DH-Budenberg

DH Budenberg Model 80 & 80L Dead-Weight Gauge

Operating and Maintenance Instructions

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This product must only be used for the express purposes as advertised by DH Budenberg and as referred to in this and other DH Budenberg approved literature.

CONTENTS

SAFETY PRECAUTIONS

MINERAL OILS HEALTH AND SAFETY (C.O.S.H.H.) INFORMATION

DH▪Budenberg provide hydraulic mineral oil in 500 ml containers labelled "ISO VG 22" for use up to 2600 bar in dead-weight testers. It is no more hazardous than other common lubricating oils.

It is the nature of the way in which this equipment is used, that there could be frequent and/or prolonged skin contact; in a few individuals this could give rise to skin irritation (Keratosis or Dermatitis). The use of an effective barrier cream will greatly reduce this possibility.

DESCRIPTION

Closed flash point:	greater than $120^{O}C$
Storage:	not above $30^{0}C$.
Oral LD 50:	15 g per kg body weight.
Threshold limit value:	5 mg/m^3.
Fire extinguishing media:	carbon dioxide/dry chemical foam or water fog
Spillage:	soak with absorbent clay or proprietary absorbent
Waste disposal:	burn or dump in approved area.

EMERGENCY TREATMENT OF ACUTE EFFECTS

Ingestion	Do not induce vomiting. Administer 250 ml milk or olive oil. The main hazard following accidental ingestion is aspiration of liquid into lungs.
Aspiration	Send to hospital immediately
Inhalation	Remove to fresh air, if nausea persists seek medical attention.
Eye Contact	Wash with copious amounts of water for at least 10 minutes. If irritation results or persists, obtain medical advice.
Skin Contact	Where skin rashes or other abnormalities occur as a result of prolonged or repeated contact, medical advice should be obtained as soon as possible.

OTHER LIQUIDS

For some very particular applications we supply specially constructed liquids. Copies of manufacturer's data will be sent to users on request.

LIFTING OF WEIGHTS

Care must be taken when lifting the weights for the dead-weight tester. Each weight must be lifted individually and never attempt to lift stack of weights on or off the tester

DATA SHEET

1.1 TESTER DIMENSIONS – PRESSURE CABINET ONLY

Width	:	500 mm
Depth	:	440 mm
Height	:	450 mm
Mass	:	31 kg (inclusive of oil fill)

1.2 PRESSURE RANGES

80L	:	7 to 120 bar (100 to 1,600 lb/in^2)
80	:	30 to 600 bar (500 to 8,000 lb/in^2)

1.3 LIQUIDS USED

An hydraulic mineral oil viscosity 20 to 37 cSt at 40^{O}C viscosity grade VG20 to VG37 to ISO3448 (BS4231) is used for all the 580 base units. Most users will be able to obtain locally suitable oil (see below) as used in hydraulic machinery. However, for the convenience of users we can supply a 500 ml bottle of oil, viscosity grade VG22.

Oils suitable for testers

The following oils are the commercially available oils suitable for use in the dead-weight tester.

ISO 3448 viscosity grade	Approx. SAE viscosity classification	Shell	Esso	Mobil
VG22		Tellus 22 Tellus R22	Nuto H22	DTE 22
VG32	10W	Tellus V32 DTE 24	Nuto H32	DTE Oil Light
VG37		Tellus 37 Tellus R37 Tellus T37 Tellus V37		

Other liquids

The Model 80 Dead-weight Gauge can be supplied as standard tested on mineral oil for the user to clean and fill, or alternatively the tester can be supplied cleaned and tested on any suitable liquid readily available in UK.

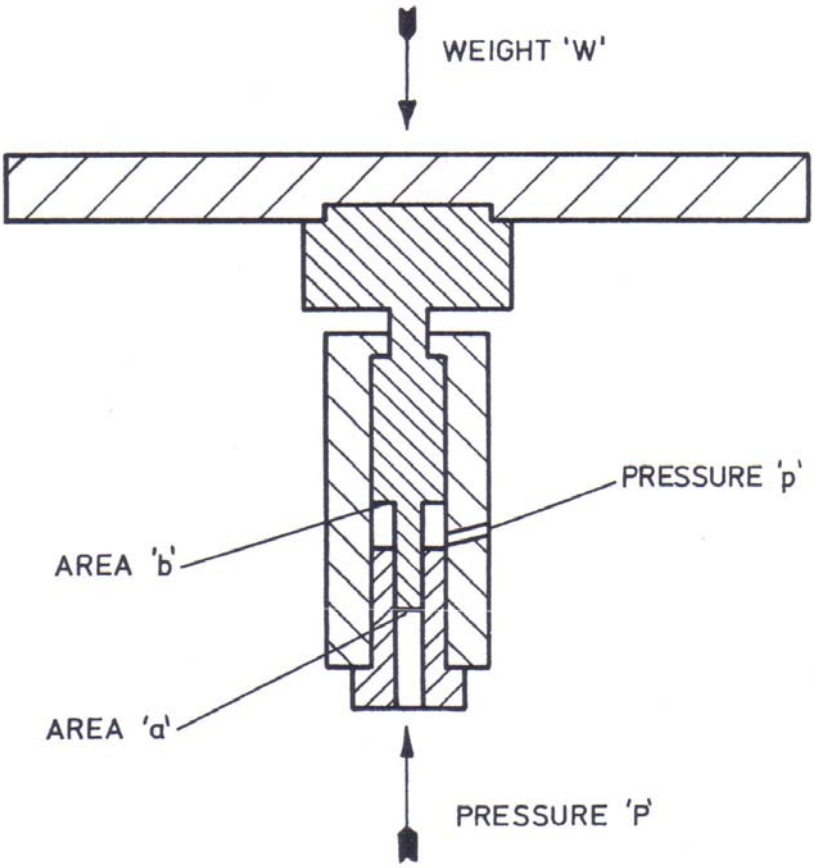
DESCRIPTION

2.1 GENERAL

The Dead-weight gauge is a portable unit suitable for the accurate measurement of arbitrary and fluctuating pressure, which occur in power plants, pipelines and many other applications. It can be used for the measurement of pressures from 30 to 600 bar (kg/cm²) or 500 to 8,000 lb/in² on the 1/80th piston, with an accuracy of 0.07 bar (kg/cm²) or 1 lb/in².

2.2 PRINCIPAL OF OPERATION

Referring to the diagram below, the pressure to be measured P' is applied to a stepped piston on area 'a' loaded with weights ''W. The weighs 'W' are greater than the force on the piston 'Pa'. A small pressure 'p' is then applied to the annulus (area 'b') until the weights rise, the piston is then in equilibrium and W = Pa + pb. The term pb is in this unit, 'small' and so the pressure P can be determined accurately by knowledge of the weight W and the area 'a'. The pressure is applied to a gauge calibrated to suit the unit thus giving 'pb'. Therefore having known areas 'a' = 1/80in² and 'b' = 9/80in², the pressure 'P' = (W-pb)/a



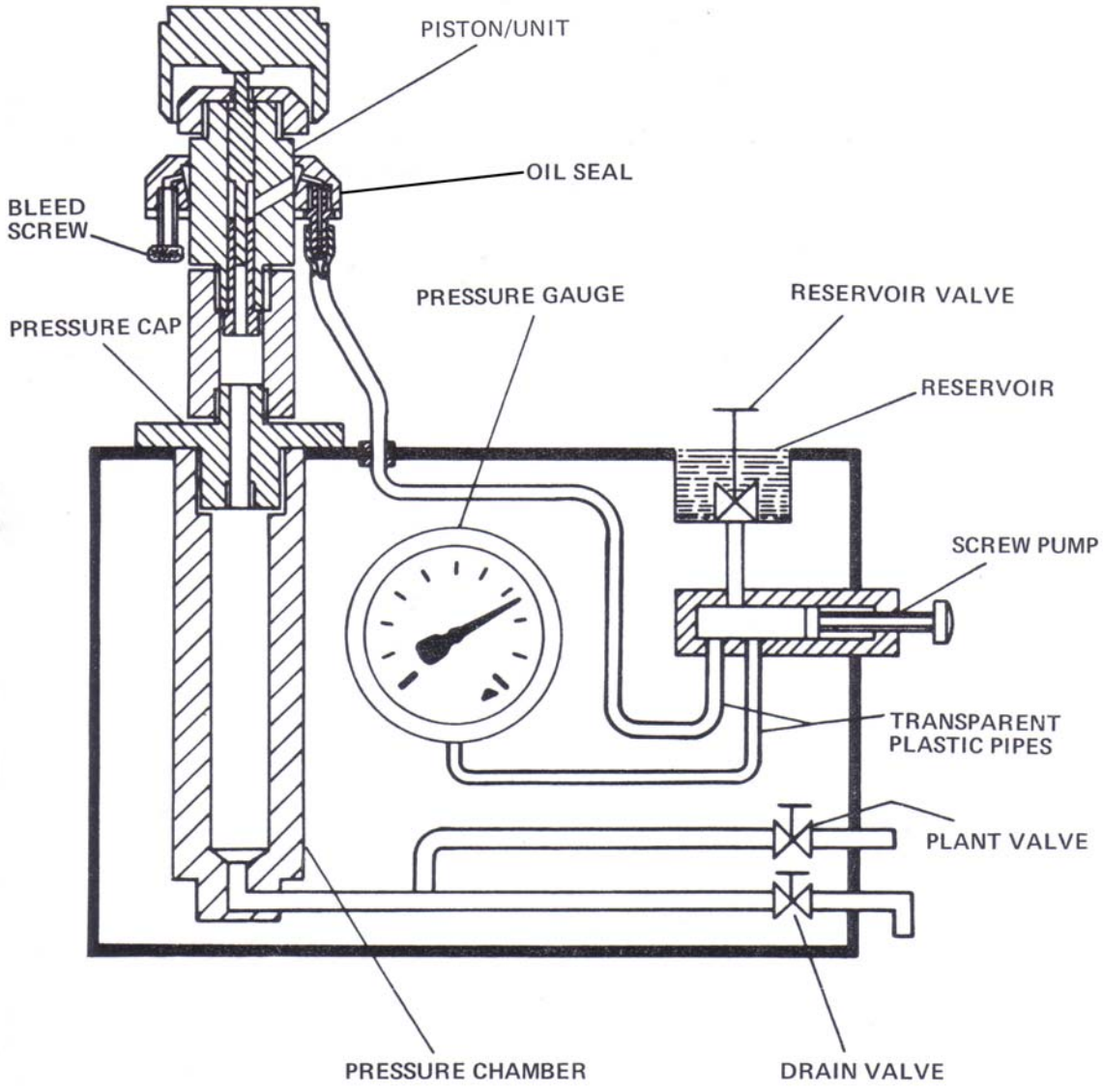
2.3 HYDRAULIC CIRCUIT

The instrument consists of a steel cabinet housing a pressure chamber onto which is screwed a piston unit. As the piston unit can only be used on hydraulic mineral oil, the chamber is used to contain the oil, and this gives an interface with other liquids, which are heavier than oil. If gas or vapour pressures are to be measured then this can be done by fitting special pipes in the chamber as described later. The pressure media being measured should be compatible with aluminium, copper, brass, mild steel, stainless steel, nylon, and nitrile rubber.

The inlet pressure to the chamber is via valve “PLANT” and the outlet via the valve marked “DRAIN”

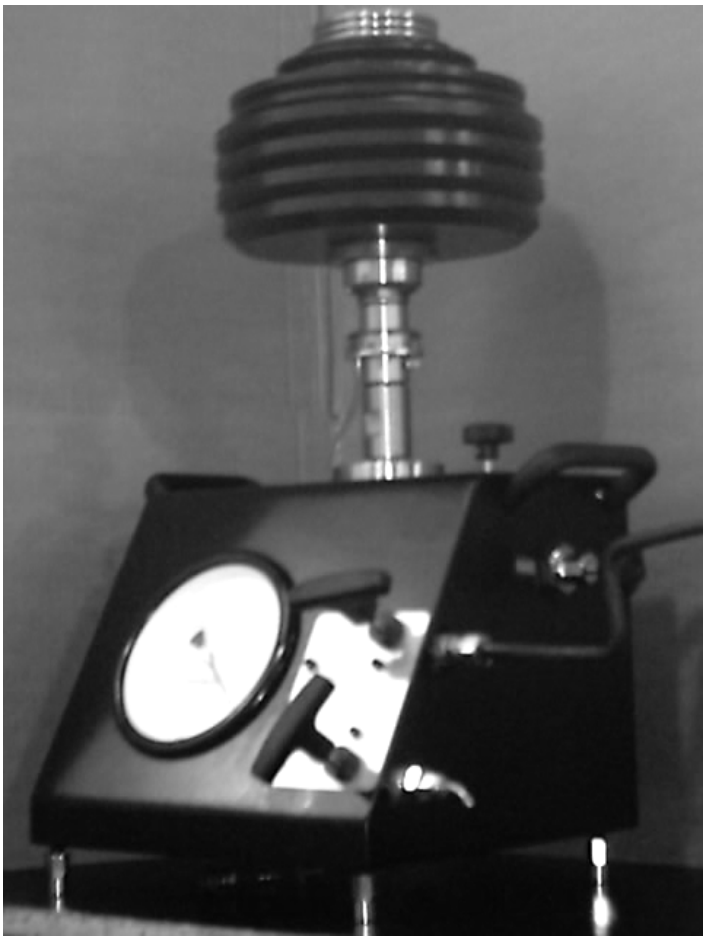
The supplementary pressure side of the system consists of a reservoir with valve and screw pump. The pump is connected to the vent hole in the side of the piston/cylinder unit and the pressure gauge via transparent plastic pipes. The pressure gauge is graduated 0-10 bar (kg/cm²) or 0-100 lb/in² in 0.1 bar (kg/cm²) or 1lb/in² divisions.

The gauge is marked ‘add gauge reading to weights added on piston. N.B. Do not include piston’.

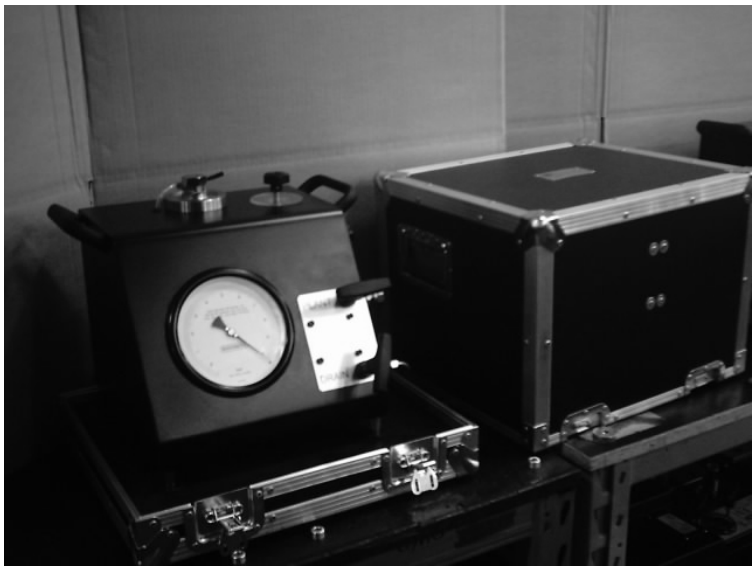


SCHEMATIC DIAGRAM OF MODEL 80 & 80L DEAD-WEIGHT GAUGE

MODEL 80 IN OPERATION



MODEL 80 WITH CARRYING CASE



INSTALLATION

3.1 UNPACKING THE TESTER

As soon as possible after delivery open the packaging of the system and check that you have all the items detailed in the packing list in section 3.4.

As you are unpacking the items, examine them for signs of damage or breakage during transit.

If any items are missing get in touch immediately with DH▪Budenberg to inform us of the shortage.

3.2 ENVIRONMENTAL REQUIREMENTS

When siting the tester, if not in a temperature controlled laboratory, look for an area that satisfies the following criteria as much as possible

- a constant temperature area free from draughts and sources of heat or cold
- an area free from noise and vibration; if possible an area away from any constantly used pathways
- a clean dry area free from corrosive liquids or vapours.

A strong, stable, level table or workbench with the capability of supporting the system with sufficient space to operate is required

3.3 ASSEMBLY OF BASE UNITS

The Dead-weight gauge is supplied in two carrying boxes. The small box contains the weights and the larger box contains the cabinet, piston unit, oil, and tubing.

Put the large box containing the cabinet on a firm bench where it is to be used and in selecting the position, bear in mind the pressure difference between the test point and the Dead-weight gauge. Remove the box by unfastening the toggle clamp.

3.4 PACKING LIST

The system carton should contain: -

1 - copy of the operating and maintenance instructions (this manual)
1 - Dead-weight gauge in carrying case (Fitted with blanking plug).
1 - Model 80 PCU with oil seal (Fitted with blanking plug).
1 - Set of weights supplied in separate carrying case
1 - 500 ml bottle of oil
1 - Set of pipes for air or gas operation, comprising two pipes and one bonded seal
1 - Length of P.V.C. tubing
1 - certificate of calibration
1 - spirit level

SETS OF WEIGHTS SUPPLIED FOR MODEL 80 & 80L

Model 80L – bar WEIGHTS

ITEM	QUANTITY	PRESSURE
PISTON & M.U.W	1	1
TOP LOADING WEIGHT	4	20
TOP LOADING WEIGHT	1	18
TOP LOADING WEIGHT	1	10
TOP LOADING WEIGHT	2	4
TOP LOADING WEIGHT	1	2
TOP LOADING WEIGHT	1	1

Model 80L – lb/in² WEIGHTS

ITEM	QUANTITY	PRESSURE
TOP LOADING WEIGHT	7	200
TOP LOADING WEIGHT	1	100
TOP LOADING WEIGHT	1	50
TOP LOADING WEIGHT	2	20
TOP LOADING WEIGHT	1	10

Model 80 – bar WEIGHTS

ITEM	QUANTITY	PRESSURE
PISTON & M.U.W	1	1
TOP LOADING WEIGHT	4	100
TOP LOADING WEIGHT	1	90
TOP LOADING WEIGHT	1	50
TOP LOADING WEIGHT	2	20
TOP LOADING WEIGHT	1	10
TOP LOADING WEIGHT	1	5

Model 80 – lb/in² WEIGHTS

ITEM	QUANTITY	PRESSURE
TOP LOADING WEIGHT	7	1000
TOP LOADING WEIGHT	1	500
TOP LOADING WEIGHT	2	200
TOP LOADING WEIGHT	1	100
TOP LOADING WEIGHT	1	50

WEIGHT SETS CAN MANUFACTURED FOR LOCAL GRAVITY. CONSULT YOUR LOCAL DISTRIBUTOR FOR ADVICE ON AVAILABILITY.

Assembly of the Dead weight Gauge

(1) Open 'DRAIN' valve, and pour hydraulic oil into the piston/cylinder connection until fluid appears from the 'DRAIN' valve. Close the 'DRAIN' valve

(2) Fit the piston unit to the pressure connection. Ensure that the mating faces are clean and the bonded seal correctly located. Excess force is not required to achieve an effective seal.

(3) Remove the backplate, and unscrew the filler plug until oil stops running from the connection.

(4) Check the level of the system base with the spirit level on the piston cylinder unit. Level if necessary by using the levelling screws.

Filling the base unit with liquid

(1) Wind screw pump handle fully clockwise. Unscrew reservoir spindle and remove completely with the reservoir cover.

(2) Fill reservoir with appropriate liquid. Use the oil supplied or an approved substitute for oil systems.

(3) Wind screw pump handle fully anti-clockwise.

(4) Top up reservoir if necessary.

(5) Check that the clear plastic pipe from the indicating gauge to the oil seal has all air removed before connecting to the oil seal. This is carried out by shutting the reservoir valve, and screwing the screw pump clockwise. This may take several attempts.

(6) Once all air has been removed from the system, the plastic pipe should be connected to the oil seal nipple.

(7) With the oil seal bleed screw open, continue to pressurise the system to relieve all trapped air by using the screw pump. This may take several attempts.

(8) The unit is fully filled when with the reservoir valve open, and the oil seal bleed screw closed, the pressure gauge registers 10 bar (kg/cm^2) or 100lb/in^2.

(9) Shut the valve marked 'PLANT' and connect the piping from the pressure source to this valve.

AIR OR GAS OPERATION

(1) Remove the back plate, and disconnect the Swagelok connection from the bottom of the pressure chamber. This is achieved by unscrewing the back nut and removing the pipe from the main part of the pressure connection body.

(2) The pressure chamber can then be removed from the pressure cap.

(3) Fit the straight pipe assembly to the pressure cap, using the copper seal provided. The pressure chamber can then be re-fitted.

(4) Screw swagelok body/bent pipe assembly into pressure chamber using the appropriate seal. Re-connect back nut to achieve a pressure tight joint.

(5) Remove filler plug from pressure chamber, and fill to level of the screw thread with Hydraulic mineral oil and replace plug. The unit should then be filled as described above.

OPERATING INSTRUCTIONS

It is assumed that the pressure to be measured is known approximately from the reading of a conventional pressure gauge.

4.1 PROCEDURE

(1) Put on the piston/cylinder unit the number of weights corresponding to the pressure between 2.5 and 7.5 bar (kg/cm^2) or 25 to 75 lb/in^2 below the approximate pressure.
NOTE: The pressure equivalent on the piston unit is not taken into account.

(2) Open the 'PLANT' valve. The pressure is now applied to the piston unit, and the piston will rise exposing the blue band.

(3) Shut reservoir valve and screw in the small pump unit until the piston unit head floats in the red band.

(4) If air appears in the plastic pipe or oil seal then release the bleed screw until all air is evacuated and then close the bleed screw.

(5) Re-float the piston unit in the red band.

(6) The weights should then be rotated by hand and adjustments made to the screw pump to ensure that the piston head is floating freely.

(7) From the instructions on the gauge read off the actual pressure. The pressure is that corresponding to the weights added to the piston unit plus the gauge reading. The pressure equivalent of the piston unit head is not taken into account.

(8) If it is required to check accuracy of the gauge when measuring a steady pressure, the weight corresponding to 5 bar (kg/cm^2) or 50 lb/in^2 can be added or taken from the piston unit and the pump adjusted accordingly. The reading of the gauge should change by 5 bar (kg/cm^2) or 50 lb/in^2 if the pressure being measured is constant.

(9) After the necessary readings have been taken the 'PLANT' valve can be closed. Open reservoir valve slowly and release supplementary pressure. Screw pump fully in and close the reservoir valve. Open the 'DRAIN' valve and relieve the main pressure.

DURING CALIBRATION

When the tester is correctly set up and there are no leaks, the piston should "float" for many minutes without it being necessary to touch the screw pump handwheel. If the piston continues to fall, check the connections for leaks.

During calibration, the weights should be rotated by hand. It is desirable that the weights should only be rotated when approximately the correct pressure is obtained. Weights should not be brought to rest by fully releasing the pressure and allowing the piston head to rotate against its stop under the full load of the weight pile.

Stops come into action if the pressure is too high or too low and it is essential that the weights should be spinning freely whilst taking readings. At the lowest pressures the weights will not spin for more than a few seconds unless a very thin oil is used, but providing the weight is rotated by hand before taking a reading and is obviously "floating" an accurate reading will be given.

4.2 COMPLETION

(1) Remove weights, disconnect the plastic pipe from the oil seal and fit the nylon plug into the plastic pipe.

(2) Unscrew Piston unit and fit blank plug. Fit blank plug to pressure cap.

(3) Disconnect from pressure source.

(4) If the unit is to be packed and might be turned upside down, the oil from the reservoir should be emptied. Once emptied the reservoir valve should be closed.

4.3 TEMPERATURE MEASUREMENT OF PISTON UNITS

For many purposes, such as calibrating most type of dial gauges and transducers, accurate knowledge of the temperature of a piston unit is not necessary. However, in order to achieve the utmost accuracy from a dead-weight tester it is important to know the temperature of the piston unit as close as possible to the working part of the unit.

In laboratories where the room temperature is controlled it is most likely that the temperature of the working parts of the unit will not differ from the ambient temperature by more than 0.5°C. When working in uncontrolled temperatures, however, one would have to measure the temperature of the piston unit

A possible way to do this is to use a disc shaped thermistor type probe sensing element taped to the outer surface of the piston unit. The sensing element should be insulated from the ambient temperature by covering the element with a thin strip of polystyrene, or other insulating material, then taping this to the piston unit.

We can supply a suitable instrument. Consult your local distributor for advice on availability

4.4 CLEANING GAUGES

THIS CLEANING/ DEGREASING PROCESS IS ONLY SUITABLE FOR USE WITH PRESSURE GAUGES WITH EITHER PHOSPHOR BRONZE, BERYLLIUM COPPER, MONEL OR STAINLESS STEEL BOURDON TUBES IN THE FORM OF A 'C'.

IT IS NOT ADVISABLE TO DEGREASE PRESSURE GAUGES WITH STEEL BOURDON TUBES SINCE A VERY SMALL AMOUNT OF CORROSION ON THE BORE OF A BOURDON TUBE CAN CAUSE INACCURACIES OF READING AND EARLY FAILURE OF THE TUBE.

THIS METHOD OF CLEANING IS NOT SUITABLE FOR USE WITH PRESSURE GAUGES WHICH ARE FITTED WITH COILED BOURDON TUBES, NOR ANY GAUGES WHICH ARE TO BE USED ON OXYGEN, AS COMPLETE REMOVAL OF OIL IS NOT ASSURED, REFER TO MANUFACTURER.

Equipment

This consists of a syringe and a special needle with the point bent through 90^{O}.

Instructions

(1) Fill syringe with solvent (Proprietary cold degreasing liquid)).

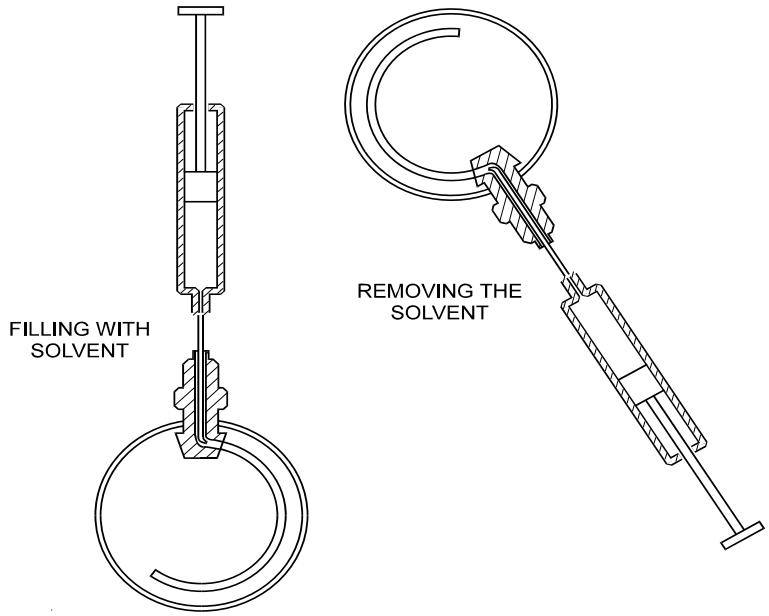
(2) With gauge connection pointing upwards put needle into connection and insert by feel the point into the hole leading to the tube.

(3) Inject the solvent. Ideally the tube should be half full.

(4) Shake gauge in various attitudes to agitate solvent.

(5) Suck solvent back into syringe, holding gauge at an angle.

(6) Check that solvent removed is clean. To be sure that all oil has been removed, repeat cleaning process until solvent removed from gauge is as clean as that put in.



Cleaning of gauges

FAULT FINDING

The following chart is an aid to fault finding on your equipment in case of a fault occurring.

Fault	Possible cause	Remedy
Equipment does not provide any output pressure.	No liquid in tester.	Check that tester is filled with liquid. Fill the equipment with fluid as necessary. Refer to section 3 (Filling the equipment with liquid).
	Reservoir Valve is open/Drain valve is open	Close valve and try again.
	Missing or damaged liquid seals shown by signs of unexplained liquid leaks.	Examine seals on equipment to ensure they are fitted correctly and are undamaged. Replace as necessary.
	If unable to locate a cause.	Return tester to DH Budenberg for investigation.
Equipment provides pressure but pressure decays to zero	Incorrect operating procedure being used.	Ensure that correct operating procedure is being followed (Refer to section 4)
	Missing or damaged liquid seals shown by signs of unexplained liquid leaks.	Examine seals on equipment to ensure they are fitted correctly and are undamaged. Replace as necessary.
	If unable to locate a cause.	Return tester to DH Budenberg for investigation.
Equipment provides pressure but pressure decays to lower value then remains steady.	Insufficient liquid in tester.	Check liquid level in reservoir. Fill reservoir with correct liquid as necessary (Refer to Section 4).
	Air in the system	Prefill component under test with appropriate liquid. If necessary re-fill tester with appropriate liquid.
	If unable to locate a cause.	Return tester to DH Budenberg for investigation.
	Internal damage	Return tester to DH Budenberg for investigation.
	Incorrect operating procedure being used.	Ensure that correct operating procedure is being followed (Refer to Section 4)
	If unable to locate a cause.	Return tester to DH Budenberg for investigation.

PERIODIC MAINTENANCE

6.1 CLEANING THE UNIT AND CHECKING THE LIQUID LEVELS.

Cleaning the units and checking the liquid levels is the only periodic maintenance required. With normal use, no further maintenance should be necessary. If required, the system can be returned to our works for re-conditioning. Accuracy, overhaul and re-certification is also explained in corrective maintenance.

Oil operation

Keep the system clean and free from spilt oil. Do not use any cleansing solvents as they may damage the seals.

Ensure that the reservoir contains sufficient liquid to carry out any calibrations required. If necessary top up the reservoir with the same liquid that is already being used. Do not mix various types or brands of liquid in the tester.

If the oil in the system becomes dirty, use the screw pump to flush through the clean oil by disconnecting the clear plastic pipe to the Piston/cylinder unit. The screw pump should be turned fully clockwise before starting.

CORRECTIVE MAINTENANCE

7.1 GENERAL

This section contains details on stripping the unit and replacing the spare parts which are listed in section 8. The component identification numbers in brackets in each procedure refer to the following drawings on page 20

7.2 REMOVING THE COVER

(1) Remove the Piston/cylinder unit to a safe place before commencing any maintenance work
(2) Remove the four screws situated at the back of the cabinet. This gives the user full access to all components.

7.3 SCREW PUMP SEALS

(1) Unscrew the hexagonal nut which the screw pump spindle rotates in.

(2) Inspect the ‘O’ ring seal (4). If damaged, carefully remove the seal and replace with a new one. The ‘O’ ring should be smeared with oil, or a suitable lubricating grease before re-assembly.

(3) Inspect screw pump piston, and screw pump cylinder for any signs of excessive wear before re-assembling.

7.4 PLANT/DRAIN VALVE SEALS

(1) Using a hexagon wrench key unscrew the socket head cap screw securing the handle to the spindle.

(2) Prise the gland nut covers, so exposing the valve gland nuts

(3) Unscrew the gland nut.

(4) Unscrew the valve spindle and remove the bonded seal.

(5) Slide gland nut off spindle.

(6) Using a suitable hooked tool remove the ‘O’ ring seal (11) from the bore of the gland nut. Renew ‘O’ ring and bonded seal (12).

(7) On replacement ensure that ‘O’ ring is correctly located in the groove and all sealing faces are clean. Remove all burrs from spindle.

7.5 PLANT/DRAIN PRESSURE CONNECTIONS

(1) Using a suitable wrench remove ‘PLANT’ and ‘DRAIN’ pressure connection.

(2) Remove seals, and inspect sealing faces for any signs of damage.

(3) Fit required new seals and re-assemble.

7.6 OIL SEAL

(1) Disconnect the plastic tube connected to the oil seal. Place a suitable blank plug into the end of the tube to stop any oil loss.

(2) Unscrew the three screws retaining the oil seal clamping plate to the oil seal.

(3) Unscrew the piston cylinder collar (identified by the red/blue band), and withdraw the piston assembly.
NOTE: take great care of the piston assembly when it is in this condition.

(4) Slide the oil seal off the piston/cylinder unit in the direction of the red/blue band cap.

(5) Replace seals using suitable tool.

(6) Lubricate the seals before re-fitting in reverse order as described above.

(7) Do not use excessive force when re-fitting the oil seal, as this may cause it damage. Ensure adequate lubrication is used.
NOTE: When the piston has been re-assembled, the piston head (approximately Ø60mm) should be slowly moved up and down prior to pressurising the system. Failure to ensure the piston has been correctly re-assembled may lead to permanent damage to the piston/cylinder assembly.

7.7 RESERVOIR

(1) Unscrew the reservoir valve spindle and remove the spindle and cover.
(2) Using a suitable socket wrench remove valve centre, and slide the reservoir out of the cabinet to expose the two bonded seals

7.8 PISTON/CYLINDER UNIT

As the piston/cylinder unit represents a high proportion of the total value of the tester, it should always be handled with care and every effort made to keep it clean.

The piston/cylinder unit is made to extremely fine limits of accuracy and it is not advisable to dismantle it. If it is necessary to clean it, the piston and cylinder bore must be oiled immediately, in order to protect the high-grade finish.

Should the unit become damaged it should be returned to DH▪Budenberg complete for replacement or repair. Parts from different units are not interchangeable, as they have to be weighed and evaluated as a whole.

The serial number of the piston/cylinder unit appears in the certificate of accuracy and is marked on the body of the unit. This number, as well as the tester serial number should always be quoted in correspondence concerning the piston/cylinder unit.

The piston/cylinder connections should be blanked if it is removed from the tester. If the unit is taken off for any reason, it should be stored upside-down, resting on its weight carrier.

7.9 FACTORY OVERHAUL AND RE-CERTIFICATION OF DEAD-WEIGHT TESTERS MAINTENANCE OF ACCURACY.

The accuracy of a dead-weight tester depends primarily on the effective area of the piston unit and on the weights applied to the piston. The effective area of the piston unit can be affected by wear of the unit. This is generally caused by contamination of the oil in the tester by foreign matter from instruments being calibrated, by water, or by chemicals from instruments, or by rust or corrosion caused by contaminants.

Weights are made of austenitic stainless steel, which are entirely stable. They should be periodically cleaned using a non-abrasive method to remove any foreign matter.

NEED FOR OVERHAUL AND RE-CERTIFICATION

We recommend that the tester be returned to us for overhaul and re-certification at any time if when used in accordance with instructions:

(a) The piston does not spin freely.

(b) The rate of fall of the piston is appreciably greater than when new and makes use of the tester difficult.

(c) The weights are damaged.

(d) The tester cannot be made to operate satisfactorily due to wear or damage to pump piping or valves which cannot be rectified by the user.

When high accuracy is required from the tester, it should be returned for overhaul and re-certification more frequently. The actual period will depend on how the tester is used. A tester kept in a laboratory and carefully used might need to be returned every two to three years. A tester carried from site to site and used for calibrating high accuracy gauges or transducers from industrial process plant or for measuring pressures directly might well need to be returned at intervals of less than a year.

The actual period between overhaul and re-certification should be fixed by the user in the light of the above comments taking into account the requirements of any inspection authority, which might be involved.

IDENTIFICATION OF WEIGHTS

All weight sets supplied with a dead-weight tester have allocated, and are marked with, a weight set number. Additionally, if users wish to ensure that only specific weights are used with an individual dead-weight tester or piston and cylinder unit, then the serial number of the tester, and/or piston cylinder unit may also be marked on the main weights. Regrettably due to size, increment weights can only be marked with the serial number of a piston and cylinder unit.

OVERHAUL AND RE-CERTIFICATION

To provide the best possible service, the tester should be returned as a complete unit comprising the base, the piston and cylinder unit, and all the weights. Users may at their discretion elect to service the base themselves and only return the piston and cylinder unit with weights for overhaul. In such instances, certification issued after overhaul can only refer to the piston and cylinder and weight set numbers and not to the base to which they were originally fitted.

Tester bases will be stripped, all pipework cleaned, all seals replaced, worn components replaced where desirable, and all reassembled and tested.

The weights will all be checked and brought to within original limits if possible. If one or two weights are missing or beyond economical repair they will be replaced. If more are missing/ beyond economical repair customer instructions will be sought.

The piston unit will be checked for accuracy and sensitivity. If it is not satisfactory for any reason a quotation will be submitted for a replacement unit.

A new certificate of accuracy will be issued for each overhauled tester. Unless otherwise instructed on order, when there has been a slight change in area of the piston unit, the certificate will reflect this; the accuracy will not be affected by more than 0.03%. For example the certificate of accuracy of an overhauled tester might show that the error does not exceed 0.05% when the original certificate shows that the error did not exceed 0.02%.

We can issue an UKAS certificate of calibration for an overhauled system. Details will be supplied on request.

ORDERING AND PRICING

An open order should be placed to avoid delays and correspondence. No tester will be overhauled if it is not economic to do so. By far the most expensive component likely to need replacement is the system piston unit; this unit will not be replaced unless customer’s approval has been obtained.

When customers ordering procedure does not allow an open order to be placed, we quote a basic price for the overhaul and re-certification of that particular model. This assumes that the tester and weights are in good condition and covers stripping, cleaning of pipework, replacement of seals, re-assembly and testing, checking of weights and of piston unit. The basic price covers our certificate of accuracy in the typical form. Customers requiring a more detailed certificate of calibration should state this on their order.

Any additional work required will be carried out and will be quoted separately and will not commence until agreed so by the customer involved.

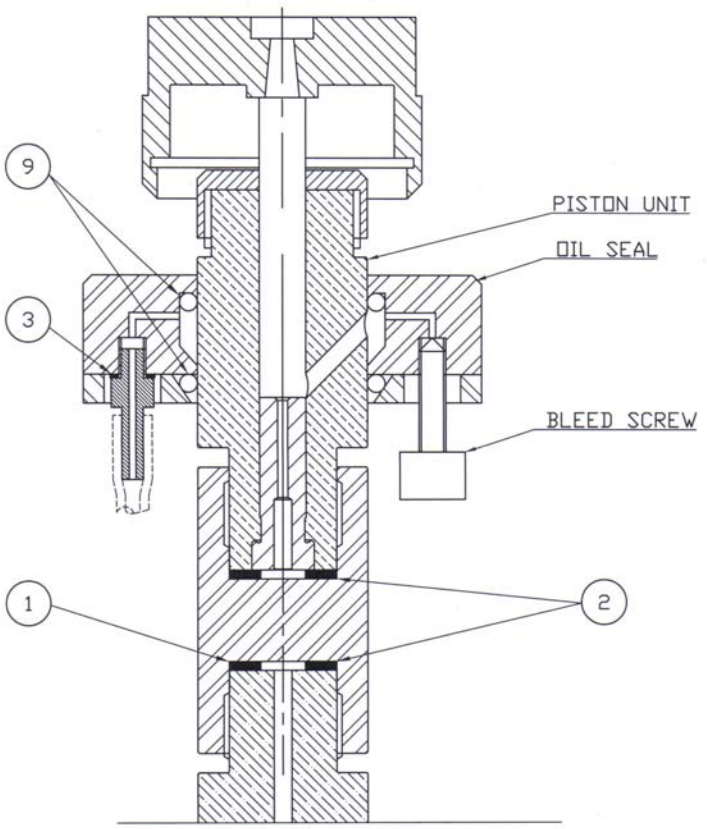
SPARE PARTS

8.1 SPARE PARTS LIST

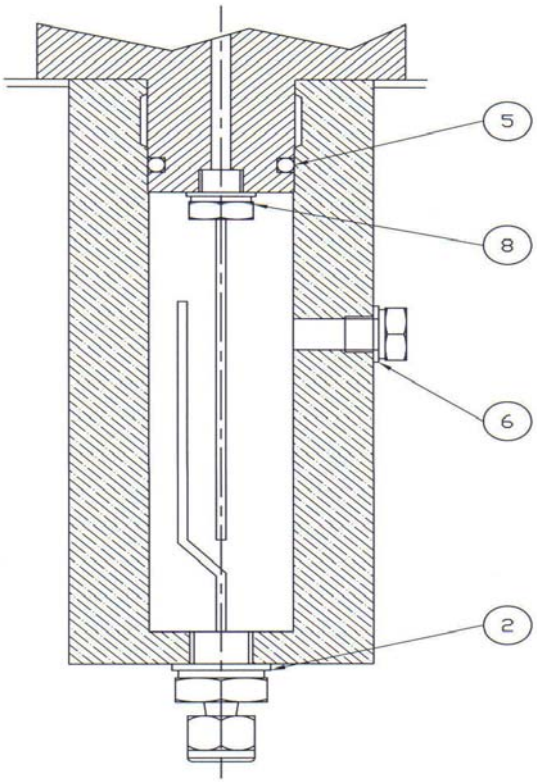
This list covers all the items subject to wear. Any enquiries should be addressed to DH Budenberg.

Unit	Item No.	Description	Part No.
Piston/cylinder	1	Model 80L Unit complete – Q/9886 Model 80 Unit complete – Q/8681	YC0305 YC0005
	2*	Bonded seal	YR1337
Screw pump	4*	'O' ring	YR1430
Reservoir	2*	Bonded seal	YR1337
Pressure Chamber	5*	'O' ring	YR1445
	6*	Bonded seal	YR1335
	2*	Bonded seal	YR1337
	8*	Bonded seal	YR1336
	10	Oil seal complete – PA/2580	YC2305
Oil seal	9*	'O' ring	YR1360
	3*	'O' ring	YR1355
Valves	11*	'O' ring	YR1436
	12*	Bonded seal	YR1351
	13*	Bonded seal	YR1352
	14*	Copper washer	GNWS05W

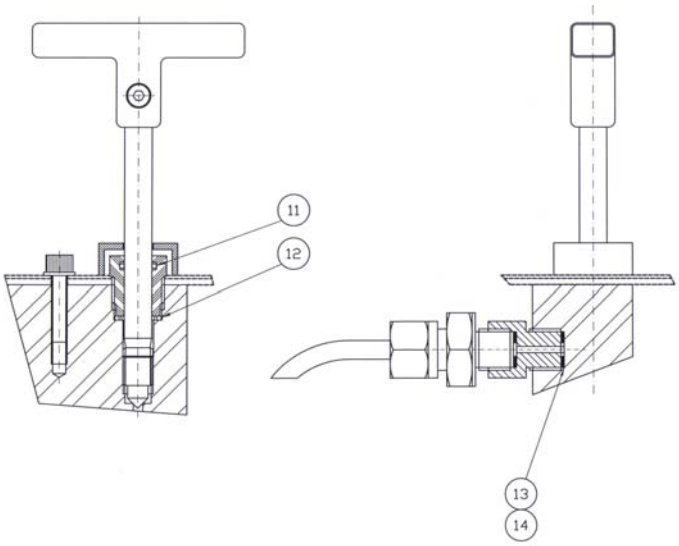
Items marked thus * are contained in the bag of seals which are available as a spare.



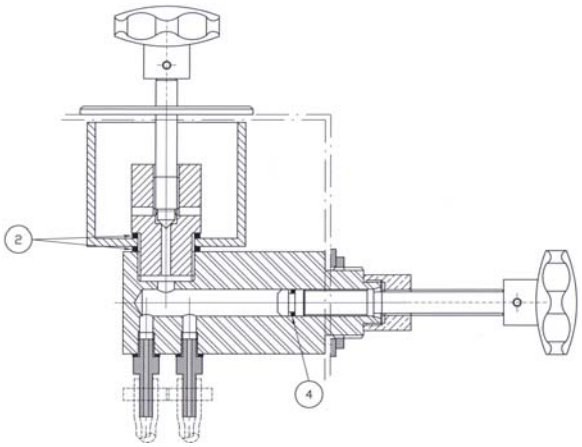
PISTON UNIT AND OIL SEAL



PRESSURE CHAMBER
NOTE: UNIT SHOWN FITTED WITH AIR PIPES. THIS IS FOR USE WHEN AIR OR GAS OPERATION IS REQUIRED

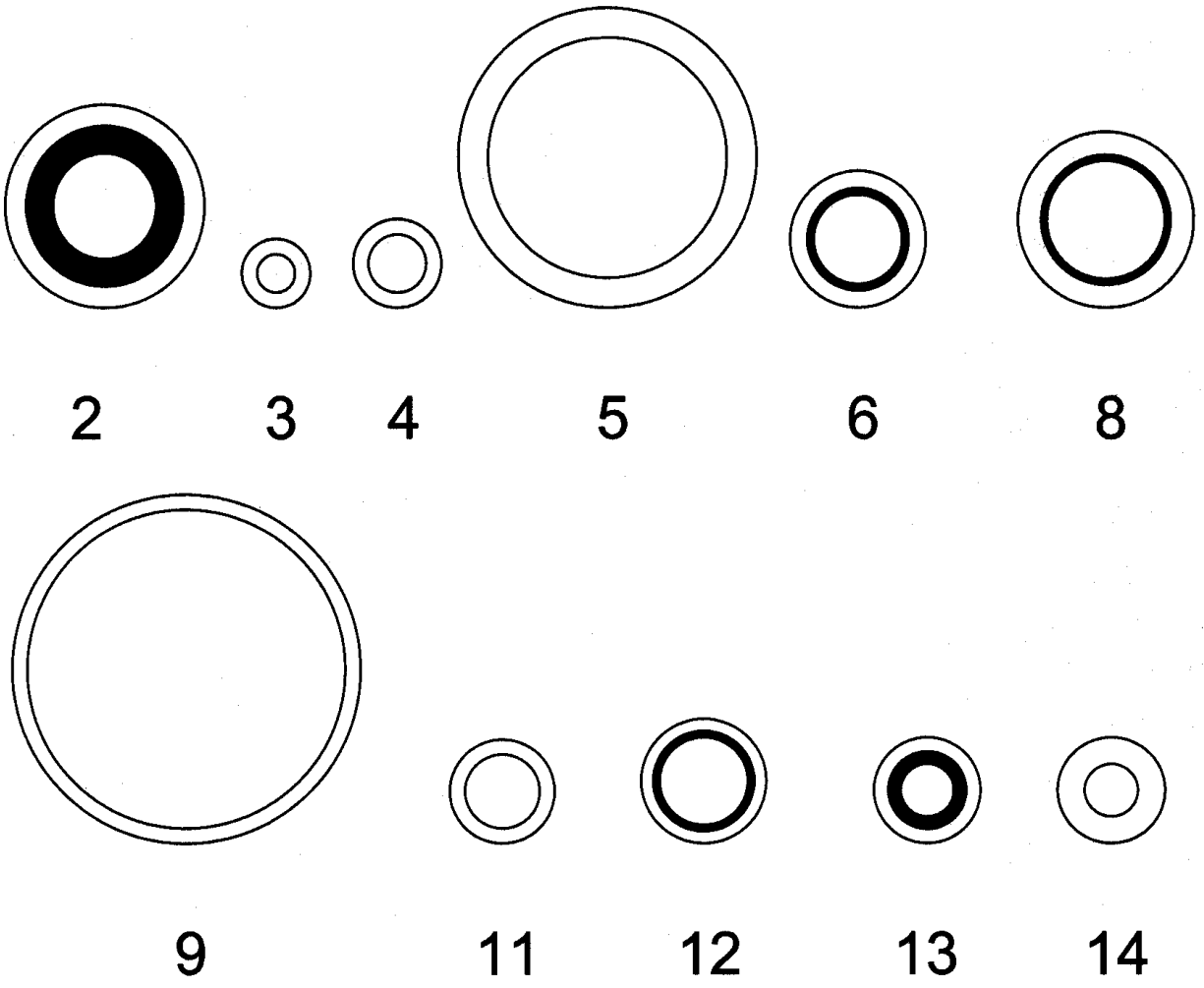


PLANT/DRAIN VALVES



SCREW PUMP

8.2 SPARE SEAL IDENTIFICATION CHART



8.3 ORDERING SPARES

When ordering spares or making enquiries always give:
1) System Model No. (on front of this manual)
2) System serial No. (on nameplate)
3) Description of part. See spare parts list.

Whilst every effort is made to ensure that the correct parts are supplied, this cannot be guaranteed unless full information is given. The seals given in this manual are applicable from tester serial number 80/28532
Ordering spares can be carried out from our service department at the following address:

DH.Budenberg Customer Services
2 Gilchrist Road, Northbank Ind. Est.,
Irlam,
Manchester
M44 5AY
UK
Tel: 44 (0)870 7877370
Fax: 44 (0)870 7877369
E-Mail: sales@dh▪budenberg.co.uk

OPTIONAL EXTRAS

9.1 FINE INCREMENT WEIGHTS

Extra weight set to give fine increments of pressure less than those normally supplied with the tester can be supplied for use all piston/cylinder units.

9.2 UKAS CERTIFICATE OF CALIBRATION

All testers are available with certificates of calibration on pressure, also calibration of effective area and mass of the piston unit, also the mass of the weights.
Consult your local distributor for advice.

Consult your local distributor for advice on any additional equipment required for calibration requirements.

EC DECLARATION OF CONFORMITY

ISSUED IN ACCORDANCE WITH THE

PRESSURE EQUIPMENT DIRECTIVE (PED) 97/23/EC

I hereby declare that in accordance with the above directive, that the

Model 80 Dead-weight Gauge

has been manufactured and tested in accordance with the conformity assessment:
Module A – 'internal production control'.

Name : J. R. HACKNEY

Position : GENERAL MANAGER - DH▪Budenberg - UK

Date : 19th April 2005

Signature : _____

EC DECLARATION OF CONFORMITY

ISSUED IN ACCORDANCE WITH THE

PRESSURE EQUIPMENT DIRECTIVE (PED) 97/23/EC

PRODUCT DESCRIPTION	:	HYDRAULIC DEAD-WEIGHT TESTER
MODEL No	:	MODEL 80(L)
MANUFACTURER	:	DH▪Budenberg MANCHESTER ENGLAND
MAXIMUM WORKING PRESSURE	:	600bar (8,000lb/in²)
HYDROSTATIC PRESSURE TEST	:	750 bar (10,900lb/in²)
ASSEMBLY DIMENSIONS	:	
SIZE	:	40cm x 40cm x 40cm (WxDxH)
WEIGHT	:	BASE (PISTON/CYLINDER FITTED) : 32Kg (70lbs) – FILLED BASE (PISTON/CYLINDER FITTED) : 31Kg (68lbs) – UNFILLED WEIGHTS - bar : 32Kg (70lbs) - lb/in² : 30Kg (66lbs)
VOLUME	:	RESERVOIR : 0.145 LITRES PRESSURISED VOLUME : 0.140 LITRES
INTENDED USE	:	PRESSURE MEASUREMENT DEVICE.

PRESSURE EQUIPMENT DIRECTIVE DEFINITION : PRESSURE ASSEMBLY
PRESSURE EQUIPMENT DIRECTIVE CLASSIFICATION : CAT I
PRESSURE EQUIPMENT DIRECTIVE CONFORMITY ASSESSMENT: MODULE A

CLASSIFICATION OF THE PRESSURE ASSEMBLY IS BASED ON THE PRESSURIZED INTERNAL VOLUME (V) AS DEFINED IN ANNEXE B OF THE PRODUCT CLASSIFICATION CHART IN THE PRESSURE EQUIPMENT DIRECTIVE 97/23/EC.

	GAS		LIQUID	
GROUP	1	2	1	2
PRESSURE <200 bar	SEP	SEP	SEP	SEP
>200 bar	CAT III	SEP	SEP	SEP
>500 bar	CAT III	SEP	CAT 2	SEP
>1000 bar	CAT IV	CAT III	CAT II	CAT I

NOTE: THE ABOVE TABLE IS BASED ON DH▪Budenberg EQUIPMENT THAT HAS A PRESSURISED INTERNAL VOLUME OF LESS THAN ONE LITRE.

DETAILS OF HARMONISED STANDARDS/TECHNICAL STANDARDS/EUROPEAN COMMUNITY DIRECTIVES SPECIFIED/USED:

STANDARD	DESCRIPTION
EN 837-1:1998	Pressure Gauges - Part 1: Bourdon tube pressure gauges – Dimensions, Metrology, Requirements and Testing

DH▪Budenberg QUALITY ASSURANCE SYSTEM : ISO 9001
DH▪Budenberg QUALITY ASSURANCE MONITORS : LLOYD'S REGISTER OF SHIPPING

DH▪Budenberg Ltd
2 Gilchrist Road
Northbank Ind. Est., Irlam
Manchester, M44 5AY,UK
Tel: 44 (0) 870 7877370
Fax : 44 (0) 870 7877369
E-Mail :sales@dh-budenberg.co.uk

DH▪Budenberg S.A.
56 Rue Des Ecoles,
93303, Aubervilliers,
France.
Tel :33 (0) 1 48 39 83 00
Fax :33 (0) 1 48 33 65 90
E-Mail :dhonline@desgranges.com

DH▪Budenberg GmbH,
Raiffeisenstrasse 2,
D - 63110 Rodgau,
Germany.
Tel :49 (0) 6106 82 940
Fax :49(0) 6106 82 9417
E-Mail:kontakt@dh-budenberg.de