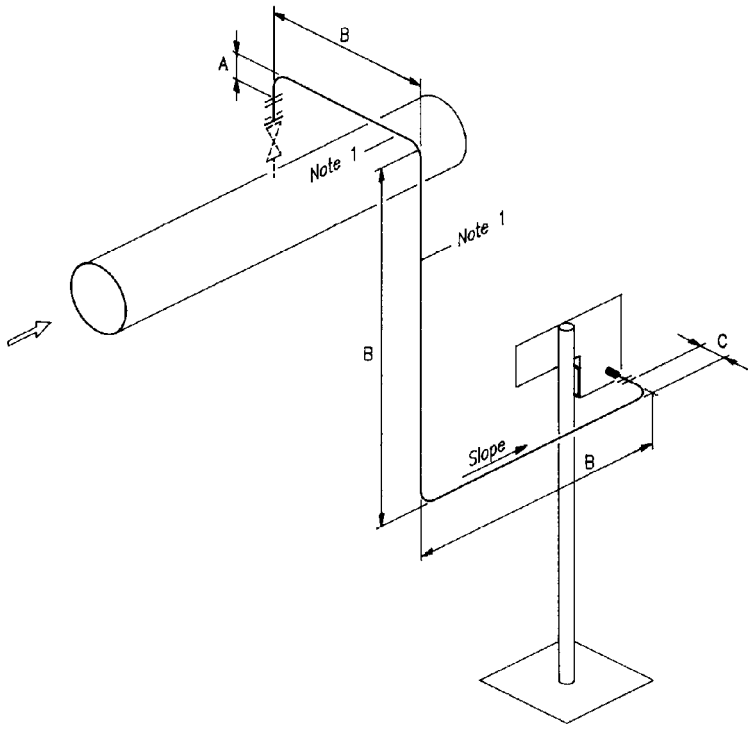
1) Apply sliding supports for the tubing in the direction of movement.
2) The expansion bend shall be located in the same plane of the pipe movement.

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue				
Checked by:	Date:	METRIC VERSION	Date				
Appr. by :	Date:	Section 11 – Thermal expansion	By				
LOCATION :		PLANT :	Project & group No.:				
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T				

DEP 32.37.02.81 – Gen., sheet 51, 7/92

Vibrating pipes - DEP 32.37.02.81-Gen., sheet 52 7/92 **(DEP Circular 44/92)**

TYPICAL HOOK–UP REQUIREMENT FOR VIBRATING PIPES



Dimensions

A = 50 mm maximum
B = 600 mm maximum
C = 100 mm maximum

NOTES:

1) Apply sliding supports for length of tubing exceeding 1 metre.

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	METRIC VERSION	Date					
Appr. by :	Date:	Section 12 – Vibrating pipes	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.81 – Gen., sheet 52, 7/92

Cover sheet - DEP 32.37.02.82-Gen., sheet 1 7/92 **(DEP Circular 44/92)**

INSTRUMENT IMPULSE LINES (IMPERIAL VERSION)

Section	Sheets	Subject
1	101	Cover sheet
2	201 – 299	Index of sheets
3	301 – 399	Index of instruments
4	401 –	Components
5	501 – 505	Mounting supports
6	601 – 699	Flow instruments
7	701 – 799	Level instruments
8	801 – 899	Pressure instruments
9	901 – 999	Miscellaneous instruments (Note 3)
10	1001 – 1099	Tracing of instruments
11	1101 – 1199	Thermal expansion Requirements for excessive movement of pipes
12	1201 – 1299	Requirements for vibrating pipes

Engineering notes

1. Guidance on selection of the particular "hook-up" sheet for various services is given in DEP 32.37.10.11-Gen.

2. For guidance during the preparation of the set of drawings for instrument impulse lines, the following pages show the general arrangement of the sheets, as well as a number of typical examples of drawings.
   For further details, see DEP 32.37.10.11-Gen.

3. When miscellaneous instruments (other than for flow, level, pressure, temperature) must be included, these shall be shown on sheets numbered sequentially from 901 up to 999, as needed.

Made by :	Date:	Title : **INSTRUMENT IMPULSE LINES**	Issue					
Checked by:	Date:	IMPERIAL VERSION	Date					
Appr. by :	Date:	Section 1 – Cover sheet	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. 101 cont'd on sheet No. Drawing No. T					

DEP 32.37.02.82 – Gen., sheet 1, 7/92

Index of sheets - DEP 32.37.02.82-Gen., sheet 2 7/92 **(DEP Circular 44/92)**

Sheet No.	Issue	Revisions date			
	0	A	B	C	D

Index of instrument- DEP 32.37.02.82-Gen., sheet 3 7/92 **(DEP Circular 44/92)**

Tag No.	Quantity	Mounting Support Type	Mounting Support Size	Impulse lines Sheet No.	Proctecting facilities (See below)	Remarks

Components - DEP 32.37.02.82-Gen., sheet 4 7/92 **(DEP Circular 44/92)**

Issue	Mat. item	Size or connection	Description	Material	MESC
	030	DN 15 x 1/2 in. NPT	Isolate/vent gauge block – smooth finish – (LPR)	AISI 316	60.98.55.200.1
	031	DN 15 x 1/2 in. NPT	Isolate/vent gauge block – smooth finish – (HPR)	AISI 316	60.98.55.210.1
	032	DN 15 x G 1/2 in.	Isolate/vent gauge block – smooth finish – (LPR)	AISI 316	60.98.55.220.1
	033	DN 15 x G 1/2 in.	Isolate/vent gauge block – smooth finish – (HPR)	AISI 316	60.98.55.230.1
	034	DN 15 x 1/2 in. NPT	Syphon isolate/vent gauge block – smooth finish – (LPR)	AISI 316	60.98.55.300.1
	035	DN 15 x 1/2 in. NPT	Syphon isolate/vent gauge block – smooth finish – (HPR)	AISI 316	60.98.55.310.1
	036	DN 15 x G 1/2 in.	Syphon isolate/vent gauge block – smooth finish – (LPR)	AISI 316	60.98.55.320.1
	037	DN 15 x G 1/2 in.	Syphon isolate/vent gauge block – smooth finish – (HPR)	AISI 316	60.98.55.330.1
	039	3/8 in.	Single isolate/vent block (DP model)	AISI 316	60.98.56.237.1
	042	3/8 in.	Double isolate/vent block	AISI 316	60.98.56.217.1
	045	3/8 in.	Single isolate/vent block	AISI 316	60.98.56.227.1
	048	3/8 in.	Double isolate/equalize/vent block	AISI 316	60.98.56.207.1
	053	3/8 in. x 1/2 in.NPT M.	Isolate/vent block	AISI 316	60.98.56.325.1
	054	3/8 in. x 1/2 in.NPT F.	Isolate/vent block	AISI 316	60.98.56.335.1
	055	3/8 in. x G 1/2 in.	Isolate/vent block	AISI 316	60.98.56.337.1
	060	–	Manifold electrical heater assembly	AISI 316	60.98.70.050.1
	061	3/8 in.	Manifold steam tracing block	AISI 316	60.98.70.110.1
	064	–	Anti Tamper Key	AISI 316	60.98.56.905.1
	068	3/8 in.	Single purge filter block with vent valve	AISI 316	60.98.70.310.1
	072	3/8 in.	Double purge filter block with vent valve	AISI 316	60.98.70.320.1
	076	3/8 in.	Seal pot with vent valve	AISI 316	60.98.70.610.1
	082	1/4 in.	Filling connector	AISI 316	60.98.90.107.1
	083	G 1/4 A in.	Port protector	AISI 316	60.98.90.207.1
	086	–	Blind kidney flange	AISI 316	60.98.90.307.1
	090	3/8 in.	Purge orifice nipple	AISI 316	60.98.90.810.1
	092	330 x 280 mm	Mounting plate L-shape	AISI 316	60.98.91.105.1
	093	330 x 150 mm	Mounting plate rectangular	AISI 316	60.98.91.118.1
	095	–	Protective shade	Non metallic	60.98.91.205.1
	096	–	Body enclosure	Non metallic	60.98.91.305.1
	407	1 in. (DN 25)	Line pipe sched. 40 S	AISI 316	74.36.23.034.1
	419	3/8 in. OD	Tubing – wall thickness 0.065 in.	AISI 316	74.48.50.055.1
	527	1/4 in. NPT	Needle valve – screwed	AISI 316	77.34.08.001.1
	528	1/2 in. NPT	Needle valve – screwed	AISI 316	77.34.08.003.1
	651	1/4 in. NPT x 35 mm	Hex pipe nipple – screwed	AISI 316	76.09.56.001.1
	652	1/2 in. NPT x 45 mm	Hex pipe nipple – screwed	AISI 316	76.09.56.031.1
	727	3/8 in. x DN 15	Lapped joint compression fitting – smooth finish	AISI 316	76.39.05.106.1
	742	3/8 in. x G 1/4 A in.	Male connector compression type	AISI 316	76.39.27.007.1
	743	3/8 in. x 1/4 in. NPT	Male connector compression type	AISI 316	76.39.27.063.1
	744	3/8 in. x 1/2 in. NPT	Male connector compression type	AISI 316	76.39.27.065.1
	750	3/8 in.	Union elbow compression type	AISI 316	76.39.44.065.1
	756	3/8 in.	Plug compression type	AISI 316	76.39.67.060.1
	766	3/8 in.	Union tee compression type	AISI 316	76.39.85.063.1
	772	3/8 in.	Union compression type	AISI 316	76.39.91.063.1
	992	From 22 mm dia. bar	Tubing spacer	Non metallic	81.86.79.020.1

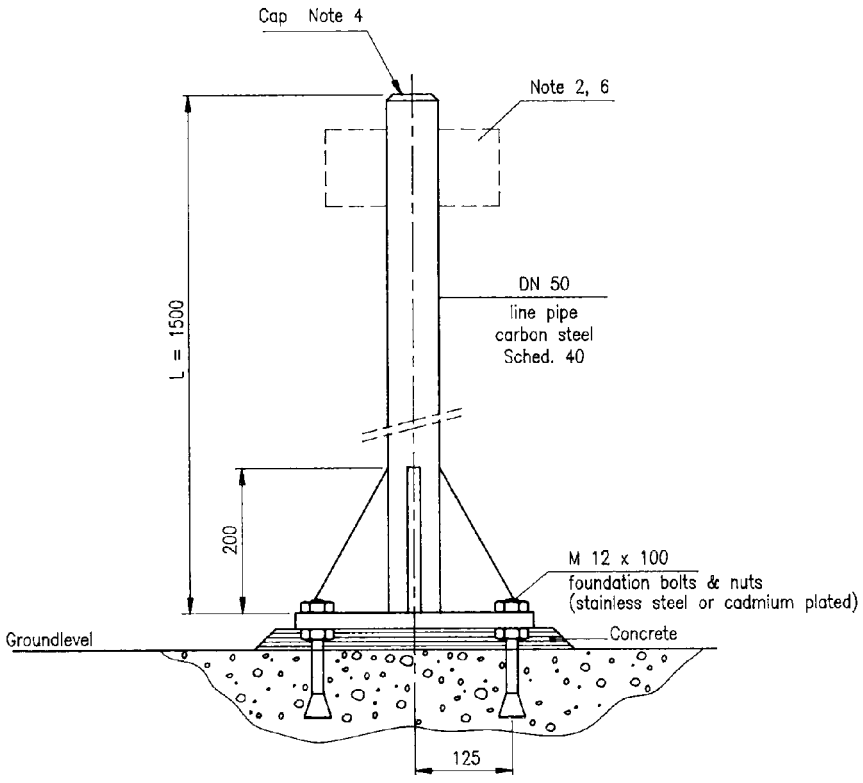
NOTE: For complete material specification, see standard form 'Summary of instrument installation materials' DEP 32.37.02.80–Gen.

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue				
Checked by:	Date:	IMPERIAL VERSION	Date				
Appr. by :	Date:	Section 4 – Components	By				
LOCATION :		PLANT :	Project & group No.:				
Eng. by : Principal :			Sheet No. 401 cont'd on sheet No. Drawing No. T				

Components - DEP 32.37.02.82-Gen., sheet 5 7/92 **(DEP Circular 44/92)**

Issue	Mat. item	Size or connection	Description	Material	MESC

Mounting supports - DEP 32.37.02.82-Gen., sheet 6 7/92 **(DEP Circular 44/92)**



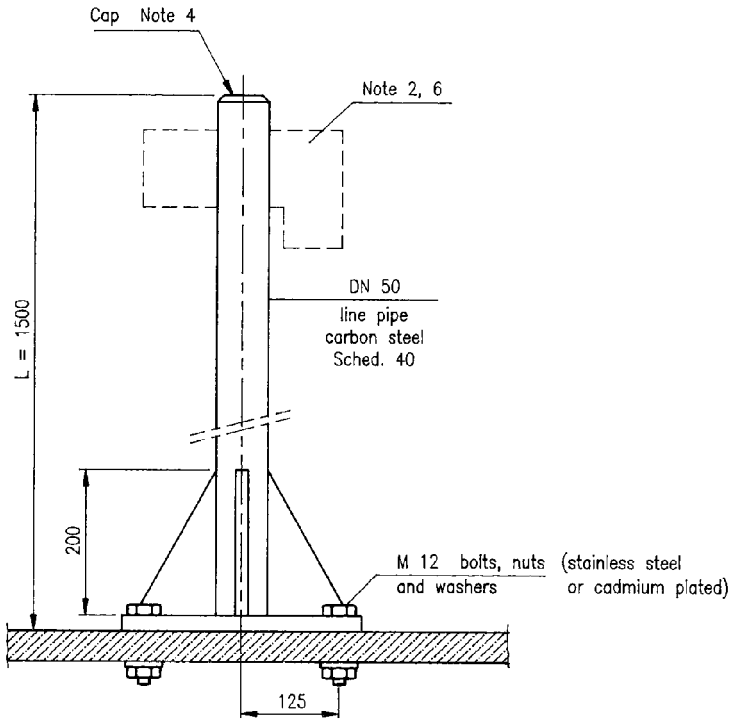
TYPE S1
FOR CONCRETE FLOORS

NOTES:

1) Plates and strips carbon steel 10 mm thick.
2) For dimensions of mounting plate, see S–37813 or S–37.814.
3) Finish: after shotblasting a preserving agent shall be applied as per requistion.
4) Cap material: ☐ plastic or ☐ carbon steel
5) Dimensions in millimetres.
6) Mounting plates are supplied separately and shall be fixed to the support at the construction site.

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	IMPERIAL VERSION	Date					
Appr. by :	Date:	Section 5 – Mounting supports	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. 501 cont'd on sheet No. Drawing No. T					

Mounting supports - DEP 32.37.02.82-Gen., sheet 7 7/92 **(DEP Circular 44/92)**



TYPE S2
FOR GRATING AND STEEL PLATFORMS

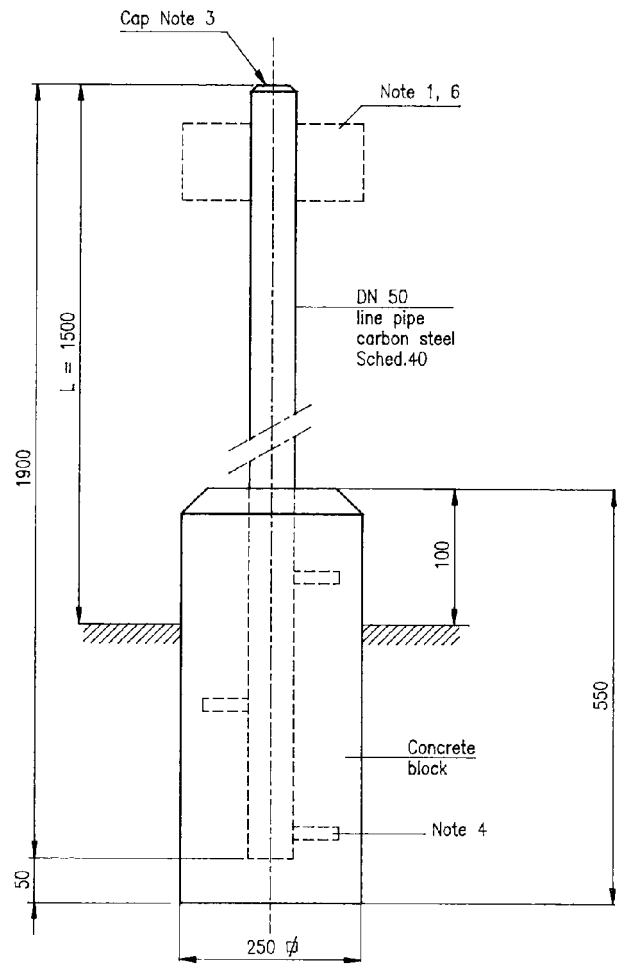
NOTES:

1) Plates and strips carbon steel 10 mm thick.
2) For dimensions of mounting plate, see S-37813 or S-37.814.
3) Finish: after shotblasting a preserving agent shall be applied as per requistion.
4) Cap material: ☐ plastic or ☐ carbon steel
5) Dimensions in millimetres.
6) Mounting plates are supplied separately and shall be fixed to the support at the construction site.

Made by :	Date:	Title : **INSTRUMENT IMPULSE LINES** IMPERIAL VERSION	Issue					
Checked by:	Date:		Date					
Appr. by :	Date:	Section 5 – Mounting supports	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. 502 cont'd on sheet No. Drawing No. T					

DEP 32.37.02.82 – Gen., sheet 7, 7/92

Mounting supports - DEP 32.37.02.82-Gen., sheet 8 7/92 **(DEP Circular 44/92)**



TYPE S3
FOR UNPAVED AREAS

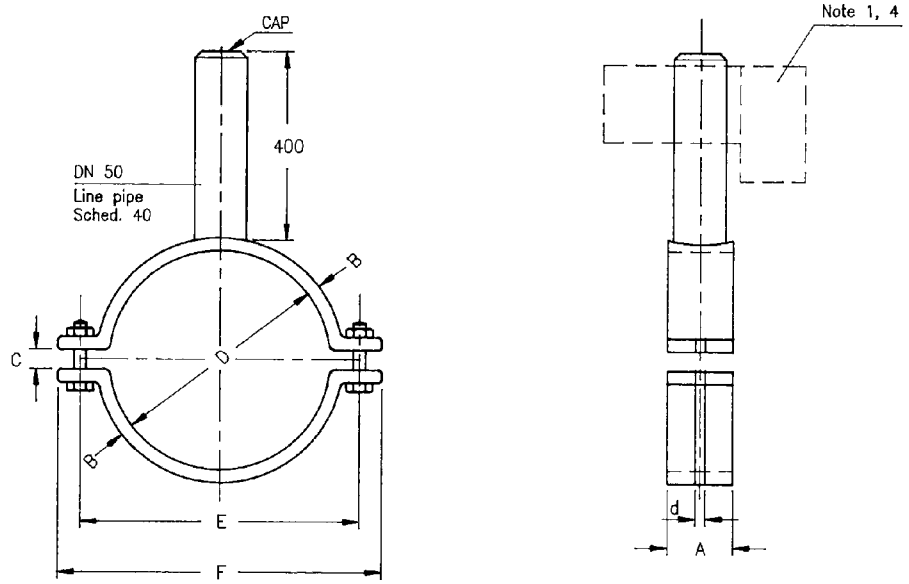
NOTES:

1) For dimensions of mounting plate, see S – 37.813 or S – 37.814.
2) Finish: after shotblasting a preserving agent shall be applied as per requisition.
3) Cap material : □ plastic or □ carbon steel.
4) Anchor strips welded to support.
5) Dimensions in milimetres.
6) Mounting plates are supplied separately and shall be fixed to the support at the construction site.

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	IMPERIAL VERSION	Date					
Appr. by :	Date:	Section 5 – Mounting supports	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. 503 cont'd on sheet No. Drawing No. T					

DEP 32.37.02.82 – Gen., sheet 8, 7/92

Mounting supports - DEP 32.37.02.82-Gen., sheet 9 7/92 **(DEP Circular 44/92)**



TYPE S4

STRAIGHT SUPPORT FOR LINE MOUNTING

(RESTRICTED USE, SEE DEP 32.37.10.11 – Gen.)

NOTES:

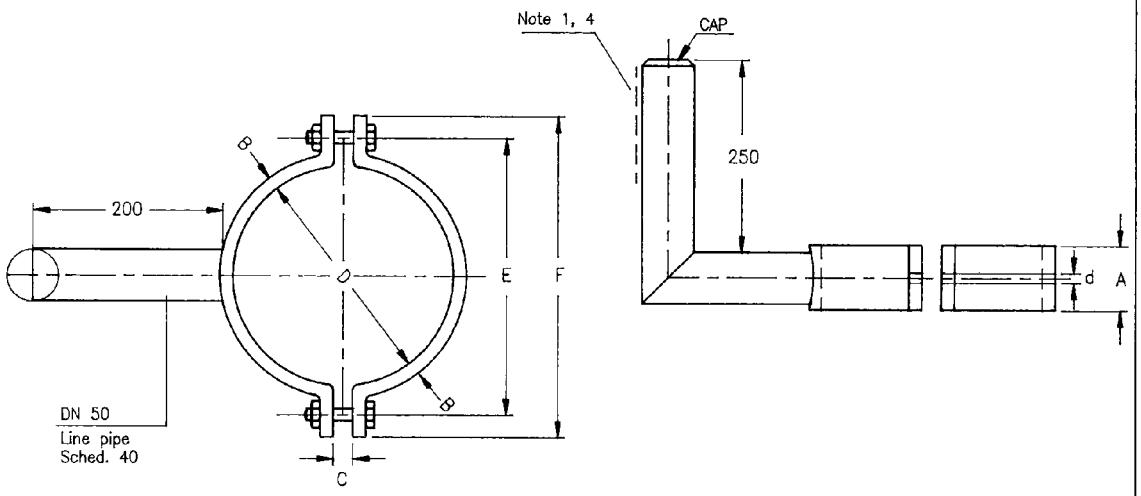
1) For dimensions of mounting plate, see S–37.813 or S–37.814.
2) Material of clamps : carbon steel
   Cap : ☐ plastic or ☐ carbon steel
   Line pipe : carbon steel
   Bolts and nuts : unified black hexagon, heavy series.
3) Finish : after shotblasting a preserving agent shall be applied as per requisition.
4) Mounting plates are supplied separately and shall be fixed to the support at the construction site.

Nom line size	Dimensions in millimetres							Bolt data
	A	B	C	D	E	F	Bolt hole d	
DN 100	65	5	12	117	180	230	22	M20 x 45
DN 150		8		171	250	300		M20 x 50
DN 200				223	300	350		
DN 250	75	10	20	277	360	410		M20 x 65
DN 300				328	420	470		
DN 350		12		360	460	510		M20 x 70
DN 400				410	520	570		
DN 450				462	570	620		
DN 500				512	620	670		
DN 600	90		24	615	720	780	28	M24 x 80

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue				
Checked by:	Date:	IMPERIAL VERSION	Date				
Appr. by :	Date:	Section 5 – Mounting supports	By				
LOCATION :		PLANT :	Project & group No.:				
Eng. by : Principal :			Sheet No. 504 cont'd on sheet No. Drawing No. T				

DEP 32.37.02.82 – Gen., sheet 9, 7/92

Mounting supports - DEP 32.37.02.82-Gen., sheet 10 7/92 **(DEP Circular 44/92)**



TYPE S5
ANGLE SUPPORT FOR LINE MOUNTING
(RESTRICTED USE, SEE DEP 32.37.10.11 – Gen.)

NOTES:

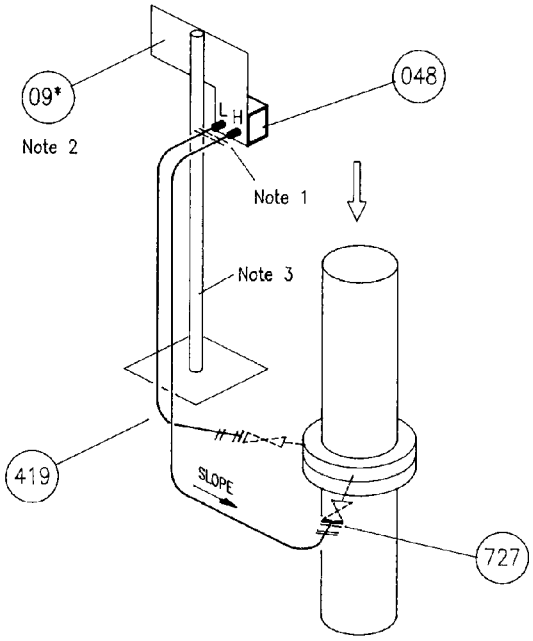
1) For dimensions of mounting plate, see S–37.813 or S–37.814.
2) Material of clamps : carbon steel
   Cap : ☐ plastic or ☐ carbon steel
   Line pipe : carbon steel
   Bolts and nuts : unified black hexagon, heavy series.
3) Finish : after shotblasting a preserving agent shall be applied as per requisition.
4) Mounting plates are supplied separately and shall be fixed to the support at the construction site.

Nom line size	Dimensions in millimetres							Bolt data
	A	B	C	D	E	F	Bolt hole d	
DN 100	65	5	12	117	180	230	22	M20 x 45
DN 150		8		171	250	300		M20 x 50
DN 200				223	300	350		
DN 250	75	10	20	277	360	410		M20 x 65
DN 300				328	420	470		
DN 350		12		360	460	510		M20 x 70
DN 400				410	520	570		
DN 450				462	570	620		
DN 500				512	620	670		
DN 600	90		24	615	720	780	28	M24 x 80

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES		Issue	
Checked by:	Date:	IMPERIAL VERSION		Date	
Appr. by :	Date:	Section 5 – Mounting supports		By	
LOCATION :		PLANT :		Project & group No.:	
Eng. by : Principal :				Sheet No. 505 cont'd on sheet No. Drawing No. T	

DEP 32.37.02.82 – Gen., sheet 10, 7/92

Flow instruments - DEP 32.37.02.82-Gen., sheet 11 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1
3) This support is typical.
   For selected type see section 3.

Item	Quantity	Size or connection	Description	Material	MESC
048	1	3/8 in.	Double isolate /equalize / vent block	SS	60.98.56.207.1
09.*	1	–	mounting plate L–shape /rectangular	SS	60.98.91
419	3 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.	SS	74.48.50.055.1
727	2	3/8 in. x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.106.1

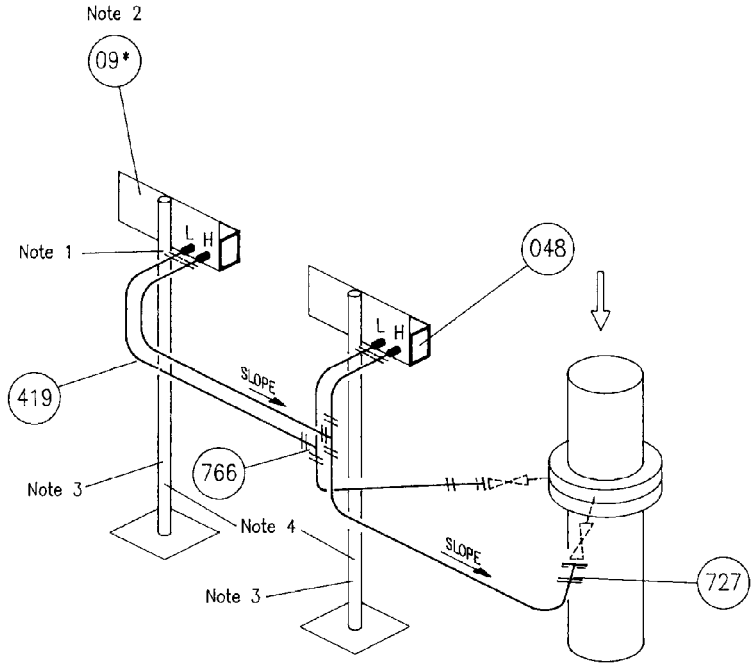
GAS FLOW
FLOW IN EITHER DIRECTION

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue		
Checked by:	Date:	IMPERIAL VERSION	Date		
Appr. by :	Date:	Section 6 – Flow instruments	By		
LOCATION :		PLANT :	Project & group No.:		
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T		

DEP 32.37.02.82 – Gen., sheet 11, 7/92

Flow instruments - DEP 32.37.02.82-Gen., sheet 12 7/92 **(DEP Circular 44/92)**

Tag No.



NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1
3) This support is typical.
   For selected type see section 3.
4) Instruments either mounted on separate supports or on one support.

Item	Quantity	Size or connection	Description	Material	MESC
048	2	3/8 in.	Double isolate /equalize / vent block	SS	60.98.56.207.1
09.*	2	–	Mounting plate L–shape /rectangular	SS	60.98.91
419	4 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.	SS	74.48.50.055.1
727	2	3/8 in. x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.106.1
766	2	3/8 in.	Union tee compression type	SS	76.39.85.063.1

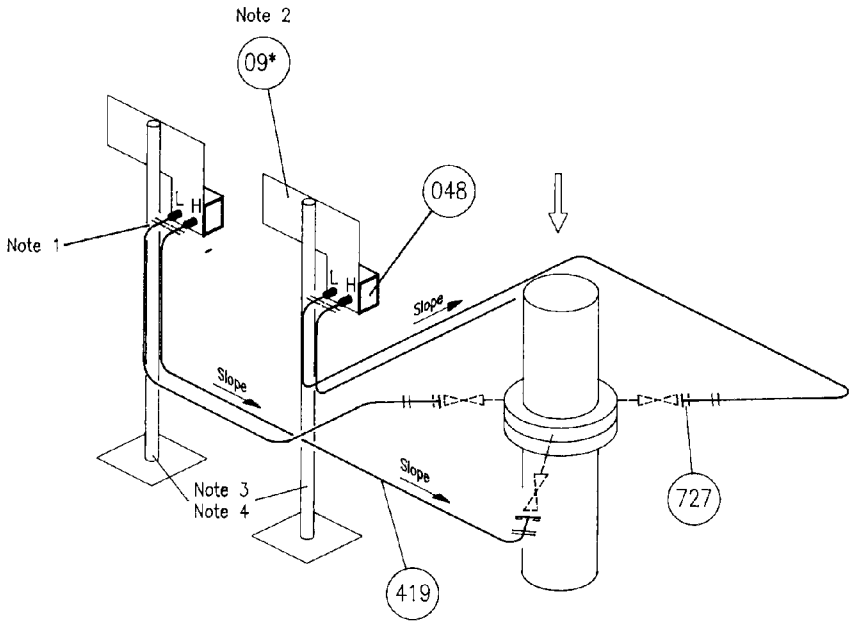
GAS FLOW
DUAL RANGE TRANSMITTERS
FLOW IN EITHER DIRECTION

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	IMPERIAL VERSION	Date					
Appr. by :	Date:	Section 6 – Flow instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.82 – Gen., sheet 12, 7/92

Flow instruments - DEP 32.37.02.82-Gen., sheet 13 7/92 **(DEP Circular 44/92)**

Tag No.



NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1
3) This support is typical. For this application, also a pipe support may be considered. (For restriction see DEP 32.37.10.11 – Gen.)
4) Instruments either mounted on separate supports or on one support.

Item	Quantity	Size or connection	Description	Material	MESC
048	2	3/8 in.	Double isolate /equalize / vent block	SS	60.98.56.207.1
09.*	2	–	Mounting plate L-shape /rectangular	SS	60.98.91
419	6 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.	SS	74.48.50.055.1
727	4	3/8 in. x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.106.1

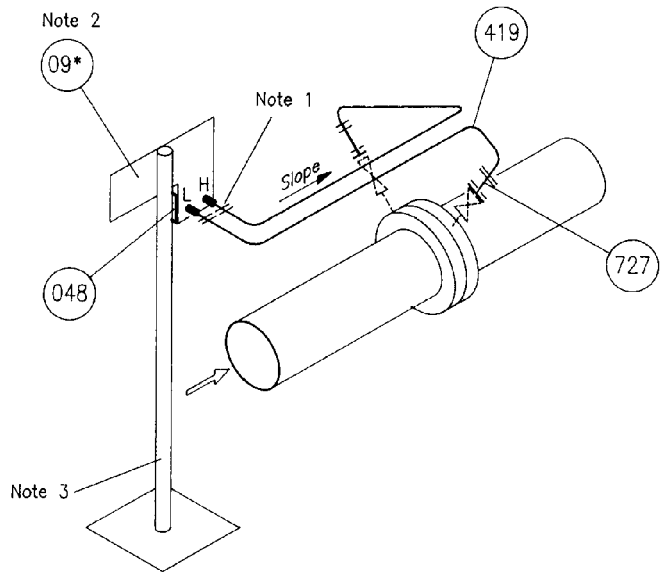
GAS FLOW
CONTROL/EMERGENCY – 2 TRANSMITTERS
FLOW IN EITHER DIRECTION

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	IMPERIAL VERSION	Date					
Appr. by :	Date:	Section 6 – Flow instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.82 – Gen., sheet 13, 7/92

Flow instruments - DEP 32.37.02.82-Gen., sheet 14 7/92 **(DEP Circular 44/92)**

Tag No.



NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1.
3) This support is typical. For selected type see section 3.

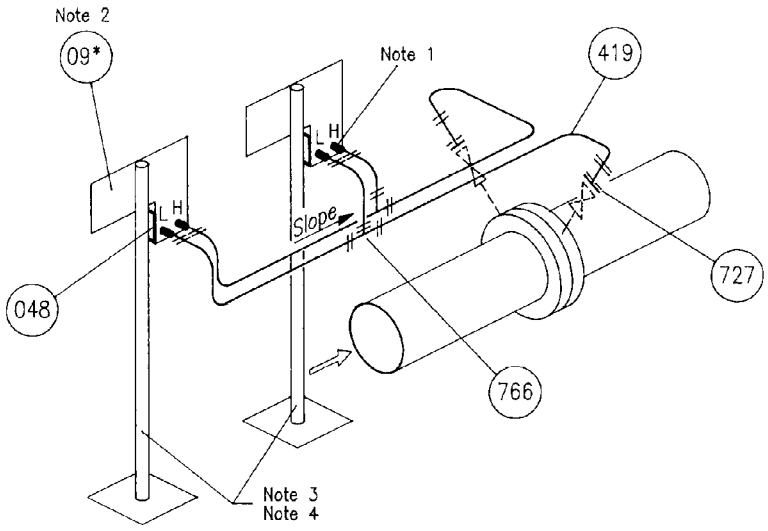
Item	Quantity	Size or connection	Description	Material	MESC
048	1	3/8 in.	Double isolate / equalize / vent block	SS	60.98.56.207.1
09.*	1	–	Mounting plate L–shape / rectangular	SS	60.98.91.
419	3 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.	SS	74.48.50.055.1
727	2	3/8 in. x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.106.1
			GAS FLOW		

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	IMPERIAL VERSION	Date					
Appr. by :	Date:	Section 6 – Flow instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.82 – Gen., sheet 14, 7/92

Flow instruments - DEP 32.37.02.82-Gen., sheet 15 7/92 **(DEP Circular 44/92)**

Tag No.



NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1
3) This support is typical. For this application, also a pipe support may be considered. (For restrictions see DEP 32.37.10.11 – Gen.)
4) Instruments either mounted on separate supports or on one support.

Item	Quantity	Size or connection	Description	Material	MESC
048	2	3/8 in.	Double isolate /equalize / vent block	SS	60.98.56.207.1
09.*	2	–	Mounting plate L–shape /rectangular	SS	60.98.91
419	4 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.	SS	74.48.50.055.1
727	2	3/8 in. x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.106.1
766	2	3/8 in.	Union tee compression type	SS	76.39.85.063.1

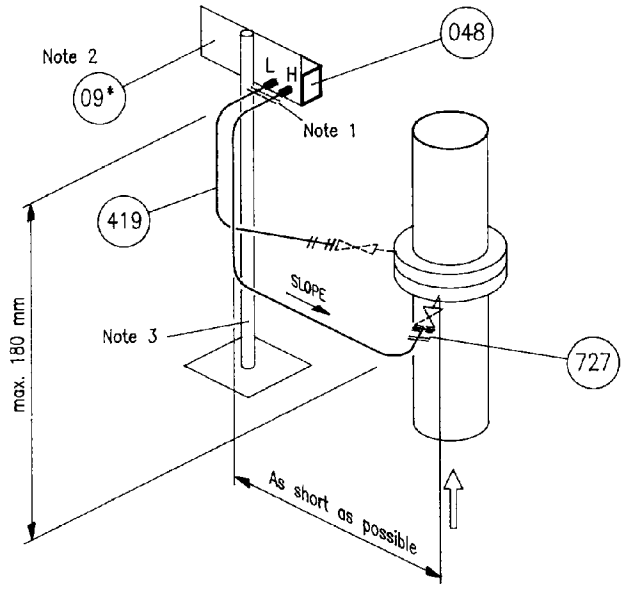
GAS FLOW
2 TRANSMITTERS

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	IMPERIAL VERSION	Date					
Appr. by :	Date:	Section 6 – Flow instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.82 – Gen., sheet 15, 7/92

Flow instruments - DEP 32.37.02.82-Gen., sheet 16 7/92 **(DEP Circular 44/92)**

Tag No.



NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1
3) This support is typical. For this application, also a pipe support may be considered. (For restrictions see DEP 32.37.10.11 – Gen.)

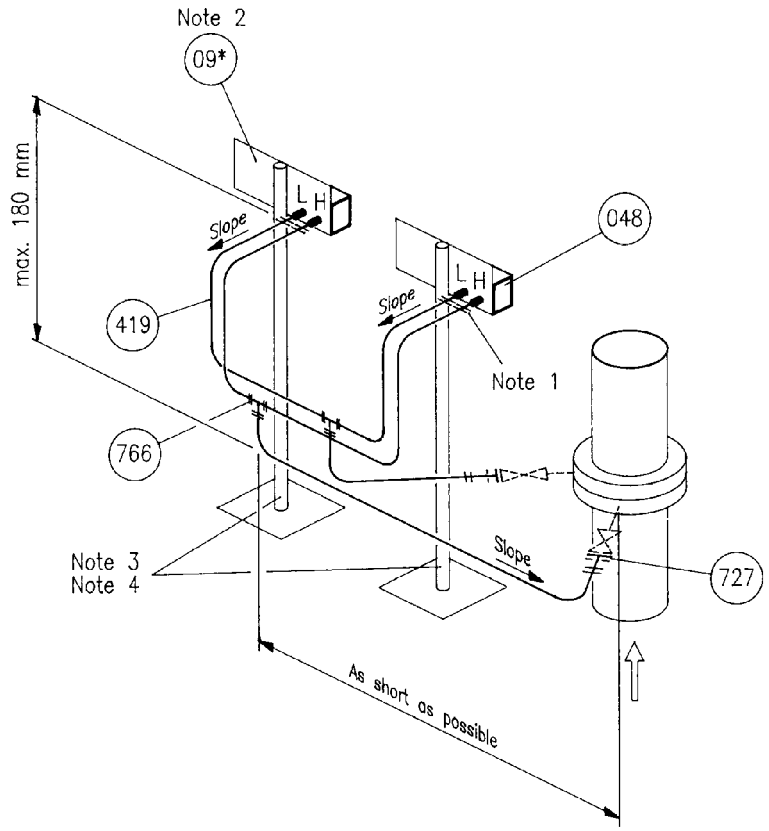
Item	Quantity	Size or connection	Description	Material	MESC
048	1	3/8 in.	Double isolate /equalize / vent block	SS	60.98.56.207.1
09.*	1	–	Mounting plate L–shape /rectangular	SS	60.98.91
419	3 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.	SS	74.48.50.055.1
727	2	3/8 in. x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.106.1

LIQUID FLOW – CLOSE COUPLED
UPWARD FLOW ONLY

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	IMPERIAL VERSION	Date					
Appr. by :	Date:	Section 6 – Flow instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.82 – Gen., sheet 16, 7/92

Flow instruments - DEP 32.37.02.82-Gen., sheet 17 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

1) Male connectors from part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1.
3) This support is typical. For this application, also a pipe suppport may be considered. (For restrictions see DEP 32.37.10.11 – Gen.)
4) Instruments either mounted on separate supports or on one support.

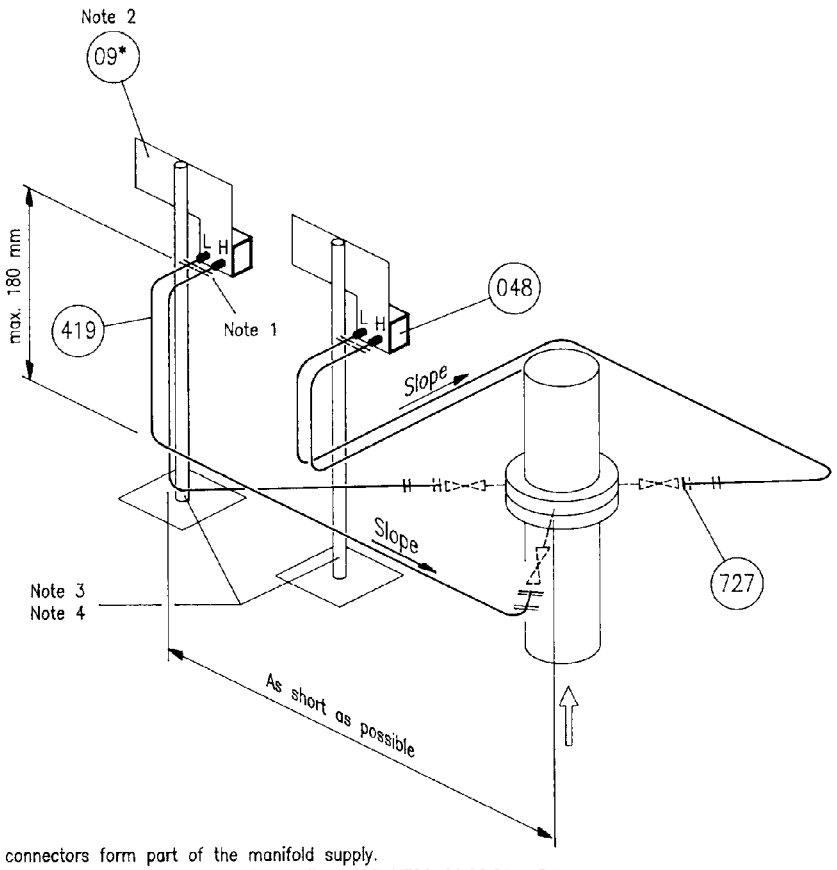
Item	Quantity	Size or connection	Description	Material	MESC
048	2	3/8 in.	Double isolate / equalize / vent block	SS	60.98.56.207.1
09.*	2	–	Mounting plate L–shape / rectangular	SS	60.98.91.
419	4 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.	SS	74.48.50.055.1
727	2	3/8 in. x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.106.1
766	2	3/8 in.	Union tee compression type	SS	76.39.85.063.1

LIQUID FLOW – CLOSE COUPLED
DUAL RANGE TRANSMITTERS
UPWARD FLOW ONLY

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES		Issue				
Checked by:	Date:	IMPERIAL VERSION		Date				
Appr. by :	Date:	Section 6 – Flow instruments		By				
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.82 – Gen., sheet 17, 7/92

Flow instruments - DEP 32.37.02.82-Gen., sheet 18 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1
3) This support is typical. For this application, also a pipe support may be considered. (For restrictions see DEP 32.37.10.11 – Gen.)
4) Instruments either mounted on separate supports or on one support.

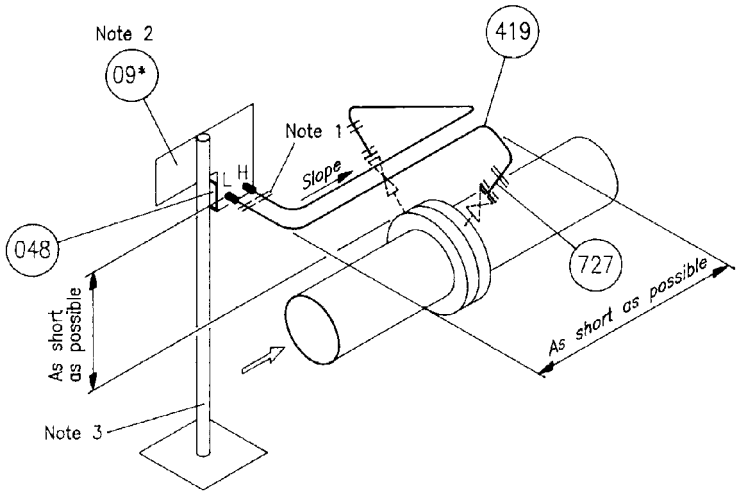
Item	Quantity	Size or connection	Description	Material	MESC
048	2	3/8 in.	Double isolate /equalize / vent block	SS	60.98.56.207.1
09.*	2	–	Mounting plate L-shape /rectangular	SS	60.98.91
419	6 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.	SS	74.48.50.055.1
727	4	3/8 in. x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.106.1

LIQUID FLOW – CLOSE COUPLED
CONTROL/EMERGENCY – 2 TRANSMITTERS
UPWARD FLOW ONLY

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	IMPERIAL VERSION	Date					
Appr. by :	Date:	Section 6 – Flow instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.82 – Gen., sheet 18, 7/92

Flow instruments - DEP 32.37.02.82-Gen., sheet 19 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1.
3) This support is typical. For this application, also a pipe support may be considered. (For restrictions see DEP 32.37.10.11 – Gen.)

Item	Quantity	Size or connection	Description	Material	MESC
048	1	3/8 in.	Double isolate / equalize / vent block	SS	60.98.56.207.1
09.*	1	–	Mounting plate L-shape / rectangular	SS	60.98.91.
419	3 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.	SS	74.48.50.055.1
727	2	3/8 in. x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.106.1

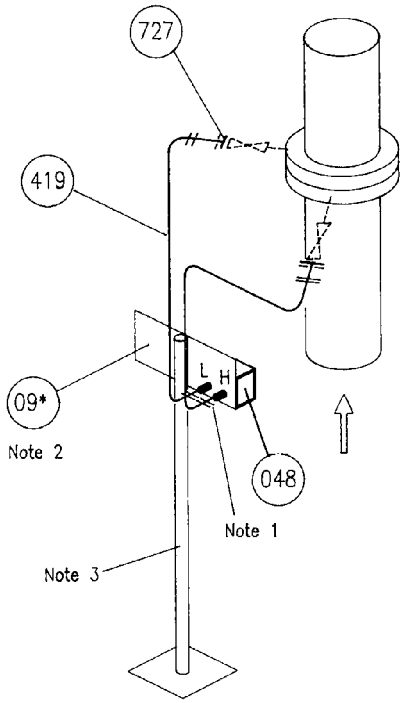
LIQUID FLOW
CLOSE COUPLED

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	IMPERIAL VERSION	Date					
Appr. by :	Date:	Section 6 – Flow instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.82 – Gen., sheet 19, 7/92

Flow instruments - DEP 32.37.02.82-Gen., sheet 20 7/92 **(DEP Circular 44/92)**

Tag No.



NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1
3) This support is typical.
   For selected type see section 3.

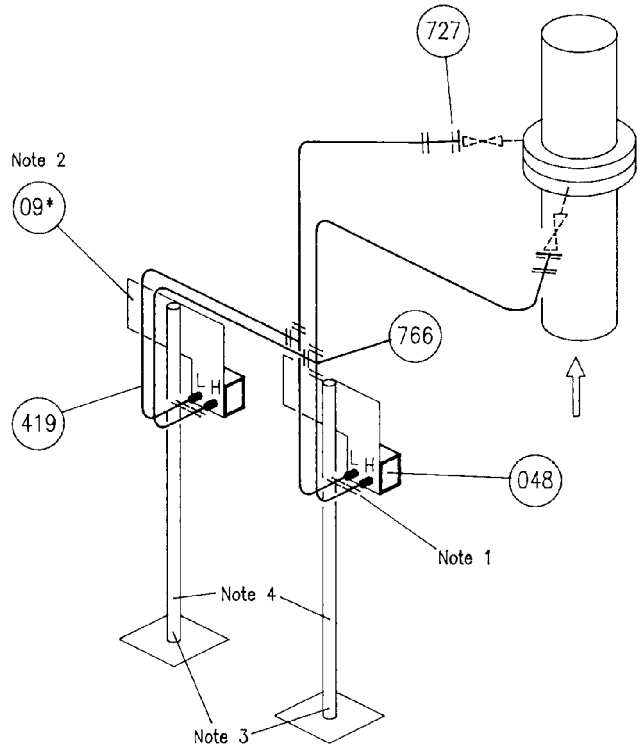
Item	Quantity	Size or connection	Description	Material	MESC
048	1	3/8 in.	Double isolate /equalize / vent block	SS	60.98.56.207.1
09.*	1	–	Mounting plate L-shape /rectangular	SS	60.98.91
419	3 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.	SS	74.48.50.055.1
727	2	3/8 in. x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.106.1

LIQUID FLOW – REMOTE MOUNTING
UPWARD FLOW ONLY

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES		Issue				
Checked by:	Date:	IMPERIAL VERSION		Date				
Appr. by :	Date:	Section 6 – Flow instruments		By				
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.82 – Gen., sheet 20, 7/92

Flow instruments - DEP 32.37.02.82-Gen., sheet 21 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1
3) This support is typical.
   For selected type see section 3.
4) Instruments either mounted on separate supports or on one support.

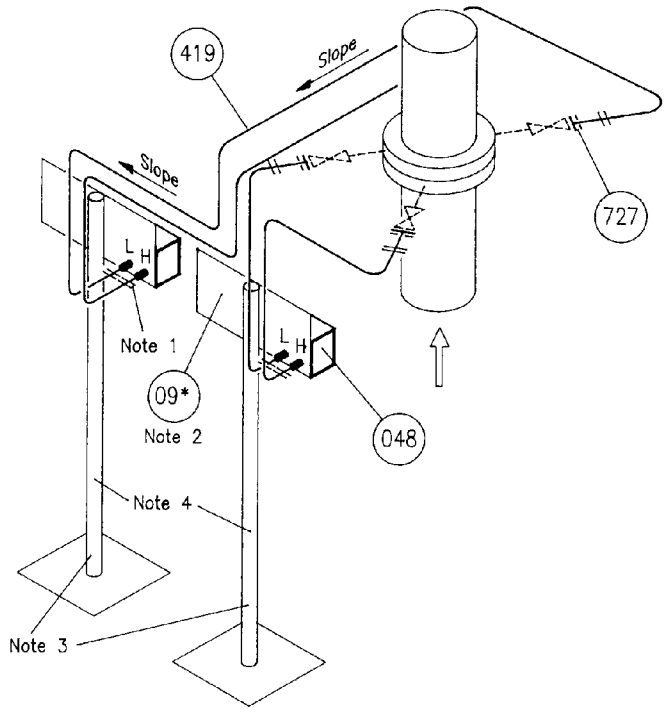
Item	Quantity	Size or connection	Description	Material	MESC
048	2	3/8 in.	Double isolate /equalize / vent block	SS	60.98.56.207.1
09.*	2	–	Mounting plate L-shape /rectangular	SS	60.98.91
419	4 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.	SS	74.48.50.055.1
727	2	3/8 in. x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.106.1
766	2	3/8 in.	Union tee compression type	SS	76.39.85.063.1

LIQUID FLOW – REMOTE MOUNTING
DUAL RANGE TRANSMITTERS
UPWARD FLOW ONLY

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	IMPERIAL VERSION	Date					
Appr. by :	Date:	Section 6 – Flow instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.82 – Gen., sheet 21, 7/92

Flow instruments - DEP 32.37.02.82-Gen., sheet 22 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1.
3) This support is typical. For selected type see section 3.
4) Instruments either mounted on separate supports or on one support.

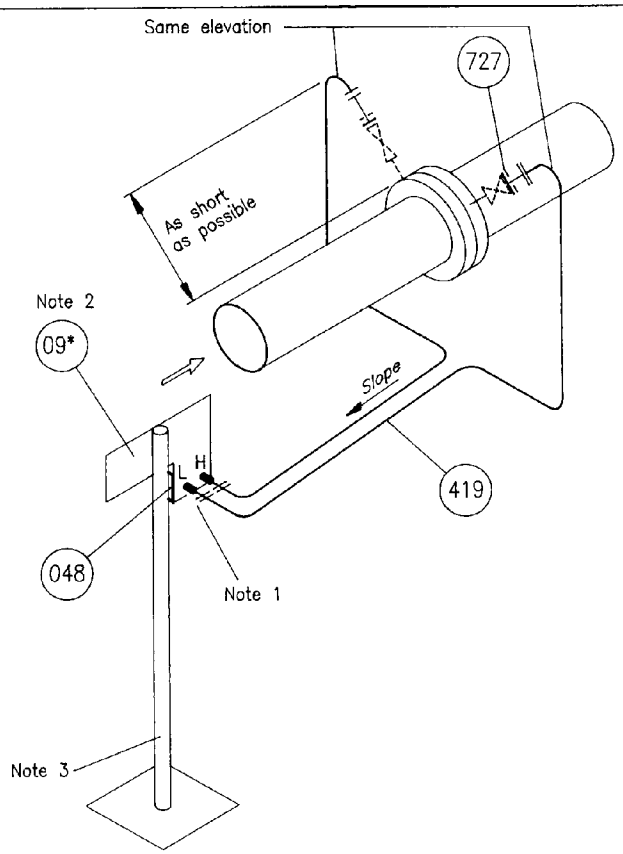
Item	Quantity	Size or connection	Description	Material	MESC
048	2	3/8 in.	Double isolate / equalize / vent block	SS	60.98.56.207.1
09.*	2	–	Mounting plate L-shape / rectangular	SS	60.98.91.
419	6 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.	SS	74.48.50.055.1
727	4	3/8 in. x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.106.1

LIQUID FLOW – REMOTE MOUNTING
CONTROL/EMERGENCY – 2 TRANSMITTERS
UPWARD FLOW ONLY

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue				
Checked by:	Date:	IMPERIAL VERSION	Date				
Appr. by :	Date:	Section 6 – Flow instruments	By				
LOCATION :		PLANT :	Project & group No.:				
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T				

DEP 32.37.02.82 – Gen., sheet 22, 7/92

Flow instruments - DEP 32.37.02.82-Gen., sheet 23 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1.
3) This support is typical. For selected type see section 3.

Item	Quantity	Size or connection	Description	Material	MESC
048	1	3/8 in.	Double isolate / equalize / vent block	SS	60.98.56.207.1
09.*	1	–	Mounting plate L–shape / rectangular	SS	60.98.91.
419	3 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.	SS	74.48.50.055.1
727	2	3/8 in. x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.106.1

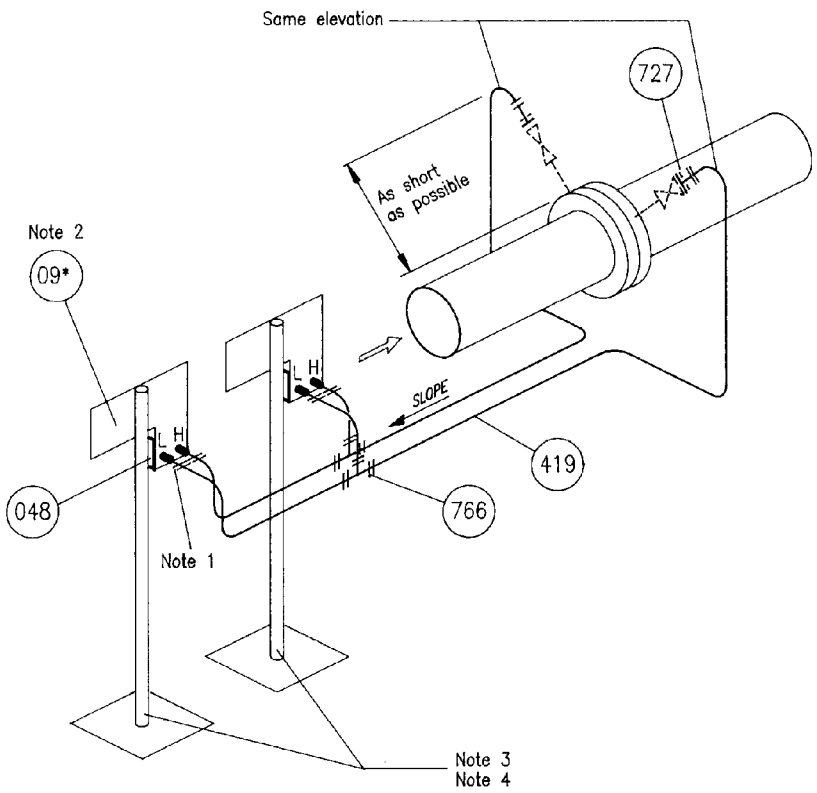
LIQUID FLOW – REMOTE MOUNTING

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	IMPERIAL VERSION	Date					
Appr. by :	Date:	Section 6 – Flow instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.82 – Gen., sheet 23, 7/92

Flow instruments - DEP 32.37.02.82-Gen., sheet 24 7/92 **(DEP Circular 44/92)**

Tag No.



NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1
3) This support is typical. For this application, also a pipe support may be considered. (For restrictions see DEP 32.37.10.11 – Gen.)
4) Instruments either mounted on separate supports or on one support.

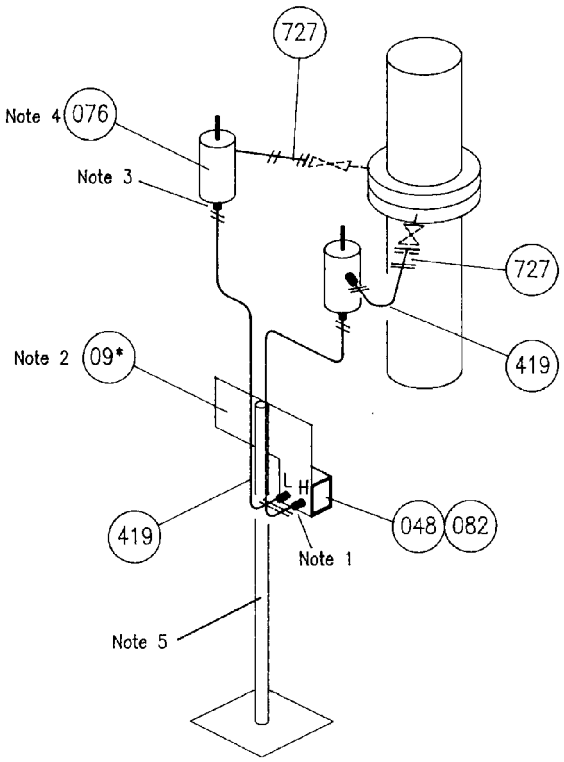
Item	Quantity	Size or connection	Description	Material	MESC
048	2	3/8 in.	Double isolate /equalize / vent block	SS	60.98.56.207.1
09.*	2	–	Mounting plate L-shape /rectangular	SS	60.98.91
419	4 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.	SS	74.48.50.055.1
727	2	3/8 in. x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.106.1
766	2	3/8 in.	Union tee compression type	SS	76.39.85.063.1

LIQUID FLOW – REMOTE MOUNTING
2 TRANSMITTERS

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	IMPERIAL VERSION	Date					
Appr. by :	Date:	Section 6 – Flow instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.82 – Gen., sheet 24, 7/92

Flow instruments - DEP 32.37.02.82-Gen., sheet 25 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1
3) Male connectors form a part of the seal pot supply.
4) Seal pots (items 076) shall be at the same elevation and well supported.
5) This support is typical.
   For selected type see section 3.

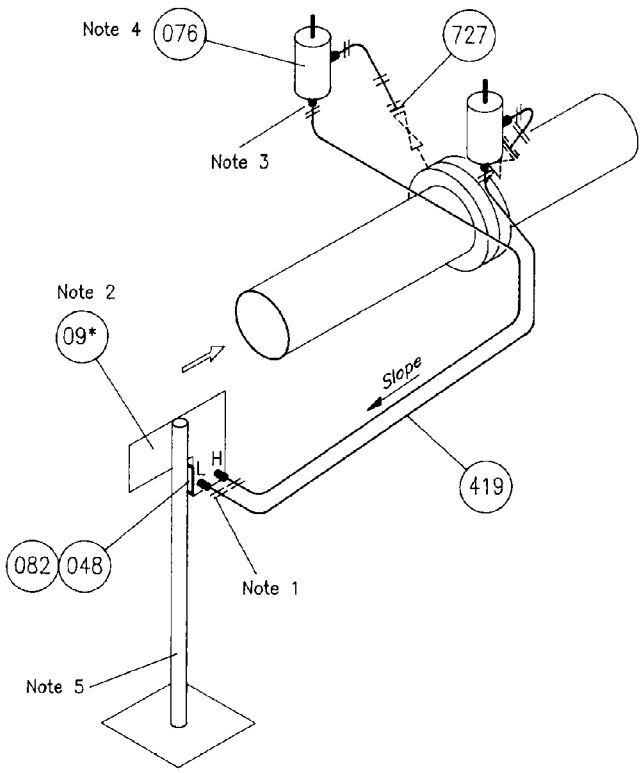
Item	Quantity	Size or connection	Description	Material	MESC
048	1	3/8 in.	Double isolate /equalize / vent block	SS	60.98.56.207.1
076	2	3/8 in.	Seal pot with vent valve	SS	60.98.70.610.1
082	2	1/4 in.	Filling connector	SS	60.98.90.107.1
09.*	1	–	Mounting plate L-shape / rectangular	SS	60.98.91
419	3 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.	SS	74.48.50.055.1
727	2	3/8 in. x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.106.1

STEAM FLOW

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	IMPERIAL VERSION	Date					
Appr. by :	Date:	Section 6 – Flow instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.82 – Gen., sheet 25, 7/92

Flow instruments - DEP 32.37.02.82-Gen., sheet 26 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1.
3) Male connectors form a part of the sealpot supply.
4) Seal pots (item 076) shall be at the same elevation and well supported.
5) This support is typical. For selected type see section 3.

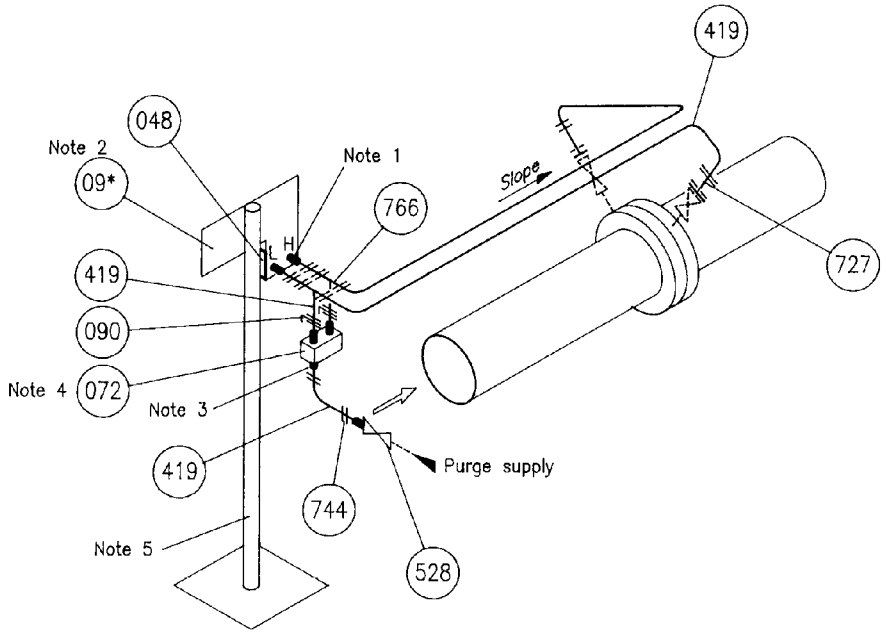
Item	Quantity	Size or connection	Description	Material	MESC
048	1	3/8 in.	Double isolate / equalize / vent block	SS	60.98.56.207.1
076	2	3/8 in.	Seal pot with vent valve	SS	60.98.70.610.1
082	2	1/4 in.	Filling connector	SS	60.98.90.107.1
09.*	1	–	Mounting plate L-shape / rectangular	SS	60.98.91.
419	3 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.	SS	74.48.50.055.1
727	2	3/8 in. x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.106.1

STEAM FLOW

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	IMPERIAL VERSION	Date					
Appr. by :	Date:	Section 6 – Flow instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.82 – Gen., sheet 26, 7/92

Flow instruments - DEP 32.37.02.82-Gen., sheet 27 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

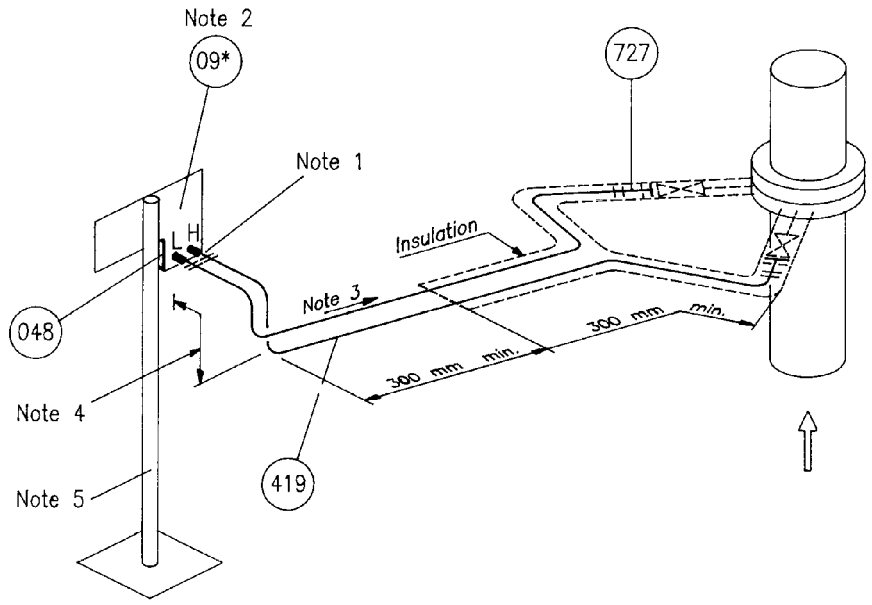
1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1.
3) Male connectors form a part of the purge filter block supply.
4) Bracket of purge filter block (item 072) shall be bolted to mounting support.
5) This support is typical. For selected type see section 3.

Item	Quantity	Size or connection	Description	Material	MESC
048	1	3/8 in.	Double isolate / equalize / vent block	SS	60.98.56.207.1
072	1	3/8 in.	Double purge filter block with vent valve	SS	60.98.70.320.1
090	2	3/8 in.	Purge orifice nipple	SS	60.98.90.810.1
09.*	1	–	Mounting plate L–shape / rectangular	SS	60.98.91.
419	3 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.	SS	74.48.50.055.1
528	1	1/2 in. NPT	Needle valve – screwed	SS	77.34.08.003.1
727	2	3/8 in. x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.106.1
744	1	3/8 in. x 1/2 in. NPT	Male connector compression type	SS	76.39.27.065.1
766	2	3/8 in.	Union tee compression type	SS	76.39.85.063.1
			EXTERNAL PURGE		

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	IMPERIAL VERSION	Date					
Appr. by :	Date:	Section 6 – Flow instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.82 – Gen., sheet 27, 4/92

Flow instruments - DEP 32.37.02.82-Gen., sheet 28 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

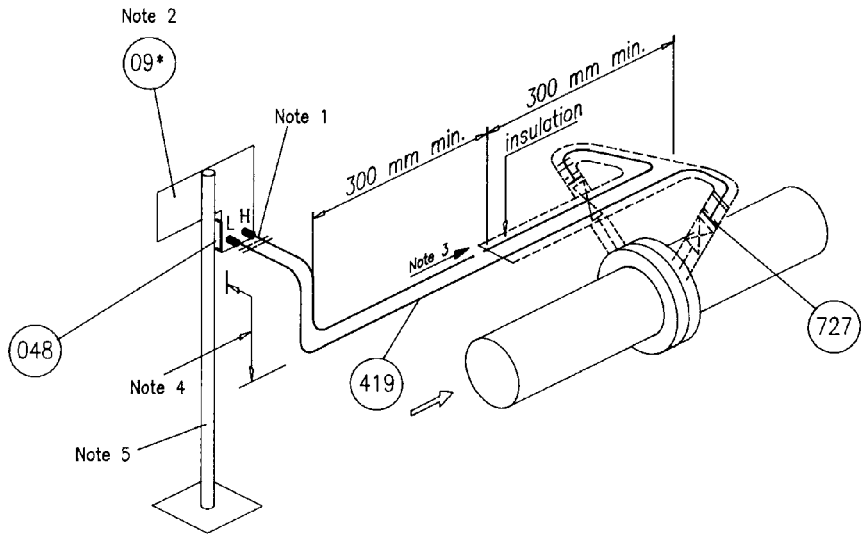
1) Male connectors from part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1.
3) Slope 1:10 to 1:20 and at same elevation.
4) This distance as short as possible.
5) This support is typical.
   For selected type see section 3

Item	Quantity	Size or connection	Description	Material	MESC
048	1	3/8 in.	Double isolate / equalize / vent block	SS	60.98.56.207.1
09.*	1	–	Mounting plate L-shape / rectangular	SS	60.98.91.
419	4 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.	SS	74.48.50.055.1
727	2	3/8 in. x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.106.1

LIQUID FLOW – SELF PURGE
CRYOGENIC-LPG
UPWARD FLOW ONLY

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES		Issue				
Checked by:	Date:	IMPERIAL VERSION		Date				
Appr. by :	Date:	Section 6 – Flow instruments		By				
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

Flow instruments - DEP 32.37.02.82-Gen., sheet 29 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1
3) Slope 1:10 to 1:20 and at same elevation.
4) This distance as short as possible.
5) This support is typical.
   For selected type see section 3

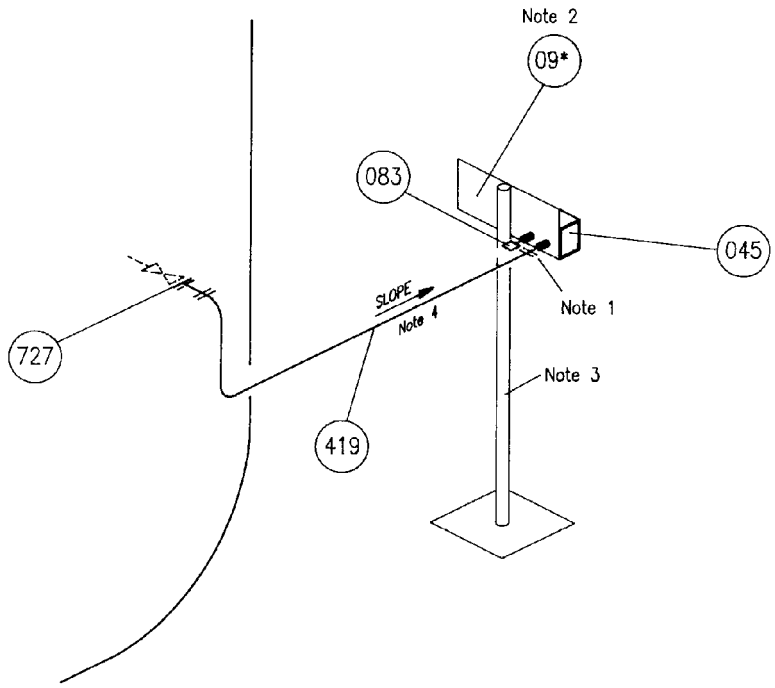
Item	Quantity	Size or connection	Description	Material	MESC
048	1	3/8 in.	Double isolate /equalize / vent block	SS	60.98.56.207.1
09.*	1	–	Mounting plate L–shape /rectangular	SS	60.98.91
419	4 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.	SS	74.48.50.055.1
727	2	3/8 in. x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.106.1

LIQUID FLOW CRYOGENIC–LPG
SELF PURGE

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	IMPERIAL VERSION	Date					
Appr. by :	Date:	Section 6 – Flow instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.82 – Gen., sheet 29, 7/92

Level instruments - DEP 32.37.02.82-Gen., sheet 30 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

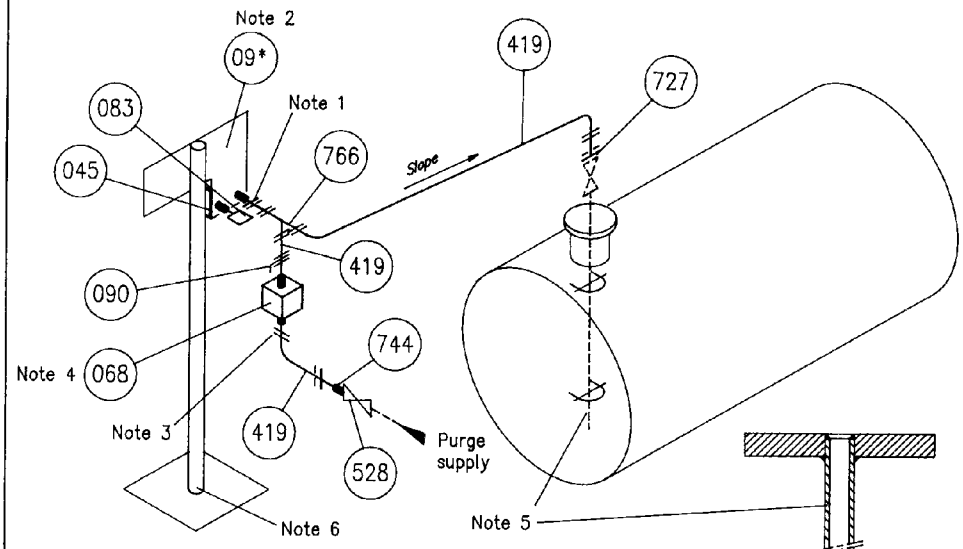
1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1
3) This support is typical.
   For selected type see section 3.
4) D.P. transmitter to be mounted as close as possible to bottom tapping

Item	Quantity	Size or connection	Description	Material	MESC
045	1	3/8 in.	Single isolate / vent block	SS	60.98.56.227.1
083	1	G 1/4 A	Port protector	SS	60.98.90.207.1
09.*	1	–	Mounting plate L-shape /rectangular	SS	60.98.91
419	2 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.	SS	74.48.50.055.1
727	1	3/8 in. x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.106.1
			OPEN VESSEL		

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue		
Checked by:	Date:	IMPERIAL VERSION	Date		
Appr. by :	Date:	Section 7 – Level instruments	By		
LOCATION :		PLANT :	Project & group No.:		
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T		

DEP 32.37.02.82 – Gen., sheet 30, 7/92

Level instruments - DEP 32.37.02.82-Gen., sheet 31 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

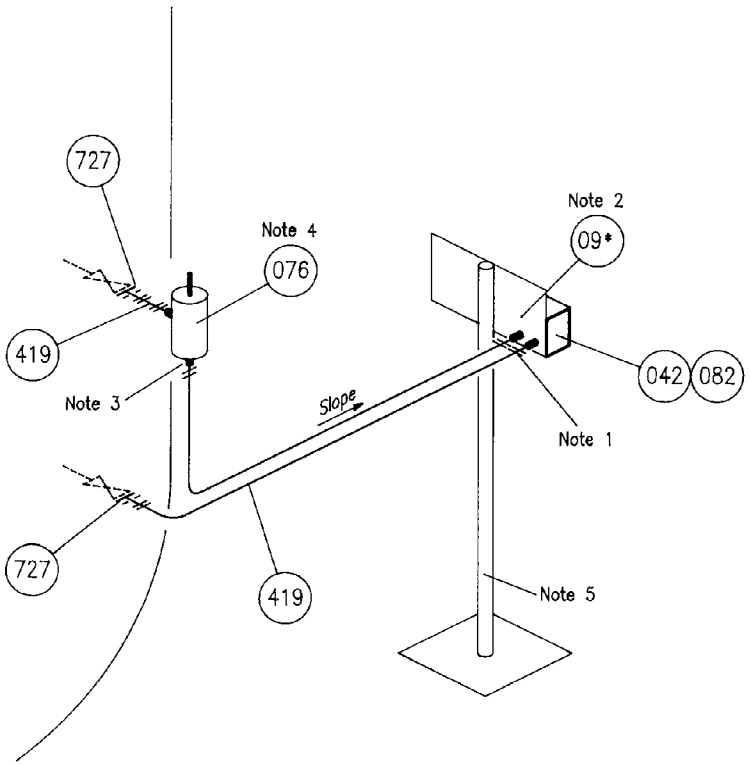
1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1.
3) Male connectors form a part of the purge filter block supply.
4) Bracket of purge filter block (item 068) shall be bolted to mounting support.
5) Purge pipe to be provided by mechanical eng. and to be supported / clamped inside the vessel at intervals of 1 m.
6) This support is typical. For selected type see section 3.

Item	Quantity	Size or connection	Description	Material	MESC
045	1	3/8 in.	Single isolate / vent block	SS	60.98.56.227.1
068	1	3/8 in.	Single purge filter block with vent valve	SS	60.98.70.310.1
083	1	G 1/4 A in.	Part protector	SS	60.98.90.207.1
090	1	3/8 in.	Purge orifice nipple	SS	60.98.90.810.1
09.*	1	–	Mounting plate L-shape / rectangular	SS	60.98.91.
419	3 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.	SS	74.48.50.055.1
528	1	1/2 in. NPT	Needle valve – screwed	SS	77.34.08.003.1
727	1	3/8 in. x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.106.1
744	1	3/8 in. x 1/2 in. NPT	Male connector compression type	SS	76.39.27.065.1
766	1	3/8 in.	Union tee compression type	SS	76.39.85.063.1

EXTERNAL PURGE
(OPEN VESSEL)

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	IMPERIAL VERSION	Date					
Appr. by :	Date:	Section 7 – Level instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

Level instruments - DEP 32.37.02.82-Gen., sheet 32 7/92 **(DEP Circular 44/92)**



NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1or item 093 MESC 60.98.91.118.1.
3) Male connectors shall form a part of the seal pot supply.
4) Seal pot (item 076) to be well supported.
5) This support is typical. For selected type see section 3.
6) D.P. transmitter to be mounted as close as possible to bottom tapping.

Tag No.

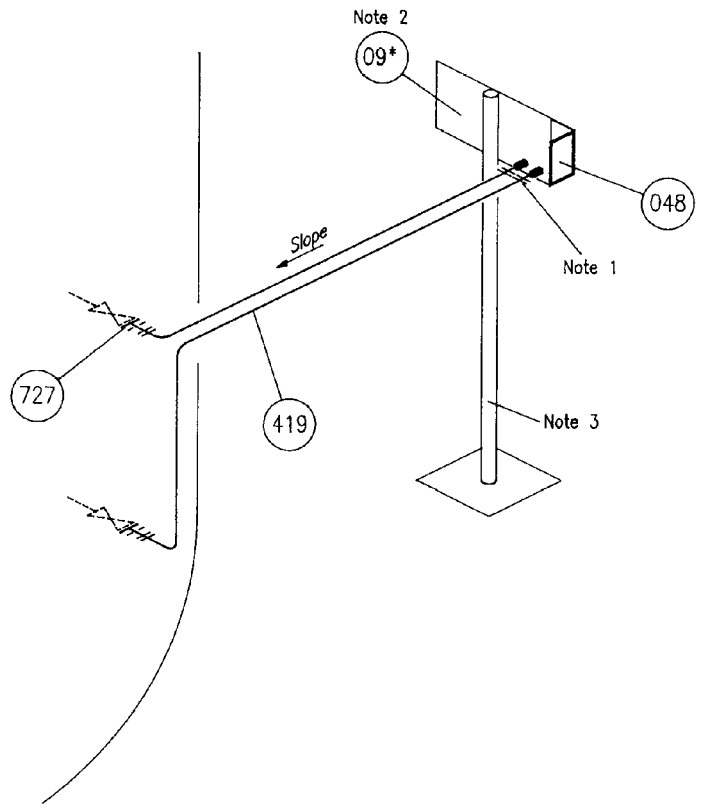
Item	Quantity	Size or connection	Description	Material	MESC
042	1	3/8 in.	Double isolate / vent block	SS	60.98.56.217.1
076	1	3/8 in.	Seal pot with vent valve	SS	60.98.70.610.1
082	1	1/4 in.	Filling connector	SS	60.98.90.107.1
09.*	1	–	Mounting plate L-shape / rectangular	SS	60.98.91.
419	3 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.	SS	74.48.50.055.1
727	2	3/8 in. x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.106.1

WET LEG
CLOSED VESSEL

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	IMPERIAL VERSION	Date					
Appr. by :	Date:	Section 7 – Level instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.82 – Gen., sheet 32, 7/92

Level instruments - DEP 32.37.02.82-Gen., sheet 33 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1or item 093 MESC 60.98.91.118.1.
3) This support is typical. For selected type see section 3.

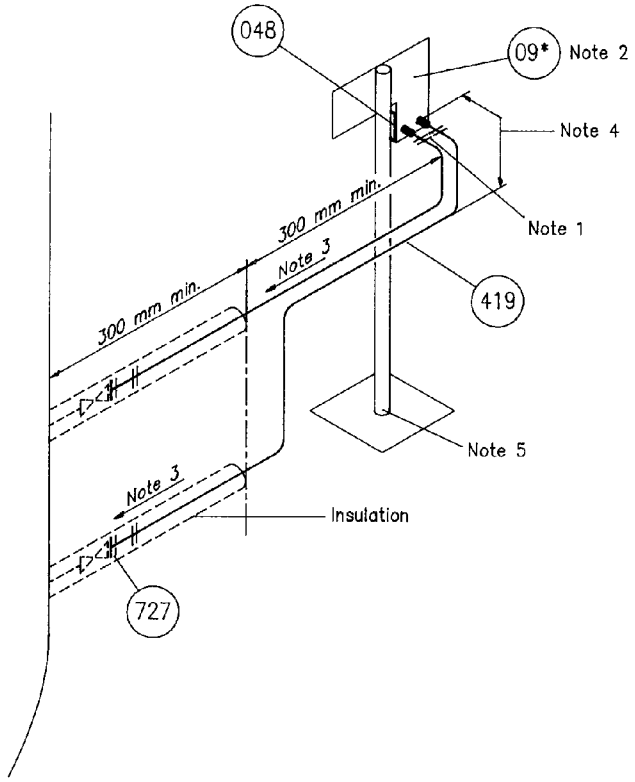
Item	Quantity	Size or connection	Description	Material	MESC
048	1	3/8 in.	Double isolate / equalize / vent black	SS	60.98.56.207.1
09.*	1	–	Mounting plate L-shape / rectangular	SS	60.98.91.
419	3 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.	SS	74.48.50.055.1
727	2	3/8 in. x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.106.1

SELF PURGE
CLOSED VESSEL

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	IMPERIAL VERSION	Date					
Appr. by :	Date:	Section 7 – Level instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.82 – Gen., sheet 33, 7/92

Level instruments - DEP 32.37.02.82-Gen., sheet 34 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1.
3) Slope 1:10 to 1:20.
4) This distance as short as possible.
5) This support is typical. For selected type see section 3.

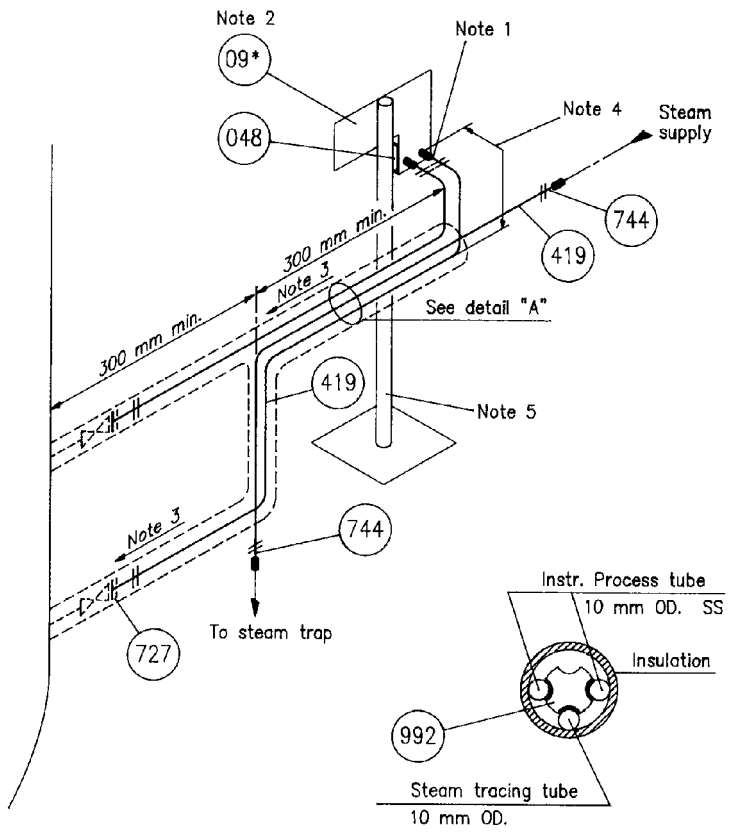
Item	Quantity	Size or connection	Description	Material	MESC
048	1	3/8 in.	Double isolate / equalize / vent block	SS	60.98.56.207.1
09.*	1	–	Mounting plate L–shape / rectangular	SS	60.98.91.
419	3 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.	SS	74.48.50.055.1
727	2	3/8 in. x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.106.1

SELF PURGE
CRYOGENIC LIQUID (LPG)
CLOSED VESSEL

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	IMPERIAL VERSION	Date					
Appr. by :	Date:	Section 7 – Level instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.82 – Gen., sheet 34, 7/92

Level instruments - DEP 32.37.02.82-Gen., sheet 35 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1.
3) Slope 1:10 to 1:20.
4) This distance as short as possible.
5) This support is typical. For selected type see section 3.

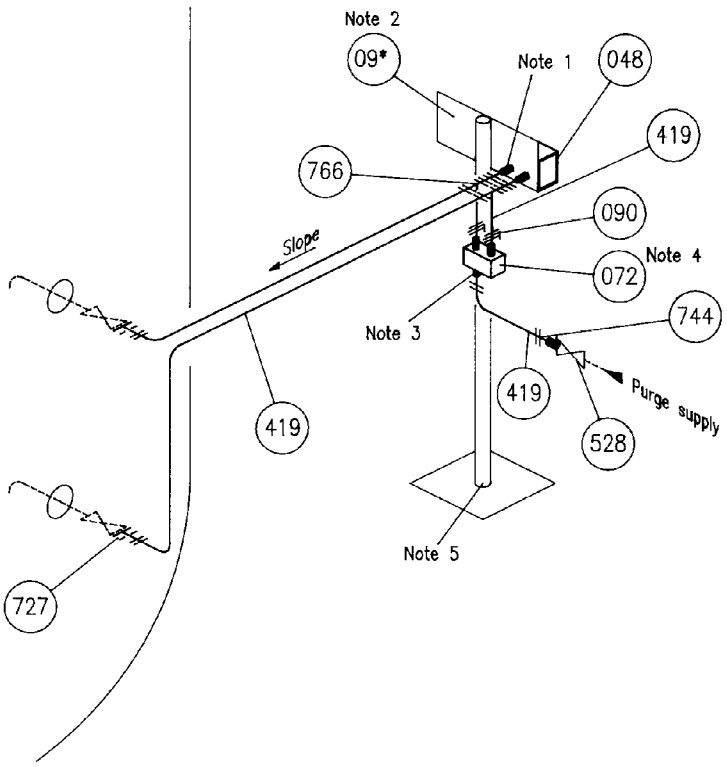
Item	Quantity	Size or connection	Description	Material	MESC
048	1	3/8 in.	Double isolate / equalize / vent block	SS	60.98.56.207.1
09.*	1	–	Mounting plate L–shape / rectangular	SS	60.98.91.
419	6 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.	SS	74.48.50.055.1
727	2	3/8 in. x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.106.1
744	2	3/8 in. x 1/2 in. NPT	Male compression type	SS	76.39.27.065.1
992	14	From 22 mm dia. bar	Tubing spacer	N–metallic	81.86.79.020.1

SELF PURGE
CRYOGENIC LIQUID (LPG)
CLOSED VESSEL

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	IMPERIAL VERSION	Date					
Appr. by :	Date:	Section 7 – Level instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.82 – Gen., sheet 35, 7/92

Level instruments - DEP 32.37.02.82-Gen., sheet 36 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1.
3) Male connectors form part of the purge filter block supply.
4) Bracket of purge filter block (item 072) shall be bolted to mounting support.
5) This support is typical.
   For selected type see section 3.

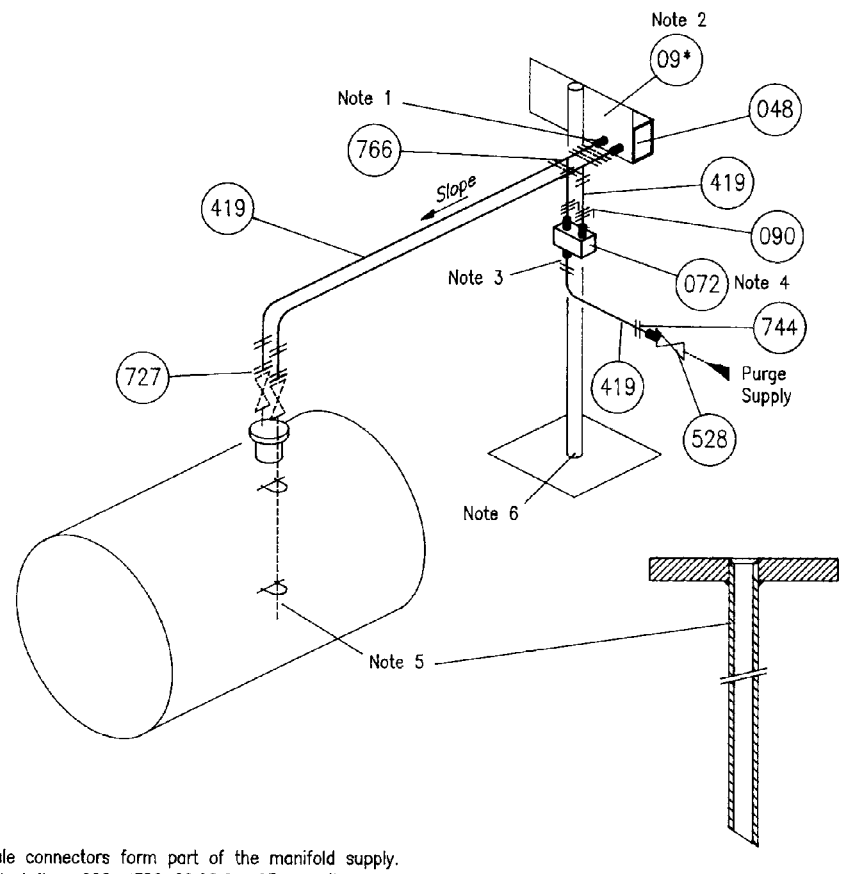
Item	Quantity	Size or connection	Description	Material	MESC
048	1	3/8 in.	Double isolate / equalize / vent block	SS	60.98.56.207.1
072	1	3/8 in.	Double purge filter block with vent valve	SS	60.98.70.320.1
090	2	3/8 in.	Purge orifice nipple	SS	60.98.90.810.1
09.*	1	–	Mounting plate L-shape / rectangular	SS	60.98.91.
419	6 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.	SS	74.48.50.055.1
528	1	1/2 in. NPT	Needle valve – screwed	SS	77.34.08.003.1
727	2	3/8 in. x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.106.1
744	1	3/8 in. x 1/2 in. NPT	Male connector compression type	SS	76.39.27.065.1
766	2	3/8 in.	Union tee compression type	SS	76.39.85.063.1

EXTERNAL PURGE
CLOSED VESSEL

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	IMPERIAL VERSION	Date					
Appr. by :	Date:	Section 7 – Level instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.82 – Gen., sheet 36, 7/92

Level instruments - DEP 32.37.02.82-Gen., sheet 37 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

1) Male connectors form part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1.
3) Male connectors form part of the purge filter block supply.
4) Bracket of purge filter block (item 072) shall be bolted to mounting support.
5) Purge pipe to be provided by mechanical and to be supported / clamped inside the vessel at intervals of 1 m.
6) This support is typical. For selected type see section 3.

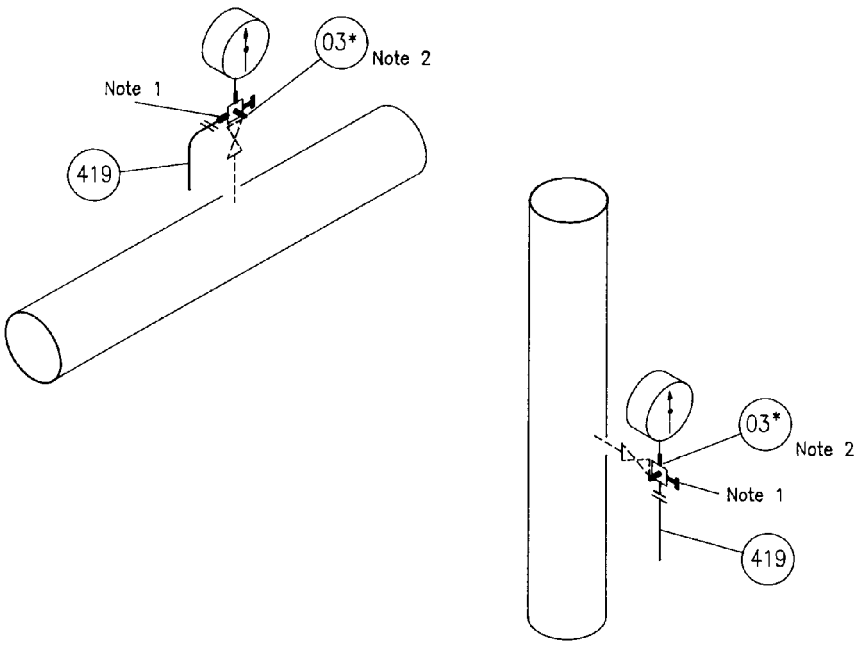
Item	Quantity	Size or connection	Description	Material	MESC
048	1	3/8 in.	Double isolate / equalize / vent block	SS	60.98.56.207.1
072	1	3/8 in.	Double purge filter block with vent	SS	60.98.70.320.1
090	2	3/8 in.	Purge orifice nipple	SS	60.98.90.810.1
09.*	1	–	Mounting plate L-shape / rectangular	SS	60.98.91.
419	6 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.	SS	74.48.50.055.1
528	1	1/2 in. NPT	Needle valve – screwed	SS	77.34.08.003.1
727	2	3/8 in. x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.106.1
744	1	3/8 in. x 1/2 in. NPT	Male connector compression type	SS	76.39.27.055.1
766	2	3/8 in.	Union tee compression type	SS	76.39.85.063.1

EXTERNAL PURGE
CLOSED VESSEL

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue		
Checked by:	Date:	IMPERIAL VERSION	Date		
Appr. by :	Date:	Section 7 – Level instruments	By		
LOCATION :		PLANT :	Project & group No.:		
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T		

DEP 32.37.02.82 – Gen., sheet 37, 7/92

Pressure instruments - DEP 32.37.02.82-Gen., sheet 38 7/92 **(DEP Circular 44/92)**



Tag No.

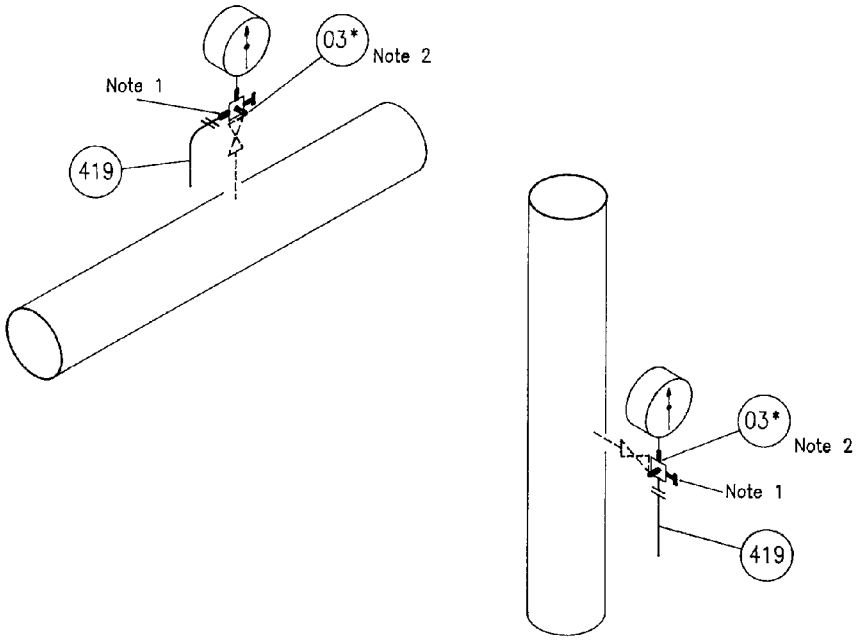
NOTES :

1) Male connectors form part of gauge block supply.
2) Select item 030 MESC 60.98.55.200.1
item 031 MESC 60.98.55.210.1
item 032 MESC 60.98.55.220.1
item 033 MESC 60.98.55.230.1
In accordance with flange rating and pressure gauge connection

Item	Quantity	Size or connection	Description	Material	MESC
03.*	1	DN 15 x ...*	Isolate / vent gauge block – smooth finish	SS	60.98.55.
419	0.5 m	3/8 in.	Tubing – Wall thickness 0.065 in.	SS	74.48.50.055.1
			LIQUID / GAS SERVICE		

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	IMPERIAL VERSION	Date					
Appr. by :	Date:	Section 8 – Pressure instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

Pressure instruments - DEP 32.37.02.82-Gen., sheet 39 7/92 **(DEP Circular 44/92)**



NOTES :

1) Male connectors form part of gauge block supply.
2) Select item 034 MESC 60.98.55.300.1
   item 035 MESC 60.98.55.310.1
   item 036 MESC 60.98.55.320.1
   item 037 MESC 60.98.55.330.1
   In accordance with flange rating and pressure gauge connection

Tag No.

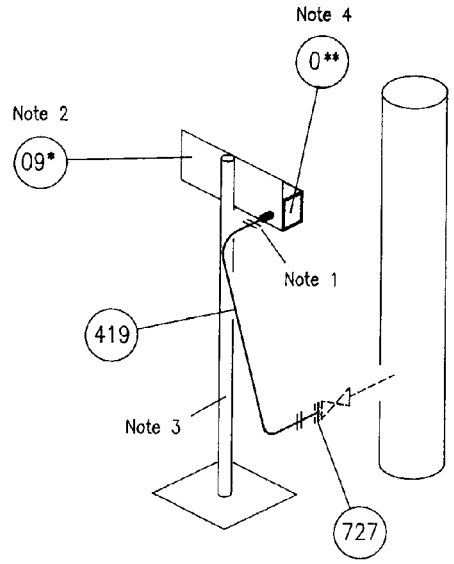
Item	Quantity	Size or connection	Description	Material	MESC
03.*	1	DN 15 x ...*	Syphon isolate / vent gauge block – smooth finish	SS	60.98.55.
419	0.5 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.	SS	74.48.50.055.1

STEAM SERVICE

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	IMPERIAL VERSION	Date					
Appr. by :	Date:	Section 8 – Pressure instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.82 – Gen., sheet 39, 7/92

Pressure instruments - DEP 32.37.02.82-Gen., sheet 40 7/92 **(DEP Circular 44/92)**



NOTES:

1) Male connector forms part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1
3) This support is typical.
   For selected type see section 3
4) Select item 039 MESC 60.98.56.237.1
   item 053 MESC 60.98.56.325.1
   item 054 MESC 60.98.56.335.1
   item 055 MESC 60.98.56.337.1
   In accordance with transmitter connection.

Tag No.

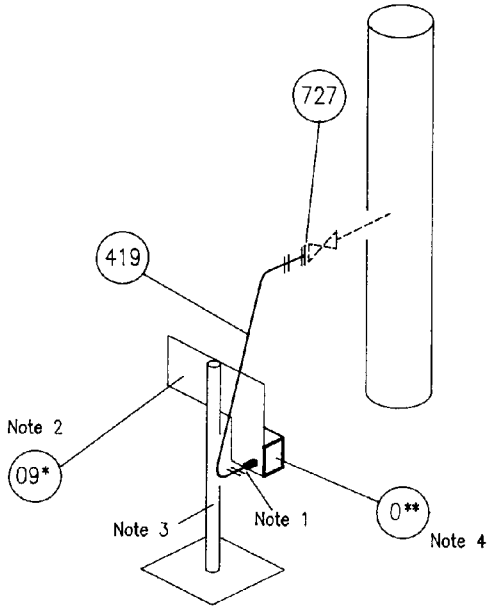
Item	Quantity	Size or connection	Description	Material	MESC
0..**	1	3/8 in.	Isolate / vent block	SS	60.98.56.
09.*	1	–	Mounting plate L–shape /rectangular	SS	60.98.91
419	3 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.	SS	74.48.50.055.1
727	1	3/8 in. x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.106.1
			GAS SERVICE		

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	IMPERIAL VERSION	Date					
Appr. by :	Date:	Section 8 – Pressure instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng.by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.82 – Gen., sheet 40. 7/92

Pressure instruments - DEP 32.37.02.82-Gen., sheet 41 7/92 **(DEP Circular 44/92)**

Tag No.



NOTES:

1) Male connector forms part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1
3) This support is typical.
   For selected type see section 3
4) Select item 039 MESC 60.98.56.237.1
   item 053 MESC 60.98.56.325.1
   item 054 MESC 60.98.56.335.1
   item 055 MESC 60.98.56.337.1
   In accordance with transmitter connection.

Item	Quantity	Size or connection	Description	Material	MESC
0..**	1	3/8 in.	Isolate / vent block	SS	60.98.56.
09.*	1	–	Mounting plate L-shape /rectangular	SS	60.98.91
419	3 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.	SS	74.48.50.055.1
727	1	3/8 in. x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.106.1

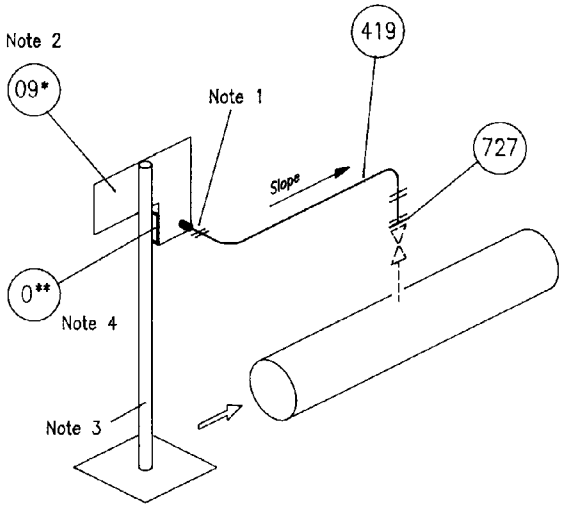
LIQUID SERVICE

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	IMPERIAL VERSION	Date					
Appr. by :	Date:	Section 8 – Pressure instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng.by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.82 – Gen., sheet 41, 7/92

Pressure instruments - DEP 32.37.02.82-Gen., sheet 42 7/92 **(DEP Circular 44/92)**

Tag No.



NOTES:

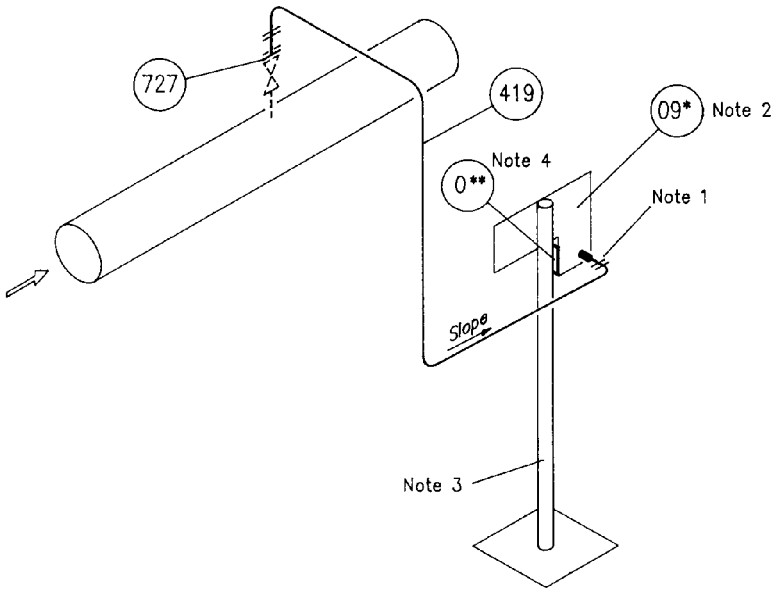
1) Male connector forms part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1
3) This support is typical.
   For selected type see section 3
4) Select item 039 MESC 60.98.56.237.1
   item 053 MESC 60.98.56.325.1
   item 054 MESC 60.98.56.335.1
   item 055 MESC 60.98.56.337.1
   In accordance with transmitter connection.

Item	Quantity	Size or connection	Description	Material	MESC
0..**	1	3/8 in.	Isolate / vent block	SS	60.98.56.
09.*	1	–	Mounting plate L–shape /rectangular	SS	60.98.91
419	3 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.	SS	74.48.50.055.1
727	1	3/8 in. x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.106.1

GAS SERVICE

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue				
Checked by:	Date:	IMPERIAL VERSION	Date				
Appr. by :	Date:	Section 8 – Pressure instruments	By				
LOCATION :		PLANT :	Project & group No.:				
Eng.by :			Sheet No. cont'd on sheet No.				
Principal :			Drawing No. T				

Pressure instruments - DEP 32.37.02.82-Gen., sheet 43 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

1) Male connector forms part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1.
3) This support is typical. For selected type see section 3.
4) Select item 039 MESC 60.98.56.237.1
   item 053 MESC 60.98.56.325.1
   item 054 MESC 60.98.56.335.1
   item 055 MESC 60.98.56.337.1
   in accordance with transmitter connection

Item	Quantity	Size or connection	Description	Material	MESC
0.**	1	3/8 in.	Single isolate / vent block	SS	60.98.56.
09.*	1	–	Mounting plate L-shape / rectangular	SS	60.98.91.
419	3 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.	SS	74.48.50.055.1
727	1	3/8 in. x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.106.1

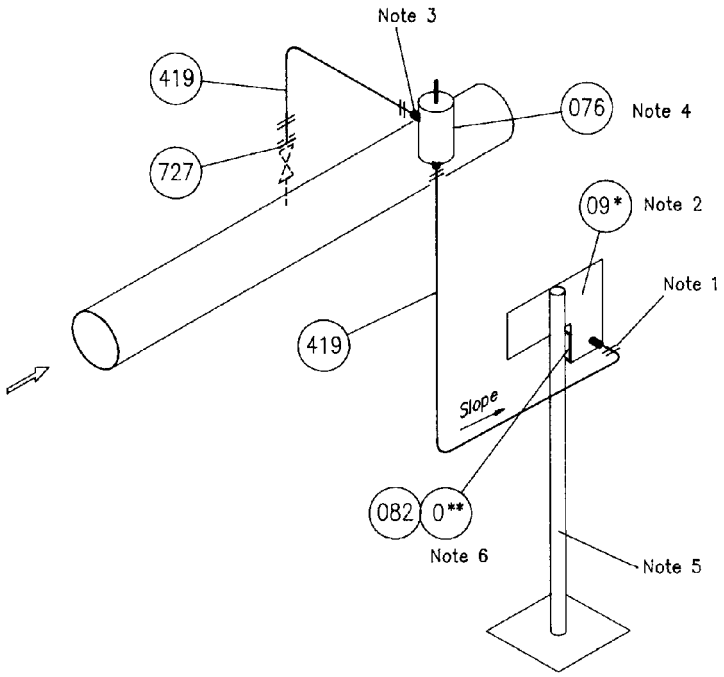
LIQUID SERVICE

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	IMPERIAL VERSION	Date					
Appr. by :	Date:	Section 8 – Pressure instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.82 – Gen., sheet 43, 7/92

Pressure instruments - DEP 32.37.02.82-Gen., sheet 44 7/92 **(DEP Circular 44/92)**

Tag No.



NOTES:

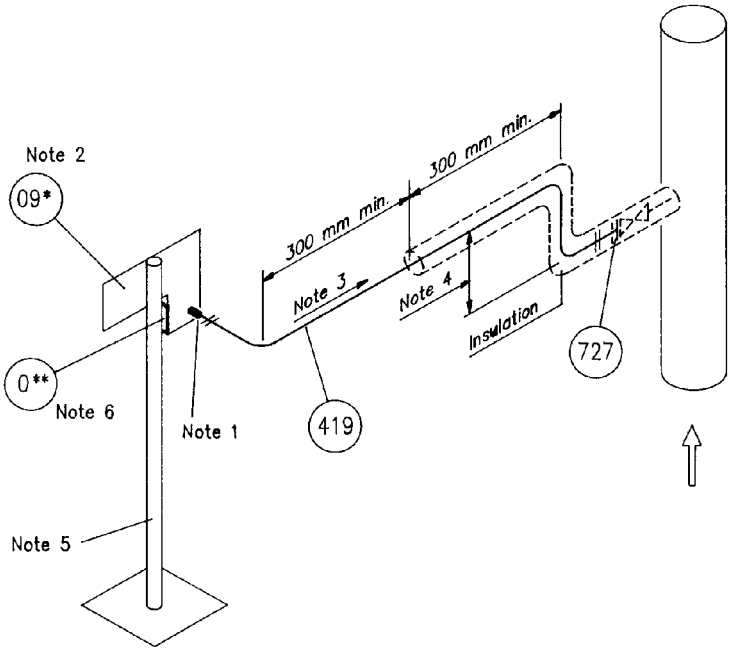
1) Male connector forms part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1.
3) Male connectors form a part of the sealpot supply.
4) Seal pot (item 076) to be well supported.
5) This support is typical. For selected type see section 3.
6) Select item 039 MESC 60.98.56.237.1
   item 053 MESC 60.98.56.325.1
   item 054 MESC 60.98.56.335.1
   item 055 MESC 60.98.56.337.1
   in accordance with transmitter connection

Item	Quantity	Size or connection	Description	Material	MESC
0..**	1	3/8 in.	Single isolate / vent block	SS	60.98.56.
076	1	3/8 in.	Seal pot with vent valve	SS	60.98.70.610.1
082	1	1/4 in.	Filling connector	SS	60.98.90.107.1
09.*	1	–	Mounting plate L-shape / rectangular	SS	60.98.91.
419	3 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.	SS	74.48.50.055.1
727	1	3/8 in. x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.106.1
			STEAM SERVICE		

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	IMPERIAL VERSION	Date					
Appr. by :	Date:	Section 8 – Pressure instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

Pressure instruments - DEP 32.37.02.82-Gen., sheet 45 7/92 **(DEP Circular 44/92)**

Tag No.



NOTES:

1) Male connector forms part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1.
3) Slope 1:10 to 1:20.
4) This distance as short as possible.
5) This support is typical. For selected type see section 3.
6) Select item 039 MESC 60.98.56.237.1
   item 053 MESC 60.98.56.325.1
   item 054 MESC 60.98.56.335.1
   item 055 MESC 60.98.56.337.1
   in accordance with transmitter connection

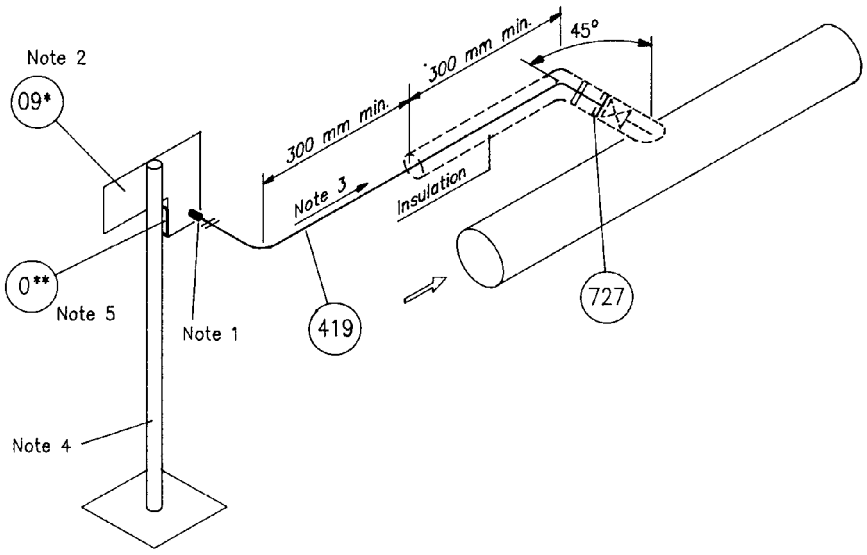
Item	Quantity	Size or connection	Description	Material	MESC
0..**	1	3/8 in.	Single isolate / vent block	SS	60.98.56.
09.*	1	–	Mounting plate L-shape / rectangular	SS	60.98.91.
419	3 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.	SS	74.48.50.055.1
727	1	3/8 in. x DN 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.106.1

SELF PURGE
CRYOGENIC-LPG SERVICE

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	IMPERIAL VERSION	Date					
Appr. by :	Date:	Section 8 – Pressure instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.82 – Gen., sheet 45, 7/92

Pressure instruments - DEP 32.37.02.82-Gen., sheet 46 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

1) Male connector forms part of the manifold supply.
2) Select item 092 MESC 60.98.91.105.1 or item 093 MESC 60.98.91.118.1.
3) Slope 1:10 to 1:20.
4) This support is typical. For selected type see section 3.
5) Select item 039 MESC 60.98.56.237.1
   item 053 MESC 60.98.56.325.1
   item 054 MESC 60.98.56.335.1
   item 055 MESC 60.98.56.337.1
   in accordance with transmitter connection

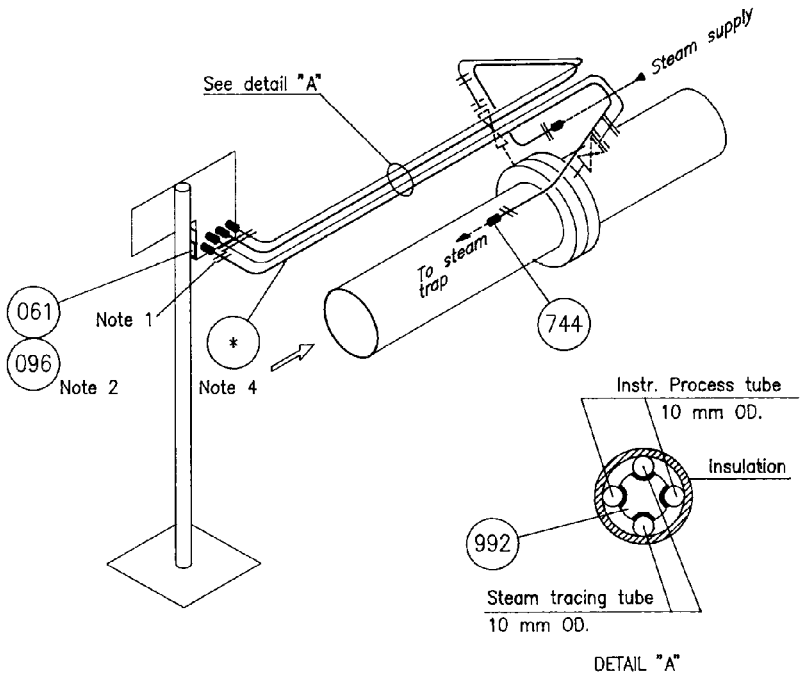
Item	Quantity	Size or connection	Description	Material	MESC
0..**	1	3/8 in.	Single isolate / vent block	SS	60.98.56.
09.*	1	–	Mounting plate L-shape / rectangular	SS	60.98.91.
419	3 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.	SS	74.48.50.055.1
727	1	3/8 in. x ON 15	Lapped joint compression fitting – smooth finish	SS	76.39.05.106.1

SELF PURGE
CRYOGENIC-LPG SERVICE

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	IMPERIAL VERSION	Date					
Appr. by :	Date:	Section 8 – Pressure instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.82 – Gen., sheet 46, 7/92

Tracing of instruments - DEP 32.37.02.82-Gen., sheet 47 7/92 **(DEP Circular 44/92)**



Tag No.

NOTES:

1) Male connectors form part of the manifold steam tracing block.
2) Item 096 MESC 60.98.91.305.1 shall be suitable for selected transmitter type/model number.
3) Materials listed are for heating components only.
4) For material of traced and lagged process tubing refer to DEP 32.37.10.11-Gen., section 4.1.

Item	Quantity	Size or connection	Description	Material	MESC
061	1	3/8 in.	Manifold steam tracing block	SS	60.98.70.110.1
096	1	–	Body enclosure	N-metallic	60.98.91.305.1
*	3 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.		note 4)
744	2	3/8 in. x 1/2 in. NPT	Male connector compression type	SS	76.39.27.065.1
992	7	From 22 mm dia. bar	Tubing spacer	N-metallic	81.86.79.020.1

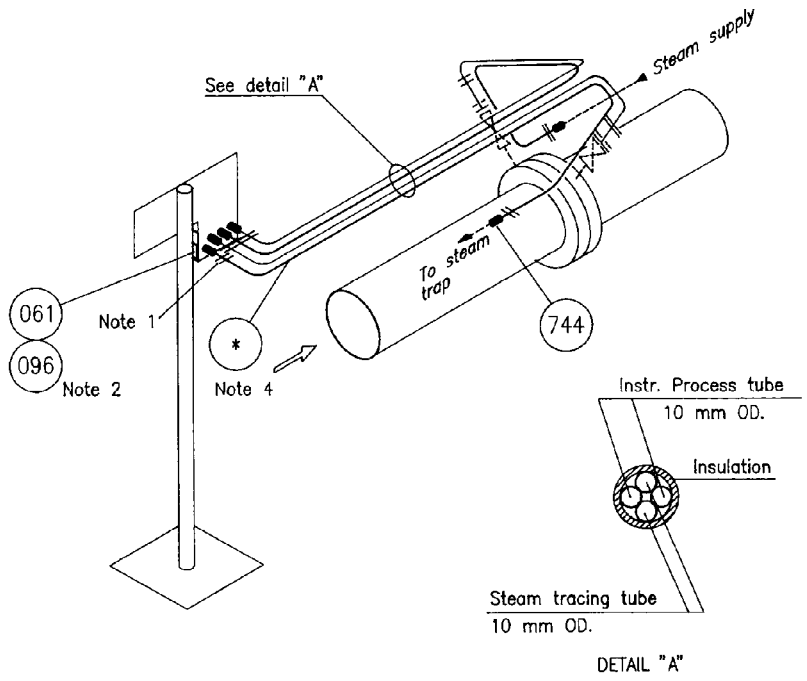
WINTERIZING

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	IMPERIAL VERSION	Date					
Appr. by :	Date:	Section 10 – Tracing of instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.82 – Gen., sheet 47, 7/92

Tracing of instruments - DEP 32.37.02.82-Gen., sheet 48 7/92 **(DEP Circular 44/92)**

Tag No.



NOTES:

1) Male connectors form part of the manifold steam tracing block.
2) Item 096 MESC 60.98.91.305.1 shall be suitable for selected transmitter type/model number.
3) Materials listed are for heating components only.
4) For material of traced and lagged process tubing refer to DEP 32.37.10.11–Gen., section 4.1.

Item	Quantity	Size or connection	Description	Material	MESC
061	1	3/8 in.	Manifold steam tracing block	SS	60.98.70.110.1
096	1	–	Body enclosure	N–metallic	60.98.91.305.1
*	3 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.		Note 4
744	2	3/8 in. x 1/2 in. NPT	Male connector compression type	SS	76.39.27.065.1

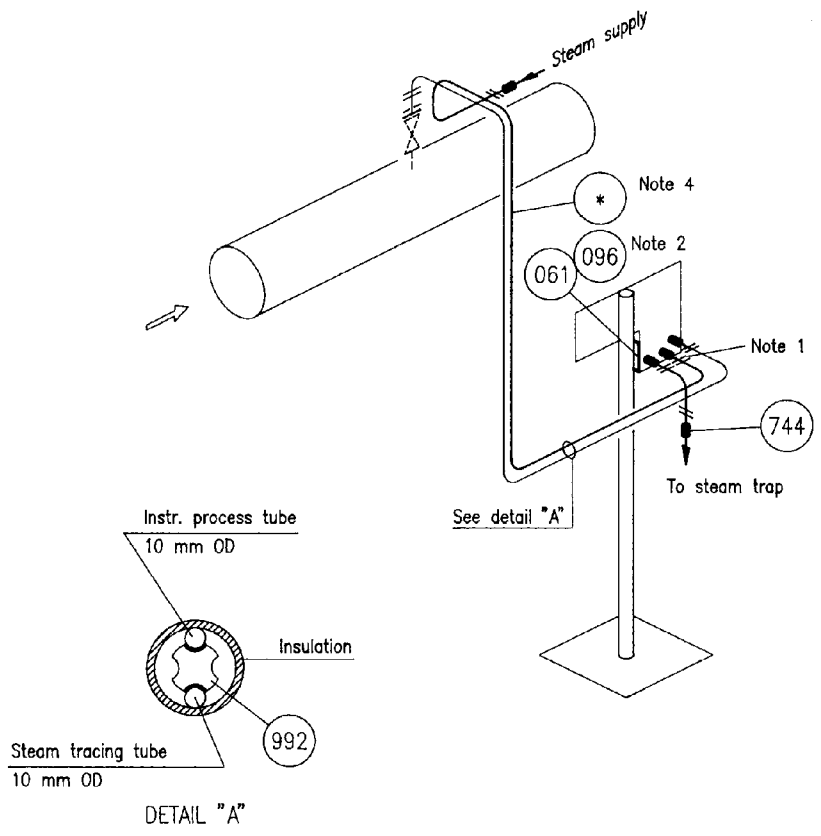
TO PREVENT SOLIDIFICATION

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	IMPERIAL VERSION	Date					
Appr. by :	Date:	Section 10 – Tracing of instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.82 – Gen., sheet 48, 7/92

Tracing of instruments - DEP 32.37.02.82-Gen., sheet 49 7/92 **(DEP Circular 44/92)**

Tag No.



DETAIL "A"

NOTES:

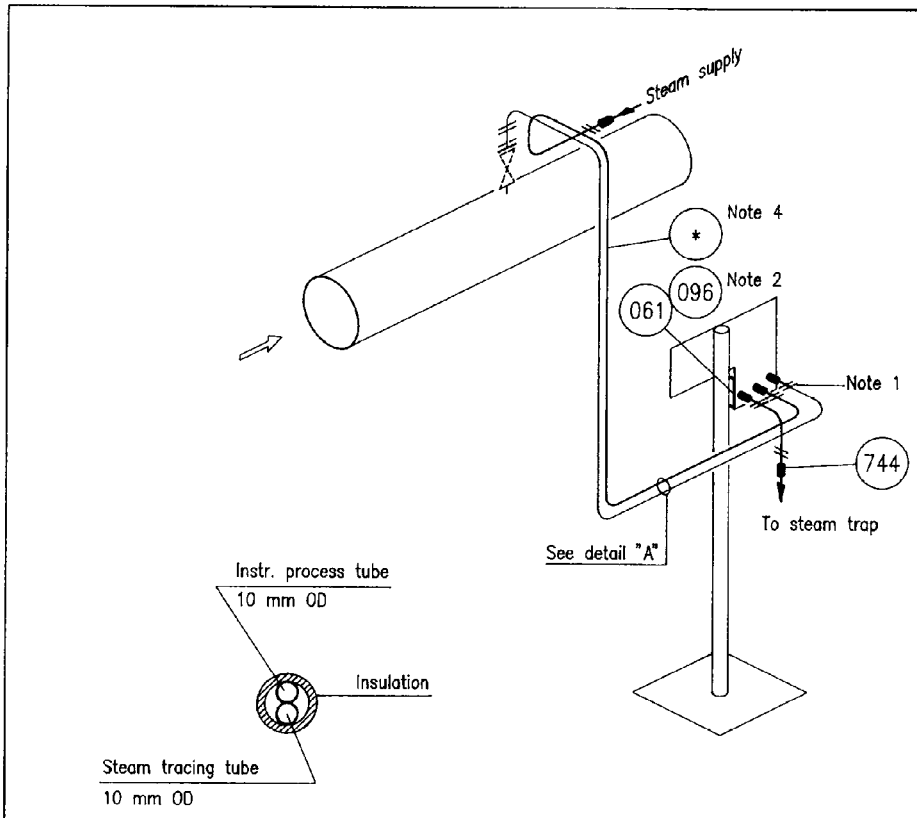
1) Male connectors form part of the manifold steam tracing block.
2) Item 096 MESC 60.98.91.305.1 shall be suitable for selected transmitter type/model number.
3) Materials listed are for heating components only.
4) For material of traced and lagged process tubing refer to DEP 32.37.10.11–Gen., section 4.1.

Item	Quantity	Size or connection	Description	Material	MESC
061	1	3/8 in.	Manifold steam tracing block	SS	60.98.70.110.1
096	1	–	Body enclosure	N–metallic	60.98.91.305.1
*	3 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.		Note 4)
744	2	3/8 in. x 1/2 in. NPT	Male connector compression type	SS	76.39.27.065.1
992	7	From 22 mm dia. bar	Tubing spacer	N–metallic	81.86.79.020.1

WINTERIZING

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	IMPERIAL VERSION	Date					
Appr. by :	Date:	Section 10 – Tracing of instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

Tracing of instruments - DEP 32.37.02.82-Gen., sheet 50 7/92 **(DEP Circular 44/92)**



DETAIL "A"

Tag No.

NOTES:

1) Male connectors form part of the manifold steam tracing block.
2) Item 096 MESC 60.98.91.305.1 shall be suitable for selected transmitter type/model number.
3) Materials listed are for heating components only.
4) For material of traced and lagged process tubing refer to DEP 32.37.10.11–Gen., section 4.1.

Item	Quantity	Size or connection	Description	Material	MESC
061	1	3/8 in.	Manifold steam tracing block	SS	60.98.70.110.1
096	1	–	Body enclosure	N-metallic	60.98.91.305.1
*	3 m	3/8 in. OD	Tubing – Wall thickness 0.065 in.		Note 4)
744	2	3/8 in. x 1/2 in. NPT	Male connector compression type	SS	76.39.27.065.1

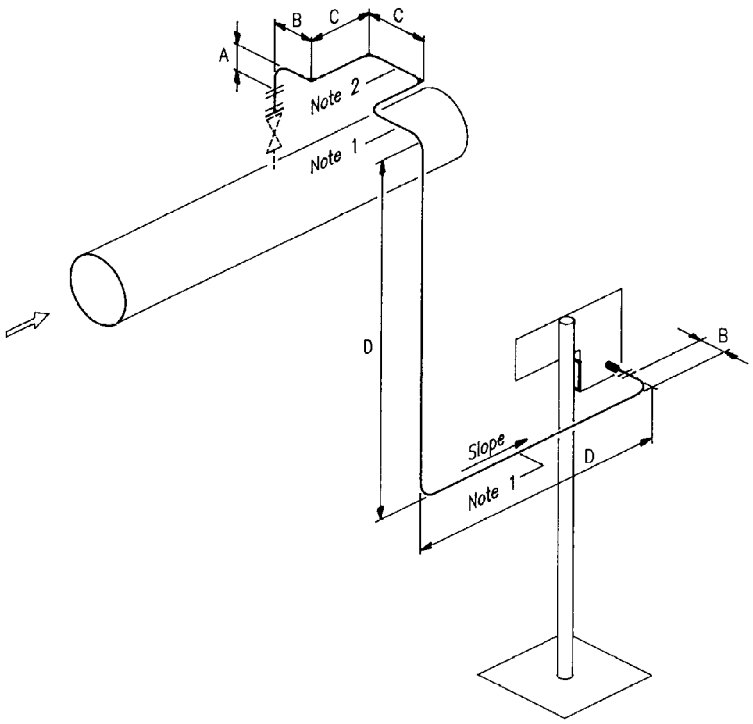
TO PREVENT SOLDIFICATION

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	IMPERIAL VERSION	Date					
Appr. by :	Date:	Section 10 – Tracing of instruments	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.82 – Gen., sheet 50, 7/92

Thermal expansion - DEP 32.37.02.82-Gen., sheet 51 7/92 **(DEP Circular 44/92)**

TYPICAL HOOK–UP REQUIREMENT FOR THERMAL EXPANSION
EXCESSIVE MOVEMENTS OF PIPES



Dimensions

A = 50 mm maximum
B = 100 mm maximum
C = 200 mm minimum
D = 600 mm maximum

NOTES:

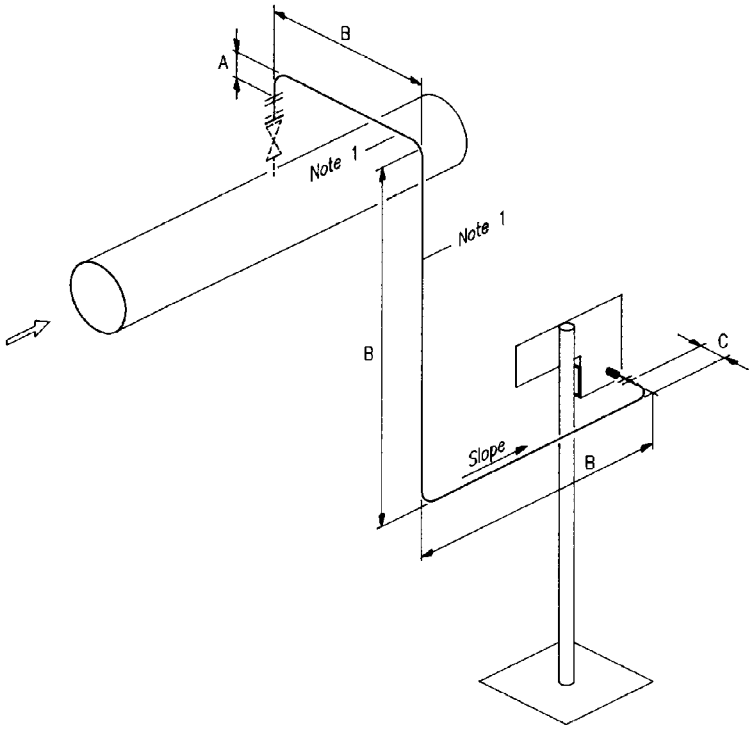
1) Apply sliding supports for the tubing in the direction of movement.
2) The expansion bend shall be located in the same plane of the pipe movement.

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue					
Checked by:	Date:	IMPERIAL VERSION	Date					
Appr. by :	Date:	Section 11 – Thermal expansion	By					
LOCATION :		PLANT :	Project & group No.:					
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T					

DEP 32.37.02.82 – Gen., sheet 51, 7/92

Vibrating pipes - DEP 32.37.02.82-Gen., sheet 52 7/92 **(DEP Circular 44/92)**

TYPICAL HOOK–UP REQUIREMENT FOR VIBRATING PIPES



Dimensions

A = 50 mm maximum
B = 600 mm maximum
C = 100 mm maximum

NOTES:

1) Apply sliding supports for length of tubing exceeding 1 metre.

Made by :	Date:	Title : INSTRUMENT IMPULSE LINES	Issue				
Checked by:	Date:	IMPERIAL VERSION	Date				
Appr. by :	Date:	Section 12 – Vibrating pipes	By				
LOCATION :		PLANT :	Project & group No.:				
Eng. by : Principal :			Sheet No. cont'd on sheet No. Drawing No. T				

DEP 32.37.02.82 – Gen., sheet 52, 7/92

Cover sheet - DEP 32.37.02.83-Gen., sheet 1 12/89

INSTRUMENT AIR LINES

Section	Sheets	Subject
1	1	Cover sheet
2	201 -	Index of sheets
3	301 -	Index of instruments
4	401 -	Components
5	501 - 503	Installation notes
6	601 - 606	Mounting support
7	701 -	Symbols
8	801 -	Instrument air supply
9	901 -	Field mounted components

Note :
Cross-out section and sheet number of subject not applicable.

Made by :	Date :	Title : **INSTRUMENT AIR LINES**	Issue				
Checked by :	Date :		Date				
Appr . by :	Date :	Section 1 - Cover sheet	By				
LOCATION :		PLANT :	Project & group No. :				
Eng . by :			Sheet No. 1 cont'd on sheet No. 201				
Principal :			Drawing No. T				

DEP 32.37.02.83 - Gen., sheet 1, 12/89

Index of sheets - DEP 32.37.02.83-Gen., sheet 2 12/89

Sheet No.	Issue	Revision date			
	O	A	B	C	D

Index of instruments - DEP 32.37.02.83-Gen., sheet 3 12/89

Tag No.	Mounting			Air lines	Protection facilities	Tag No.	Mounting			Air lines	Protection facilities
	Support		Plate	Sheet No.	P		Support		Plate	Sheet No.	P
	Type	Size	Yes/No				Type	Size	Yes/No		

Typical components - DEP 32.37.02.83-Gen., sheet 4 12/89

Issue	Mat. item	Size or connection	Description	Material	MESC
	006	2 inch NPT	Instrument air filter		60.98.33.160.1
	011	1/4 inch NPT	Instrument air filter regulator		60.98.3x.xxx.x
	013	1/2 inch NPT	Instrument air regulator		60.98.35.730.1
	016	2 inch NPT	Instrument air regulator		60.98.35.900.1
	017				
	018				
	019				
	026				
	028				
	084	1/4 inch NPT	Port protector	Brass	60.98.90.217.1
	409	2 inch	Line pipe schedule 40S	AISI 316	74.36.23.085.1
	410	3 inch	Line pipe schedule 10S	AISI 316	74.36.23.065.1
	414	16 mm OD	Tubing - wall thickness 2 mm	CS	74.48.28.181.1
	444	6 mm OD	Tubing - black PVC sheated, wall thickness 1 mm	Cu	74.66.22.374.1
	508	1/2 inch NPT	Ball valve-screwed	CS	77.01.00.003.1
	525	1/2 inch NPT	Ball valve-screwed	AISI 316	77.04.00.003.1
	530	DN 50 (2 inch)	Ball valve-flanged	CS	77.00.00.008.1
	532	DN 50 (2 inch)	Ball valve-flanged	AISI 316	77.03.08.008.1
	604	1/4 inch x 40 mm	Nipple-screwed	Brass	76.01.56.441.1
	609	1/4 inch NPT	Plug-screwed	Bronze	76.01.66.104.1
	610	1/2 inch NPT	Plug-screwed	Bronze	76.01.66.108.1
	611	1/2 x 1/4 inch NPT	Conc. reducer-bushing-screwed	Bronze	76.01.14.081.1
	646	1/2 inch x 76 mm	Pipe nipple-screwed/bevelled, sced. 40S	AISI 316	76.09.57.332.1
	648	1 inch x 76 mm	Pipe nipple-screwed/bevelled, sced. 40S	AISI 316	76.09.57.352.1
	650	2 inch x 76 mm	Pipe nipple-screwed/bevelled, sced. 40S	AISI 316	76.09.57.381.1
	668	DN 50 (2 inch)	Elbow 90°, schedule 40S	AISI 316	76.33.46.336.1
	672	DN 50 (2 inch)	Stub end, schedule 40S	AISI 316	76.33.54.336.1
	674	DN 80 (3 inch)	Stub end, schedule 10S	AISI 316	76.33.54.354.1
	677	DN 50 x 25	Con. Reducer, schedule 40S	AISI 316	76.33.69.636.1
	679	DN 80 x 50	Con. Reducer, schedule 40S	AISI 316	76.33.69.686.1
	683	DN 50 (2 inch)	Tee, schedule 40S	AISI 316	76.33.84.336.1
	685	DN 50 (2 inch)	Flange - blind	CS	76.62.10.070.1
	688	DN 50 (2 inch)	Flange - lap-joint	CS	76.62.20.220.1
	690	DN 80 (3 inch)	Flange - lap-joint	CS	76.62.20.222.1
	692	DN 50 (2 inch)	Flange - blind	AISI 316	76.65.10.670.1
	783	16 mm x 1/2 in. NPT	Male connector compression type	CS	76.39.24.277.1
	789	16 mm	Union tee, compression type	CS	76.39.82.180.1
	792	16 mm	Union, compression type	CS	76.39.88.280.1
	803	16 mm x 1/2 in. NPT	Male connector, compression type	Brass	76.40.24.041.1
	837	6 mm	Union tee, compression type	Brass	76.40.82.004.1
	892	1/4 in. NPT	Quick connector male	Brass	73.37.22.405.1
	893	4 mm	Dust cap, for item 892	PVC	73.37.22.604.1
	951	5/8 inch x 80 mm	Stud bolt with 2 nuts	Alloy	81.36.61.269.1
	998	DN 50 (2 inch)	Gasket	CAF	85.31.02.014.1

NOTE:
For complete material specification, see standard form
'Summary of instrument installation materials' DEP 32.37.02.80-Gen.

Made by :	Date :	Title : **INSTRUMENT AIR LINES**	Issue					
Checked by :	Date :		Date					
Appr . by :	Date :	Section 4 - Typical components	By					
LOCATION :		PLANT :	Project & group No. :					
Eng . by :			Sheet No. 401 cont'd on sheet No.					
Principal :			Drawing No. T					

Installation notes - DEP 32.37.02.83-Gen., sheet 5 12/89

INSTALLATION NOTES

Before and during the actual installation of the instruments and their impulse lines, the following points shall be observed.

LOCATION

The attached drawings show in general the required position of the instrument relative to the measuring point. The exact location shall be determined at site; the responsible instrument supervisor shall mark this location on the process equipment, plant structures, etc..

All indicating instruments shall be installed with the instrument centre approximately 1.3 m above floor level and shall be visible from the corresponding controlling element, where applicable.

All instruments shall be installed in such a way that they are not subject to excessive vibration and/or extreme environmental conditions, and do not obstruct traffic. Instruments shall not be located under places with potential leakage.

Sufficient space shall be left around the instrument for removing the protective shades.
The minimum clearance between any part of the instrument mounting system and surrounding structures or equipment shall not be less than 0.3 m.

INSTRUMENT SUPPORTS

When specified in Section 3, each instrument shall be provided with a support as detailed in Section 6.

Subject to approval by principal's instrument engineer, more than one mounting plate may be attached to one instrument support instead of separate supports as shown on the relevant drawing.

Supports at grade or on concrete floors shall have concrete footings and/or grouting.

Support on process pipes shall not cause electrolytic corrosion. Therefore an insulation layer shall be provided on all piping in materials other than carbon steel, e.g. in the form of a strip of non-metallic gasket.

TUBING AND COMPRESSION FITTINGS

The tubing shall be cut dead square with a tube cutter; the edges shall be deburred.
The tube end shall be undamaged, round and without scratches over the length which fits into the compression fitting. Any coating or painting shall be removed.

Tubes shall be bent with a high-quality tube bender which shall have a minimum bending radius as specified by the tubing manufacturer.

Made by :	Date :	Title : **INSTRUMENT AIR LINES**	Issue					
Checked by :	Date :		Date					
Appr. by :	Date :	Section 5 - Installation notes	By					
LOCATION :		PLANT :	Project & group No. :					
Eng. by :			Sheet No. 501 cont'd on sheet No. 502					
Principal :			Drawing No. T					

Long lengths of tubing shall be supported over the full length and fixed to the support at intervals of approximately 1m.

Where final control elements may change position relative to the instrument, e.g. due to thermal expansion the air lines shall be so arranged that undue stresses on the compression fittings are prevented.

When tightening compression fittings, manufacturer's instructions shall be carefully adhered to.

THREAD SEALANT

NPT threaded connections require PTFE tape (MESC 85.15.78.038.1)
to prevent seizing and leakage.

The tape shall be apllied as follows :

Place tape on male thread, leaving two threads at the small end free from tape, hold in place and wrap clockwise only once with a slight overlap. Draw tightly around threads so that it conforms to the threaded surface.

PRESSURE TESTING, etc.

For procedures of pressure testing, applying seal liquid, commissioning, etc.,
see DEP 62.37.10.12 - Gen.

Note: Instrument air supply and pneumatic signal lines shall only be pressure tested with compressed air.

CODES FOR PROTECTION FACILITIES

The codes as specified in section 3 are:
P = protective shade.

Made by :	Date :	Title : **INSTRUMENT AIR LINES**	Issue				
Checked by :	Date :		Date				
Appr . by :	Date :	Section 5 - Installation notes	By				
LOCATION :		PLANT :	Project & group No. :				
Eng . by : Principal :			Sheet No. 502 cont'd on sheet No. Drawing No. T				

Mounting supports - DEP 32.37.02.83-Gen., sheet 7 12/89

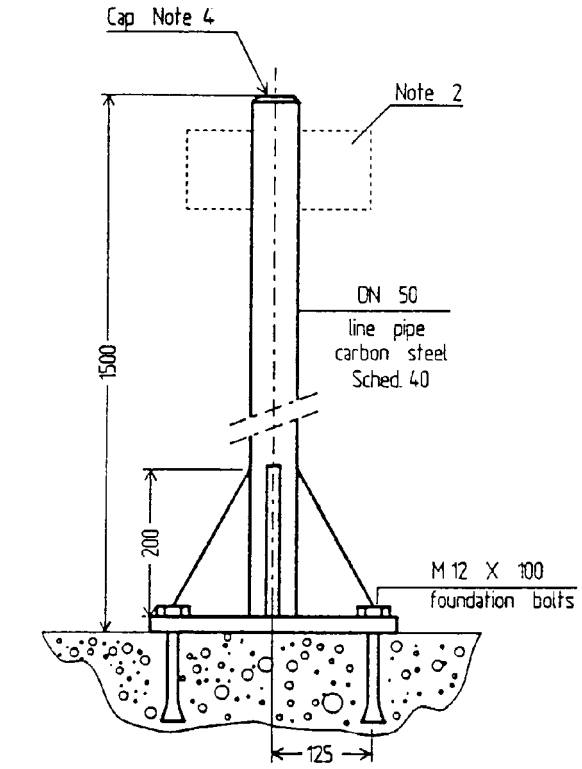
CODES FOR INSTRUMENT SUPPORTS

Type code	Description	Sheet	Notes
S1	Support for floor mounting	602	
S2	Support for platform mounting	603	
S3	Support for unpaved areas	604	
S4	Straight support for line mounting	605	1
S5	Angle support for line mounting	606	1

Note : Observe pipe size (DN) as specified in Section 3

Made by :	Date :	Title : **INSTRUMENT AIR LINES**	Issue				
Checked by :	Date :		Date				
Appr . by :	Date :	Section 6 - Mounting supports	By				
LOCATION :		PLANT :	Project & group No. :				
Eng . by :			Sheet No. 601 cont'd on sheet No.				
Principal :			Drawing No. T				

Mounting supports - DEP 32.37.02.83-Gen., sheet 8 12/89



TYPE S1
FOR CONCRETE FLOORS

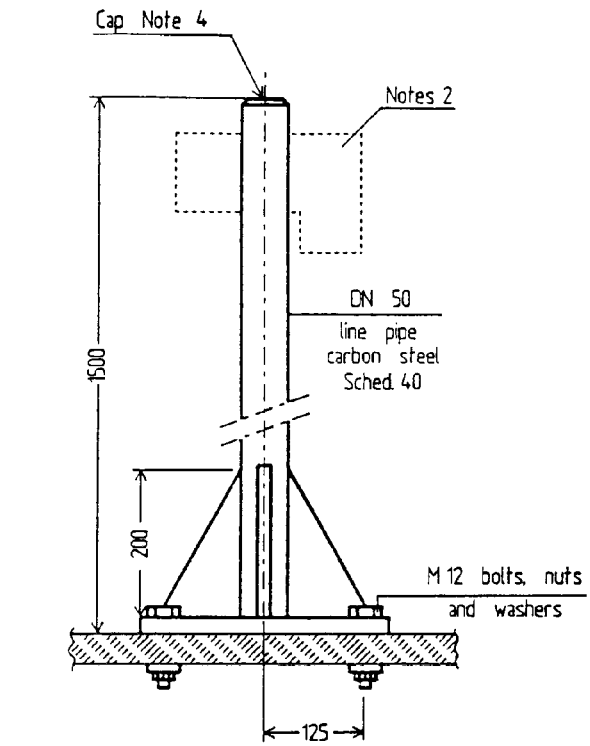
NOTES:

1) Plates and strips carbon steel 10 mm thick.
2) Finish: after shotblasting a preserving agent shall be applied as per requisition.

Made by :	Date :	Title : **INSTRUMENT AIR LINES**	Issue				
Checked by :	Date :	Support type S1	Date				
Appr . by :	Date :	Section 6 - Mounting supports	By				
LOCATION :		PLANT :	Project & group No. :				
Eng . by :			Sheet No. 602 cont'd on sheet No.				
Principal :			Drawing No. T				

DEP 32.37.02.83 - Gen., sheet 8, 12/89

Mounting supports - DEP 32.37.02.83-Gen., sheet 9 12/89



TYPE S2
FOR GRATING AND STEEL PLATFORMS

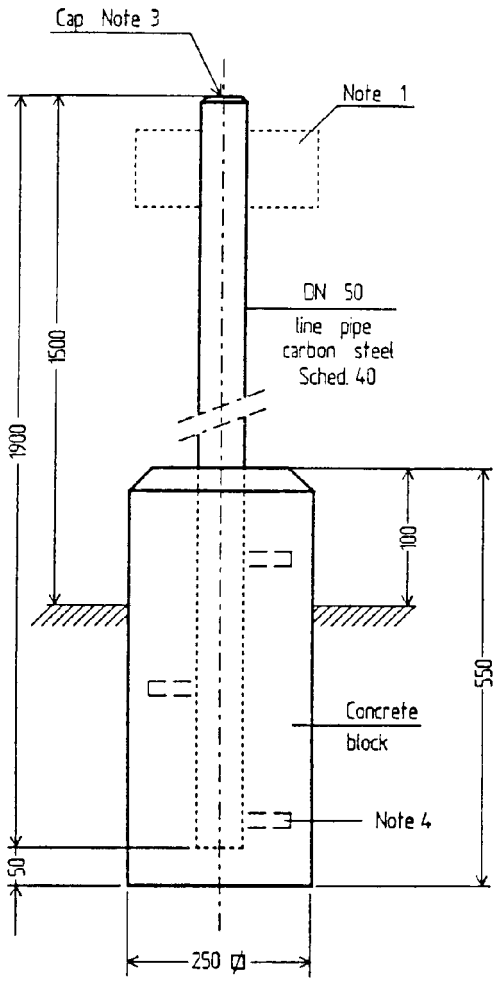
NOTES:

1) Plates and strips carbon steel 10 mm thick.
2) Finish: after shotblasting a preserving agent shall be applied as per requisition.

Made by :	Date :	Title : **INSTRUMENT AIR LINES**	Issue					
Checked by :	Date :	Support type S2	Date					
Appr . by :	Date :	Section 6 - Mounting supports	By					
LOCATION :		PLANT :	Project & group No. :					
Eng . by :			Sheet No. 603 cont'd on sheet No.					
Principal :			Drawing No. T					

DEP 32.37.02.83 - Gen., sheet 9, 12/89

Mounting supports - DEP 32.37.02.83-Gen., sheet 10 12/89



TYPE S3
FOR UNPAVED AREAS

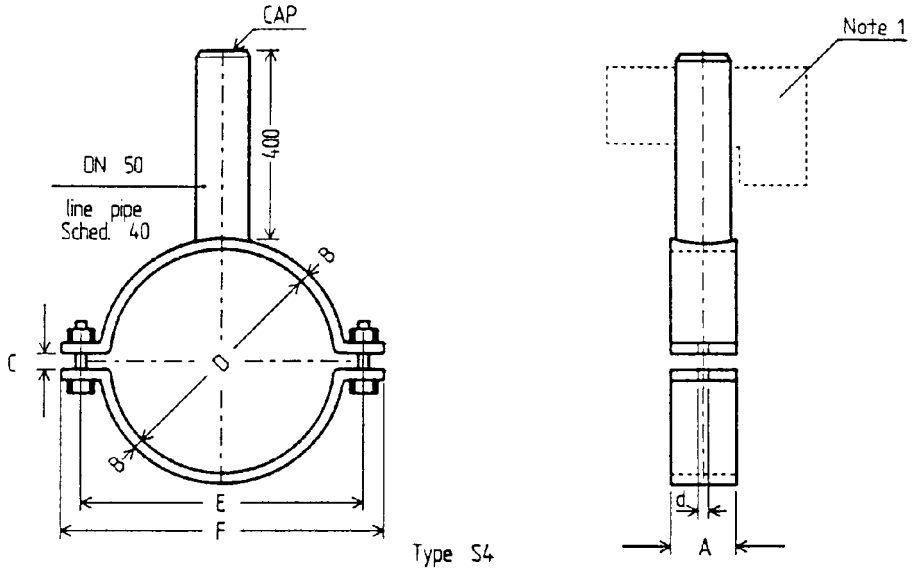
NOTES:

1) Finish: after shotblasting a preserving agent shall be applied as per requisition.

Made by :	Date :	Title : **INSTRUMENT AIR LINES**	Issue					
Checked by :	Date :	Support type S3	Date					
Appr . by :	Date :	Section 6 - Mounting supports	By					
LOCATION :		PLANT :	Project & group No. :					
Eng . by : Principal :			Sheet No. 604 cont'd on sheet No. Drawing No. T					

DEP 32.37.02.83 - Gen., sheet 10, 12/89

Mounting supports - DEP 32.37.02.83-Gen., sheet 11 12/89



Type S4

STRAIGHT SUPPORT FOR LINE MOUNTING

NOTES:

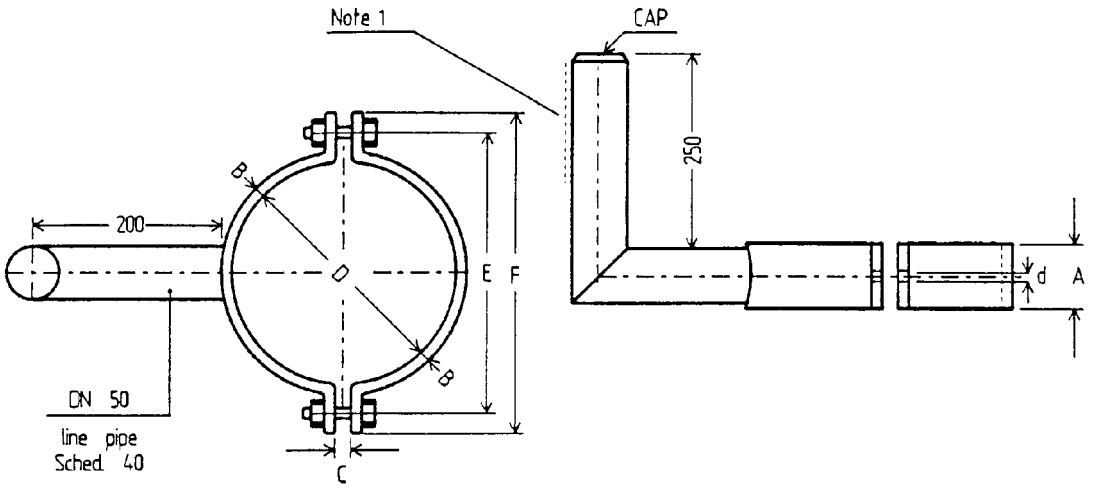
1) Material of clamps : carbon steel
   Cap : plastic
   Line pipe : carbon steel
   Bolts and nuts : unified black hexagon, heavy series - UNC thread
   Finish : after shotblasting a preserving agent shall be applied as per requisition.

Nom line size	Dimensions in millimetres							Bolt data Dia. x length in. x mm.
	A	B	C	D	E	F	Bolt hole d	
50	65	5	10	61	120	170	22	3/4 x 40
80				90	150	200		
100			12	115	180	230		3/4 x 34
150		8		169	250	300		3/4 x 50
200				220	300	350		
250	75	10	20	274	360	410		3/4 x 65
300				324	420	470		
350		12		356	460	510		3/4 x 70
400				408	520	570		
450				458	570	620		
500				508	620	670		

Made by :	Date :	Title : INSTRUMENT AIR LINES		Issue				
Checked by :	Date :	Support type S4		Date				
Appr . by :	Date :	Section 6 - Mounting supports		By				
LOCATION :		PLANT :		Project & group No. :				
Eng . by :				Sheet No. 605 cont'd on sheet No.				
Principal :				Drawing No. T				

DEP 32.37.02.83 - Gen., sheet 11, 12/89

Mounting supports - DEP 32.37.02.83-Gen., sheet 12 12/89



Type S5

ANGLE SUPPORT FOR LINE MOUNTING

NOTES:

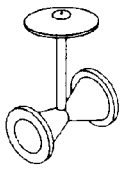
1) Material of clamps : carbon steel
   Cap : plastic
   Line pipe : carbon steel
   Bolts and nuts : unified black hexagon, heavy series - UNC thread
   Finish : after shotblasting a preserving agent shall be applied as per requisition.

Nom line size	Dimensions in millimetres							Bolt data Dia. x length in. x mm.
	A	B	C	D	E	F	Bolt hole d	
50	65	5	10	61	120	170	22	3/4 x 40
80				90	150	200		
100			12	115	180	230		3/4 x 34
150		8		169	250	300		3/4 x 50
200				220	300	350		
250	75	10	20	274	380	410		3/4 x 65
300				324	420	470		
350		12		356	460	510		3/4 x 70
400				408	520	570		
450				458	570	620		
500				508	620	670		

Made by :	Date :	Title : **INSTRUMENT AIR LINES**	Issue					
Checked by :	Date :	Support type S5	Date					
Appr . by :	Date :	Section 6 - Mounting supports	By					
LOCATION :		PLANT :	Project & group No. :					
Eng . by :			Sheet No. 605 cont'd on sheet No.					
Principal :			Drawing No. T					

DEP 32.37.02.83 - Gen., sheet 12, 12/89

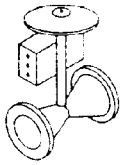
Symbols - DEP 32.37.02.83-Gen., sheet 13 12/89



CONTROL VALVE WITHOUT POSITIONER

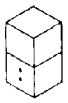
QUICK EXHAUST VALVE

I/P CONVERTER



CONTROL VALVE WITH POSITIONER

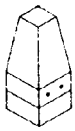
AIR LUBRICATOR



SOLENOID VALVE

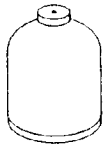
INSTRUMENT AIRFILTER REGULATOR

BOOSTER



TRANSMITTER

LOCK-UP DEVICE

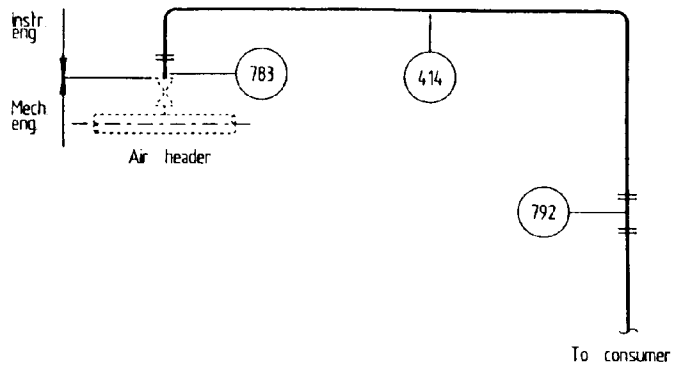


BUFFER VESSEL

Made by :	Date :	Title : **INSTRUMENT AIR LINES**	Issue				
Checked by :	Date :		Date				
Appr . by :	Date :	Section 7 - Symbols	By				
LOCATION :		PLANT :	Project & group No. :				
Eng . by :			Sheet No. 701 cont'd on sheet No.				
Principal :			Drawing No. T				

DEP 32.37.02.83 - Gen., sheet 13, 12/89

Instrument air supply - DEP 32.37.02.83-Gen., sheet 14 12/89



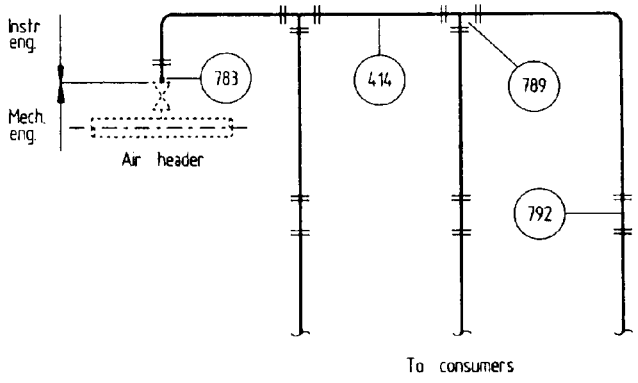
Tag No.

Item	Quantity	Size or connection	Description	Material	MESC
414	9 m	16 mm OD	Tubing - Wall thickness 2 mm	CS	74.48.28.181.1
783	1	16 mm x 12 inch	Male connector, compression type	CS	76.39.24.277.1
792	1	16 mm	Union, compression type	CS	76.39.88.280.1

Made by :	Date :	Title : **INSTRUMENT AIR LINES**	Issue					
Checked by :	Date :	Air supply to one consumer	Date					
Appr. by :	Date :	Section 8 - Instruments air supply	By					
LOCATION :		PLANT :	Project & group No. :					
Eng. by :			Sheet No. cont'd on sheet No.					
Principal :			Drawing No. T					

DEP 32.37.02.83 - Gen., sheet 14, 12/89

Instrument air supply - DEP 32.37.02.83-Gen., sheet 15 12/89



Tag No.

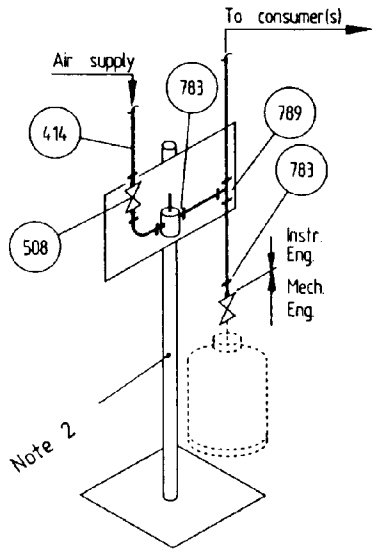
Engineering note:
1) Total quantity of materials to be determined by engineering.

Item	Quantity	Size or connection	Description	Material	MESC
414		16 mm OD	Tubing - Wall thickness 2 mm	CS	74.48.28.181.1
783		16 mm x 12 inch	Male connector, compression type	CS	76.39.24.277.1
783		16 mm	Union tee, compression type	CS	76.39.82.180.1
792		16 mm	Union, compression type	CS	76.39.88.280.1

Made by :	Date :	Title : **INSTRUMENT AIR LINES**	Issue					
Checked by :	Date :	Air supply to consumers	Date					
Appr. by :	Date :	Section 8 - Instruments air supply	By					
LOCATION :		PLANT :	Project & group No. :					
Eng. by :			Sheet No. cont'd on sheet No.					
Principal :			Drawing No. T					

DEP 32.37.02.83 - Gen., sheet 15, 12/89

Instrument air supply - DEP 32.37.02.83-Gen., sheet 16 12/89



Tag No.

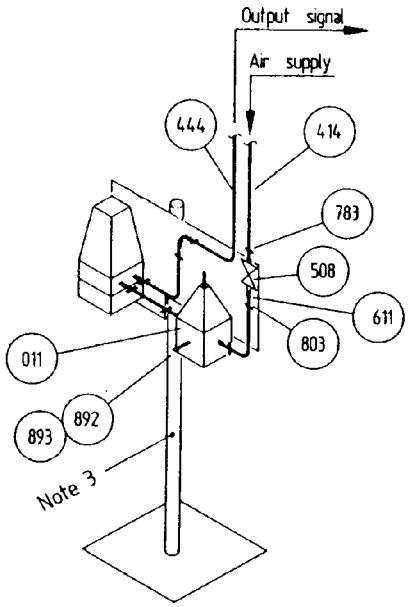
Installation notes:
1) Valve (item 508) and lock-up device shall be to be fixed to the mounting plate.
2) This support is typical. For selected type see section 3.

Item	Quantity	Size or connection	Description	Material	MESC
414	6 m	16 mm OD	Tubing - Wall thickness 2 mm	CS	74.48.28.181.1
508	1	1/2 in. NPT	Ball valve - screwed	CS	77.01.00.003.1
783	5	16 mm x 1/2 in.	Male connector, compression type	CS	76.39.24.277.1
789	1	16 mm	Union tee, compression type	CS	76.39.82.180.1

Made by :	Date :	Title : **INSTRUMENT AIR LINES**	Issue					
Checked by :	Date :	Back-up cylinder	Date					
Appr . by :	Date :	Section 8 - Instruments air supply	By					
LOCATION :		PLANT :	Project & group No. :					
Eng . by :			Sheet No. cont'd on sheet No.					
Principal :			Drawing No. T					

DEP 32.37.02.83 - Gen., sheet 16, 12/89

Field mounted components - DEP 32.37.02.83-Gen., sheet 17 12/89



Tag No.

Installation notes:
1) Input signal (item 444) shall be roted close to instrument air supply (item 414)
2) Items 011 and 508 shall be fixed to the mounting plate
3) This support is typical. For selected type see section 3.

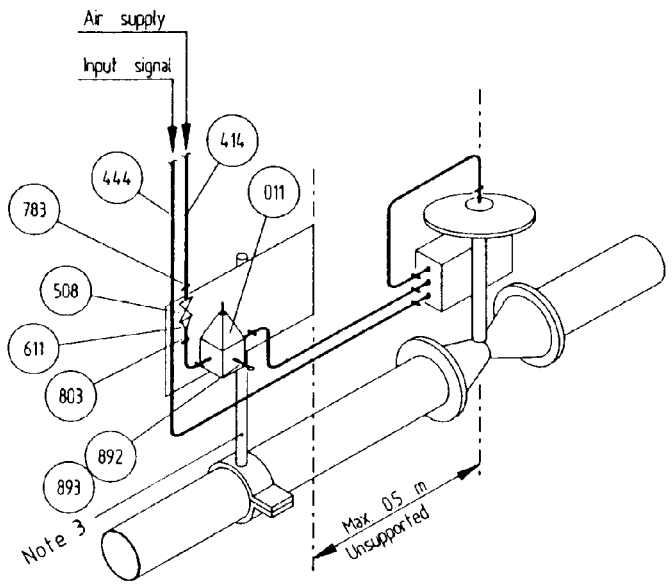
Item	Quantity	Size or connection	Description	Material	MESC
011	1	1/4 inch NPT	Instrument air filter regulator	-	60.98.3x.xxx.x
414	6 m	16 mm OD	Tubing - Wall thickness 2 mm	CS	74.48.28.181.1
444	16 m	6 mm OD	Tubing - black PVC sheated, wall thickness 2 mm	Cu	74.66.22.374.1
508	1	1/2 inch NPT	Ball valve - screwed	CS	77.01.00.003.1
611	1	1/2 x 1/4 inch NPT	Conc. reducer bushing-screwed	Bronze	76.01.14.081.1
783	1	16 mm x 1/2 in. NPT	Male connector, compression type	CS	76.39.24.277.1
803	7	6 mm x 1/2 in. NPT	Male connector, compression type	Brass	76.40.24.041.1
892	2	1/4 inch NPT	Quick connector, male	Brass	73.37.22.405.1
893	2	4 mm	Dust cap, for item 892	PVC	73.37.22.605.1

Made by :	Date :	Title : **INSTRUMENT AIR LINES**	Issue					
Checked by :	Date :	Pneumatic transmitter	Date					
Appr. by :	Date :	Section 9 - Field mounted components	By					
LOCATION :		PLANT :	Project & group No. :					
Eng. by :			Sheet No. cont'd on sheet No.					
Principal :			Drawing No. T					

DEP 32.37.02.83 - Gen., sheet 17, 12/89

Field mounted components - DEP 32.37.02.83-Gen., sheet 18 12/89

Tag No .



Installation notes:
1) Input signal (item 444) shall be roted close to instrument air supply (item 414)
2) Items 011 and 508 shall be fixed to the mounting plate
3) This support is typical. For selected type see section 3.
4) Typical hook-up. Assessories (solenoid valve, booster, quick exhaust valve, lock-up valve etc.) to be included as and when required.

Item	Quantity	Size or connection	Description	Material	MESC
011	1	1/4 inch NPT	Instrument air filter regulator	-	60.98.3x.xxx.x
414	6 m	16 mm OD	Tubing - Wall thickness 2 mm	CS	74.48.28.181.1
444	16 m	6 mm OD	Tubing - black PVC sheated, wall thickness 2 mm	Cu	74.66.22.374.1
508	1	1/2 inch NPT	Ball valve - screwed	CS	77.01.00.003.1
611	1	1/2 x 1/4 inch NPT	Conc. reducer bushing-screwed	Bronze	76.01.14.081.1
783	1	16 mm x 1/2 in. NPT	Male connector, compression type	CS	76.39.24.277.1
803	7	6 mm x 1/2 in. NPT	Male connector, compression type	Brass	76.40.24.041.1
892	2	1/4 inch NPT	Quick connector, male	Brass	73.37.22.405.1
893	2	4 mm	Dust cap, for item 892	PVC	73.37.22.604.1

Made by :	Date :	Title : **INSTRUMENT AIR LINES**	Issue					
Checked by :	Date :	Control valve with pneumatic postioner	Date					
Appr . by :	Date :	Section 9 - Field mounted components	By					
LOCATION :		PLANT :	Project & group No. :					
Eng . by :			Sheet No. cont'd on sheet No.					
Principal :			Drawing No. T					

Instrument nameplates type A - DEP 32.37.02.84-Gen., sheet 1 09/89

Issue	Qty	Text on nameplate (1 5 10 15 20 25)	Type A Colour Note 1)	Notes

NOTES : 1) WBW = White-Black-White, BWB = Black-White-Black
2) Refer to Standard Drawing S37.601-C

Made by :	Date :	Title :	Issue	0			
Checked by :	Date :	INSTRUMENT NAMEPLATES	Date				
Appr. by :	Date :	TYPE A	By				
LOCATION :		PLANT :	Project&group No.:				
Eng. by :			Sheet No. cont'd on sheet No.				
Principal :			Drawing No. T-				

DEP 32.37.02.84-Gen., sheet 1, 09/89

Instrument nameplates type B - DEP 32.37.02.84-Gen., sheet 2 09/89

Issue	Qty	Text on nameplate (1 … 5 … 10 … 13)	Type B Colour Note 1)	Notes

NOTES : 1) WBW = White-Black-White, BWB = Black-White-Black
2) Refer to Standard Drawing S37.601-C

Made by :	Date :	Title :	Issue	0			
Checked by :	Date :	INSTRUMENT NAMEPLATES	Date				
Appr. by :	Date :	TYPE B	By				
LOCATION :		PLANT :	Project&group No.:				
Eng. by :			Sheet No. cont'd on sheet No.				
Principal :			Drawing No. T-				

DEP 32.37.02.84-Gen., sheet 2, 09/89

Instrument nameplates typeC - DEP 32.37.02.84-Gen., sheet 3 09/89

Issue	Qty	Text on nameplate (1 ... 5 ... 10 ... 15)	Type C Colour Note 1)	Notes

NOTES : 1) Colour black/white/black unless otherwise indicated.
2) Refer to Standard Drawing S37.601-C

Made by :	Date :	Title :	Issue	0				
Checked by :	Date :	INSTRUMENT NAMEPLATES	Date					
Appr. by :	Date :	TYPE C	By					
LOCATION :		PLANT :	Project&group No.:					
Eng. by :			Sheet No. cont'd on sheet No.					
Principal :			Drawing No. T-					

DEP 32.37.02.84-Gen.,sheet 3, 09/89

Instrument nameplates type D1 - DEP 32.37.02.84-Gen., sheet 4 09/89

Issue	Qty	Text on nameplate (1 5 10 15 20 22)	Type DI Colour Note 1)	Notes

NOTES : 1) Colour black/white/black unless otherwise indicated.
2) Refer to Standard Drawing S37.601-C

Made by :	Date :	Title :	Issue	0			
Checked by :	Date :	INSTRUMENT NAMEPLATES	Date				
Appr. by :	Date :	TYPE DI	By				
LOCATION :		PLANT :	Project&group No.:				
Eng. by :			Sheet No. cont'd on sheet No.				
Principal :			Drawing No. T-				

DEP 32.37.02.84-Gen., sheet 4, 09/89

Instrument nameplates type D2 - DEP 32.37.02.84-Gen., sheet 5 09/89

Issue	Qty	Text on nameplate 1 ... 5 ... 10	Type D2 Colour Note 1)	Notes

NOTES : 1) Colour black/white/black unless otherwise indicated.
2) Refer to Standard Drawing S37.601-C

Made by :	Date :	Title :	Issue	0			
Checked by :	Date :	INSTRUMENT NAMEPLATES	Date				
Appr. by :	Date :	TYPE D2	By				
LOCATION :		PLANT :	Project&group No.:				
Eng. by :			Sheet No. cont'd on sheet No.				
Principal :			Drawing No. T-				

DEP 32.37.02.84-Gen., sheet 5, 09/89