103848 - PERFORMANCE TEST

DELAVAL-STORK
Techn. Serv. Dept.
HENGELO (O) THE NETHERLANDS

DATE: FEBRUARY 1982.

⚠1 DATE: MARCH 1982.

# PERFORMANCE TEST PROGRAM

# OF THE

# PV52 CENTRIFUGAL COMPRESSOR

# FOR

# GREEK PETROCHEMICALS S.A.

103848

| | | |
|---|---|---|
| | DESTINATION | : H.D.P.E. PLANT - GREECE |
| ⚠1 | CONTRACTOR | : CJB (PROJECTS) LTD. |
| | CONTRACTOR ORDER NO. | : 4110/A/4/30/01 |
| ⚠1 | C.J.B. DWG. NO. | : 4410/C-430/25~~A~~B |
| | DELAVAL-STORK ORDER NO. | : LC 0261/0262 |

DISTRIBUTION: C.J.B. (3x), 3307, 3456, 2955.

DELAVAL-STORK V.O.F.
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☐ RECORD APPROVAL ONLY.
☒ FINAL DISTRIBUTION.
☐
DATE: 7 APR 1982
SIGN.:

CJB (PROJECTS) LTD.
FINAL DRAWING
SIGNATURE ............ DATE 22.4.82

TABLE OF CONTENTS.

## NOTATIONS

| Symbol | Description | Units |
|---|---|---|
| $b_i$ | Tip Width First Impeller | m |
| $D_i$ | Diameter First Impeller | m |
| g | Acceleration Due to Gravity | $m/s^2$ |
| k | Isentropic Exponent | |
| H | Head | kJ/kg |
| Ma | Machine Machnumber | |
| M.W. | Molecular Weight | |
| N | Speed | rpm |
| n | Polytropic Exponent | |
| $\eta$ | Efficiency | |
| $\mu$ | Dynamic Viscosity | $Ns/m^2$ |
| $\mu$ | Tension | mmVolt |
| $R_a$ | Absolute Gasconstant | kJmol/kgK |
| R | Gasconstant | kJ/kgK |
| $R_e$ | Reynoldsnumber | |
| $r_p$ | Pressure Ratio | |
| T | Absolute Temperature | K |
| v | Specific Volume | $m^3/kg$ |
| $\nu$ | Kinematic Viscosity | $m^2/s$ |
| q | Volume Flow Rate | $m^3/s$ |
| z | Compressibility Factor | |

(NOTATIONS Cont'd)

⚠ **Subscripts:**

| | |
|---|---|
| 1 | Suction |
| 2 | Discharge |
| d | Design |
| t | Test |
| pol | Polytropic |
| i | Impeller |
| isen | Isentropic |
| m | Orifice |
| sp | Specified |

## 1. GENERAL INFORMATION.

For the works aerodynamic performance test the unit is set up on Delaval-Stork's testbed in Hengelo (Holland).
The compressor will be tested on air in an open loop (see appendix 1).
During the test the compressor will be driven by an electric motor via a gearbox. The speed of the electric motor can be controlled by a water resistance in series with the rotor windings.
The purpose of the test is to verify, that the compressor will meet the Delaval-Stork guaranteed values, when operating on the design gas at design operating conditions.
The performance test will be executed on the main rotor and is in accordance with ASME - PTC 10 Class III.

## 2. SPECIFIED OPERATING CONDITIONS.

For the specified operating conditions see appendix 5-6, page 16 and 17. Operating condition "Duty 1" is the guarantee point.

## 3. CONDITIONS OF TEST.

The performance curve of the compressor will be determined by a test classified as class III acc. ASME PTC 10 - 1965 and fully in accordance with the contract specifications including API 617, latest addition.
The test will be carried out in an open loop arrangement using air as testgas.

⚠1 Some relevant properties of air:

| | |
|---|---|
| Molecular weight | : ± 28.84 |
| Isentropic coefficient | : 1.40 |
| Kinematic viscosity | : $15 \times 10^{-6}$ $m^2$/sec for p = 1 bar and t = $20^\circ C$ |
| Compressibility | : 1.00 |
| Relative humidity | : ± 50% |

Above mentioned properties will be reviewed on day of test with regard to prevailing ambient conditions.

In order to comply with table 3 of PTC 10 the following parameters are determined:

### 3.1 The volume ratio equivalent speed.

### 3.2 The Mach Number.

### 3.3 The Reynolds Number.

3.1.1 Calculation of test speed.

The following test conditions of the compressor are applicable:

| | |
|---|---|
| Inlet pressure (absolute) | : $p_1 = \pm 1.0$ bar abs (atmospheric) |
| Inlet temperature | : $t_1 = \pm 20\ ^\circ C$ |
| Discharge pressure (absolute) | : $p_2 = 1.09 \times 1.0 = \pm 1.09$ bar abs. |
| Discharge temperature | : $t_2 = \pm 29\ ^\circ C$ |
| Isentropic exponent | : $K = 1.40$ |
| Compressibility factor inlet | : $Z_1 = 1.0$ |
| Compressibility factor discharge | : $Z_2 = 1.0$ |
| Compressibility mean factor | : $Z_{mean} = 1.0$ |

The compressibility factors X and Y for air are:

| | Testgas (air) | Specified gas |
|---|---|---|
| $X_1 = 0$ | $Y_1 = 1.0$ | $Y_1 = 1.05$ |
| $X_2 = 0$ | $Y_2 = 1.0$ | |
| $X_{mean} = 0$ | $Y_{mean} = 1.0$ | |

The polytropic exponent $n_t$ for air is determined from:
(acc. P.T.C. 10 page 25-26)

$$m = \frac{8315 \times Z_{mean}}{M.W. \times c_p} \left( \frac{1}{\eta_{pol(d)}} + X_{mean} \right)$$

$$n_t = \frac{1}{Y_{mean} - m\ (1 + X_{mean})}$$

$$m = \frac{8315 \times 1.0}{28.84 \times 1009} \left( \frac{1}{0.805} + 0 \right) = 0.35496$$

$$n_t = \frac{1}{1.0 - 0.35496\ (1 + 0.0)} = 1.5503$$

In order to have the correct volume ratio on test the following conditions must be met:

$$\left[q_i/q_d\right]_{test} = \left[q_i/q_d\right]_{sp} \qquad \left[(r_p)^{\frac{1}{n}}\right]_t = \left[(r_p)^{\frac{1}{n}}\right]_d$$

or:

$$r_{p\,t} = \left[\left(r_p^{\frac{1}{n_d}}\right)_d\right]^{n_t} = \left[\frac{23.17}{21.60}^{\frac{1}{1.2622}}\right]^{1.5503} = 1.0900$$

The required test speed is then calculated by the following:

$$N_t = N_{sp}\sqrt{\frac{T_{1t}\ Z_{1t}\ M_{sp}\left(\frac{n}{n-1}\right)_t\left(r_p^{\frac{n-1}{n}}-1\right)_t}{T_{1sp}\ Z_{1dp}\ M_t\left(\frac{n}{n-1}\right)_{sp}\left(r_p^{\frac{n-1}{n}}-1\right)_{sp}}}$$

$$N_t = 2986\sqrt{\frac{293.15 \times 1.0\left(\frac{1.5503}{1.5503-1}\right)\left[1.0900^{\left(\frac{1.5503-1}{1.5503}\right)}-1\right]\ 26.38}{373.15 \times .951\left(\frac{1.2622}{1.2622-1}\right)\left[\frac{23.17}{21.60}^{\left(\frac{1.2622-1}{1.2622}\right)}-1\right]\ 28.84}}$$

$N_t$ = 2916 rpm

⚠1 This calculated test speed is for ambient air at 20°C. If ambient conditions vary significantly from 20°C then $N_t$ will have to be re-calculated at time of test.

3.2.1 Calculation Mach Number:

$$Ma_d = u \Big/ \sqrt{\frac{k \times z_1 \times RT_1}{Y_1}} = \frac{\pi \times D \times N}{60\sqrt{\frac{k \times z_1 \times RT_1}{Y_1}}}$$

$$Ma_d = \frac{\pi \times 0.8255 \times 2986}{60 \sqrt{\dfrac{1.201 \times 0.951 \times \dfrac{8315}{26.88} \times 373.15}{1.05}}} = 0.364$$

$$Ma_t = \frac{\pi \times 2916 \times 0.8255}{60 \sqrt{\dfrac{1.40 \times 1.0 \times \dfrac{8315}{28.84} \times 293.15}{1.0}}} = 0.366$$

$$\frac{Ma_t}{Ma_d} = \frac{0.366}{0.364} = 1.005$$ Allowable limits : 0.50 - 1.05

3.3.1 Calculation Reynolds Number.

$$Re_d = \frac{u \times b_i}{\nu} = \frac{\pi \times D_i\ N \times b_i}{60 \times v_1 \times}$$

$$Re_d = \frac{\pi \times 0.8255 \times 2986 \times 0.0356}{60 \times \dfrac{1}{19.7} \times 13.00 \times 10^{-6}} = 6.94 \times 10^6$$

$$Re_t = \frac{\pi \times 0.8255 \times 2916 \times 0.0356}{60 \times \dfrac{1}{1.18} \times 15 \times 10^{-6}} = 0.35 \times 10^6$$

⚠1 $$\frac{Re_t}{Re_d} = \frac{0.35 \times 10^6}{6.94 \times 10^6} = 0.05$$

No Reynoldsnumber correction on head and efficiency will be applied.

## 4. METHOD OF MEASUREMENT AND USED INSTRUMENTS.

The open loop system is designed and installed according ASME POWER TEST CODE PTC 10 - 1965 (See appendix 1) Class III.
Air is used as testgas.

### 4.1 Mass Flow.

The mass flow of the compressor will be measured by means of two concentric, square edge orifices mounted in two parallel measuring pipes. Dimensions of square edges according DIN 1952 and VDI 2040 Blatt 1.
The square edge orifices are mounted in a carrier ring with annular slot. Dewpoint will be measured to ascertain true M.W. etc. of test gas.

### 4.2 Temperatures.

Because the temperature rise across the compressor is rather small, the temperature difference between discharge and suction will be measured directly by means of four pair of thermocouple columns, spaced 90 degrees in the suction- and discharge pipe.
Each probe of a pair of columns consists of seven couples in series.

The thermocouples are of the iron-constantan type.
To measure the absolute temperature of the suction pipe four single thermocouples are installed in the suction pipe spaced 90 degrees.

The absolute discharge temperature is derived from the measured absolute inlet temperature and the measured temperature rise.

In order to verify the accuracy of the differential temperature readings after the test, the thermocouple columns will be immersed in controlled temperature oil baths and connected to a millivoltmeter.
The temperature of the oil baths will be measured with precision thermometers make Beckmann.

Suction and discharge piping will be insulated over their entire length to minimize the effect of heat transfer between ambient and test gas through the piping.

The orifice temperature is measured with two thermocouples (type iron-constantan) connected to a digital thermometer.

### 4.3 Pressures.

Suction and discharge static pressure taps (4) located as shown in appendix 1 will be connected to J-tube type water manometers for measuring suction and discharge pressures.
The static and differential pressure of the orifice will also be measured with J-tube type manometers, filled with water or mercury.

### 4.4 Measurement of Shaft Speed.

The compressor speed is indicated by an electric counter from a once per rev. pulse.

⚠1 4.5 Mechanical losses.

The mechanical losses will be calculated by measuring the oil mass flow and the temperature rise of the oil from the bearings and the shaft seal. The oil mass flow will be measured by calibrated measuring pipes, provided of orifice plates.
The differential pressure over this orifice plate will be measured with one calibrated Bourdon type manometer.
The temperature rise of the oil will be measured with calibrated iron-constantan thermocouples connected to a digital thermometer.
The mechanical losses will exceed 10% of absorbed power.

4.6 Power at coupling.

The total power at the coupling of the compressor will be determined from the gaspower by measuring the enthalpy rise of the gas plus the measured mechanical losses.

⚠1 5. TEST-PROCEDURE.

The compressor will be tested at a speed of approx. N = 2916 rpm.
Final speed will be calculated at time of test.
The test should progress from a maximum flow condition through design point to surge in 5 decreasing flow points. Each point should be set for a minimum of 30 minutes to allow the temperatures to become stable before the data is gathered.
During half an hour 5 readings will taken for each measuring point.
The observed data recorded during each testrun will be scrutinized for consistency within the limits specified in PTC 10 Table 2.

6. COMPUTATION OF RESULTS AND TRANSLATED TO SPECIFIED CONDITIONS.

6.1 Flow.

The suction volume at testspeed of the compressor is calculated from the mass flow and the density of the gas at the suction side.
The density at the inlet of the compressor section is calculated with the aid of the measured static pressure and temperature.
The capacity varies directly with the speed for conversion to specified speed.
For specified conditions the density will be calculated with the aid of the specified pressure, specified molecular weight and specified temperature.

6.2 Head.

The polytropic head at the test is calculated from inlet and discharge conditions.
The head varies with the square of the speed ratio.
With the aid of the head the discharge pressure is calculated.

⚠ 6.3 Power.

The gas efficiency is calculated on a polytropic basis.
It will be used to calculate the gaspower at specified conditions with specified capacity and specified polytropic head.
The mechanical losses measured at testspeed will be transferred to specified conditions with the square of the speed ratio between test and specified.

## 7. MEASURING TOLERANCE.

The accuracy of the direct measured magnitudes will be:

| | |
|---|---|
| Pressure | : ± 2 mm (J-type manometer filled with mercury or water) |
| Temperature (diff.) | : ± 0.09 °C |
| Temperature (abs.) | : ± 0.4 °C |
| Speed | : ± 0.1 % |
| Gasconstant | : ± 0.1 % |

The accuracy of the specified characteristics of guarantee point will be:

| | |
|---|---|
| Specified capacity | : ± 1.3 % |
| Specified polytropic head | : ± 0.7 % |
| Specified shaft power | : ± 1.6 % |

Allowances for error in measurement will be made by indicating an upper and lower limit in the test result plot, according ASME - PTC 10 - art. 3.15.

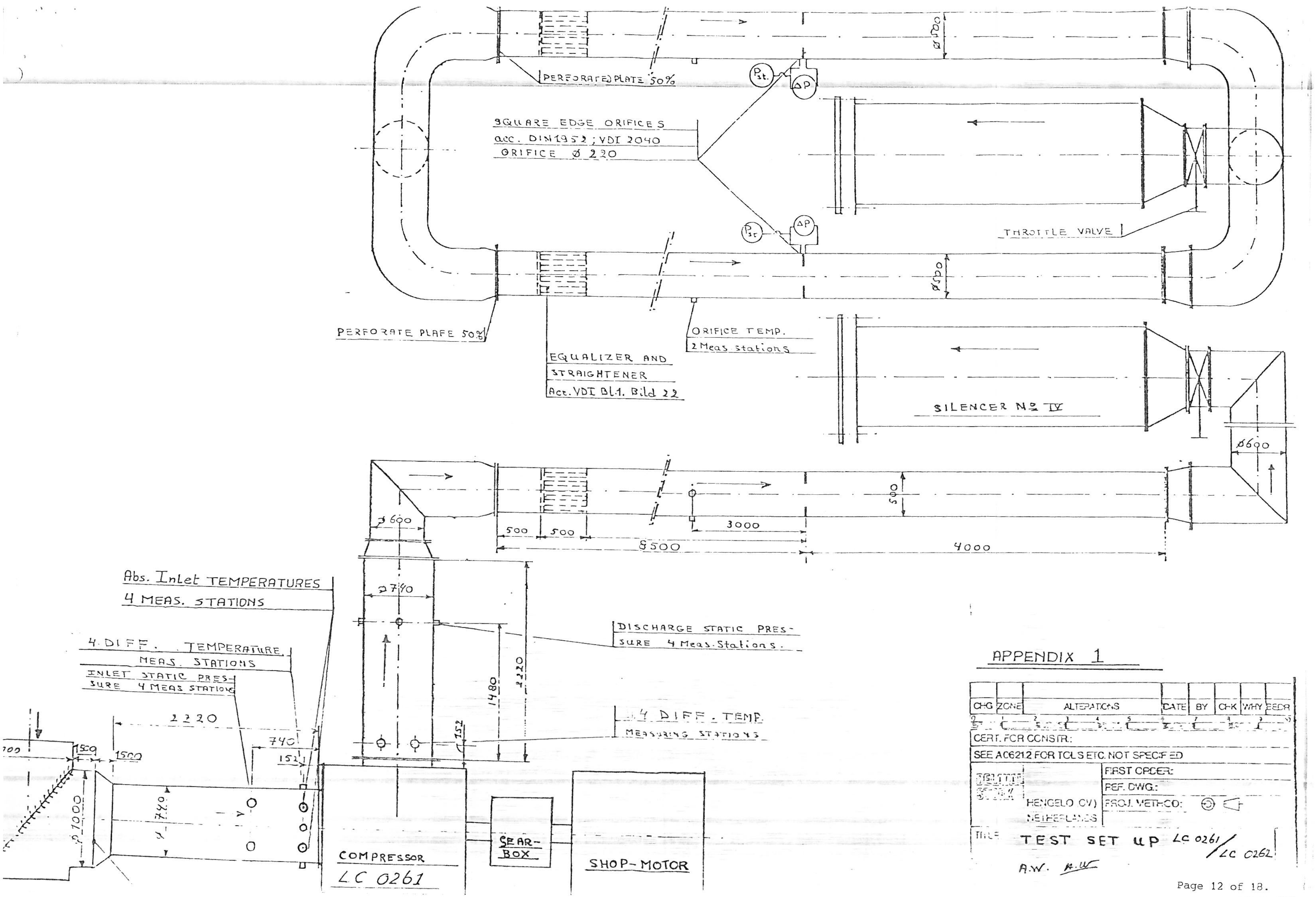
## 8. PERFORMANCE GUARANTEE.

The following tolerances on guaranteed performance are applicable:

- capacity (mass flow) : +0% - 0%
- head (polytropic) : +4% - 0%
- power consumption : +4% - 4%

A. Wesselink.

A. Wesselink


PERFORATED PLATE 50%
SQUARE EDGE ORIFICES
acc. DIN 1952; VDI 2040
ORIFICE Ø 220
THROTTLE VALVE
PERFORATE PLATE 50%
ORIFICE TEMP.
2 Meas stations
EQUALIZER AND
STRAIGHTENER
Acc. VDI Bl.1. Bild 22
SILENCER No IV
Ø600
Ø 600
500
3000
8500
4000
Abs. Inlet TEMPERATURES
4 MEAS. STATIONS
4 DIFF. TEMPERATURE
MEAS. STATIONS
INLET STATIC PRES-
SURE 4 MEAS STATIONS
DISCHARGE STATIC PRES-
SURE 4 Meas. Stations.
4 DIFF. TEMP.
MEASURING STATIONS
2220
740
152
1480
1500
Ø 1000
COMPRESSOR
LC 0261
GEAR-
BOX
SHOP-MOTOR
APPENDIX 1
CHG
ZONE
ALTERATIONS
DATE
BY
CHK
WHY
CERT. FOR CONSTR.:
SEE A06212 FOR TOLS ETC. NOT SPECIFIED
FIRST ORDER:
REF. DWG.:
HENGELO (O)
NETHERLANDS
PROJ. METHOD:
TITLE
TEST SET UP LC 0261/LC 0262
A.W.

APPENDIX 2.

LIST OF INSTRUMENTS

| Instrument | Make | Type | Accuracy | Scale Division |
|---|---|---|---|---|
| 1 Thermometer | Fluke | Digital | ± 0.35 °C | 0.1 °C |
| 1 Multy switch | Heraeus | - | - | - |
| 4 Thermocoupl. Differential | Rössel | J | ± 0.05 °C | - |
| 12 Thermocouples | Thermo Electric premium grade | J | ± 0.5 °C | - |
| 15 Manometers | Observator | J-tube | ± 2 mm | 2 mm |
| 3 Manometers | De Wit | Bourdon | 0.6% (0-2.5 bar) | 0.02 bar |
| 2 Thermometers | Beckmann | Differential 0-6 °C | ± 0.02 °C | 0.02 °C |
| 1 Electric Counter | Hewlett & Packard | Digital | ± 1 rpm | ± 1 rpm |
| 1 Barometer | Wallace & Tierman | - | 0.3 mmHg | 0.5 mmHg |
| 1 Millivoltmeter | Fluke | Digital | ± 0.003 mmV (0-20 mmV) | 0.001 mmV |

Instruments will be carried before and checked after the test.

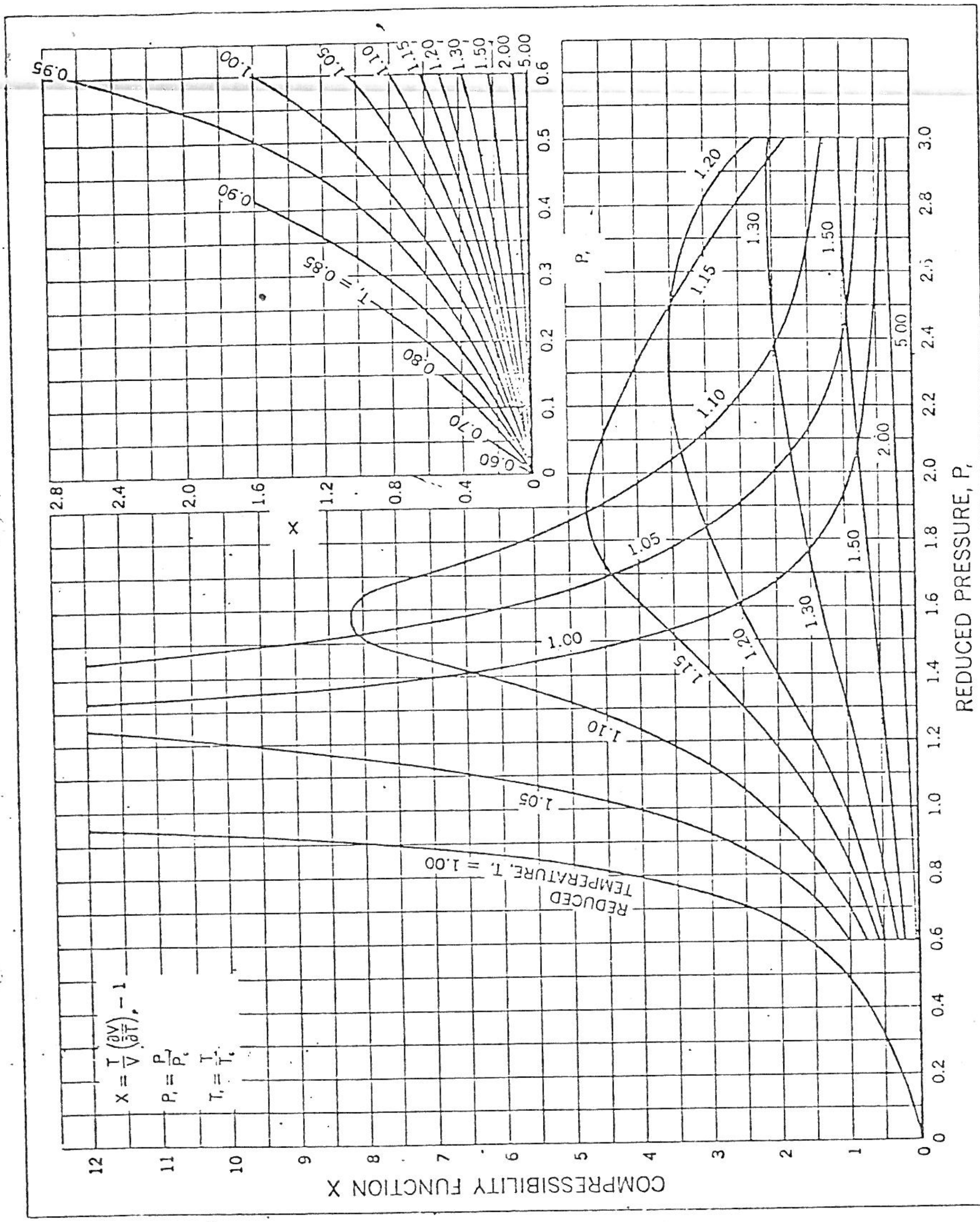



Fig. 2 Generalized compressibility function X

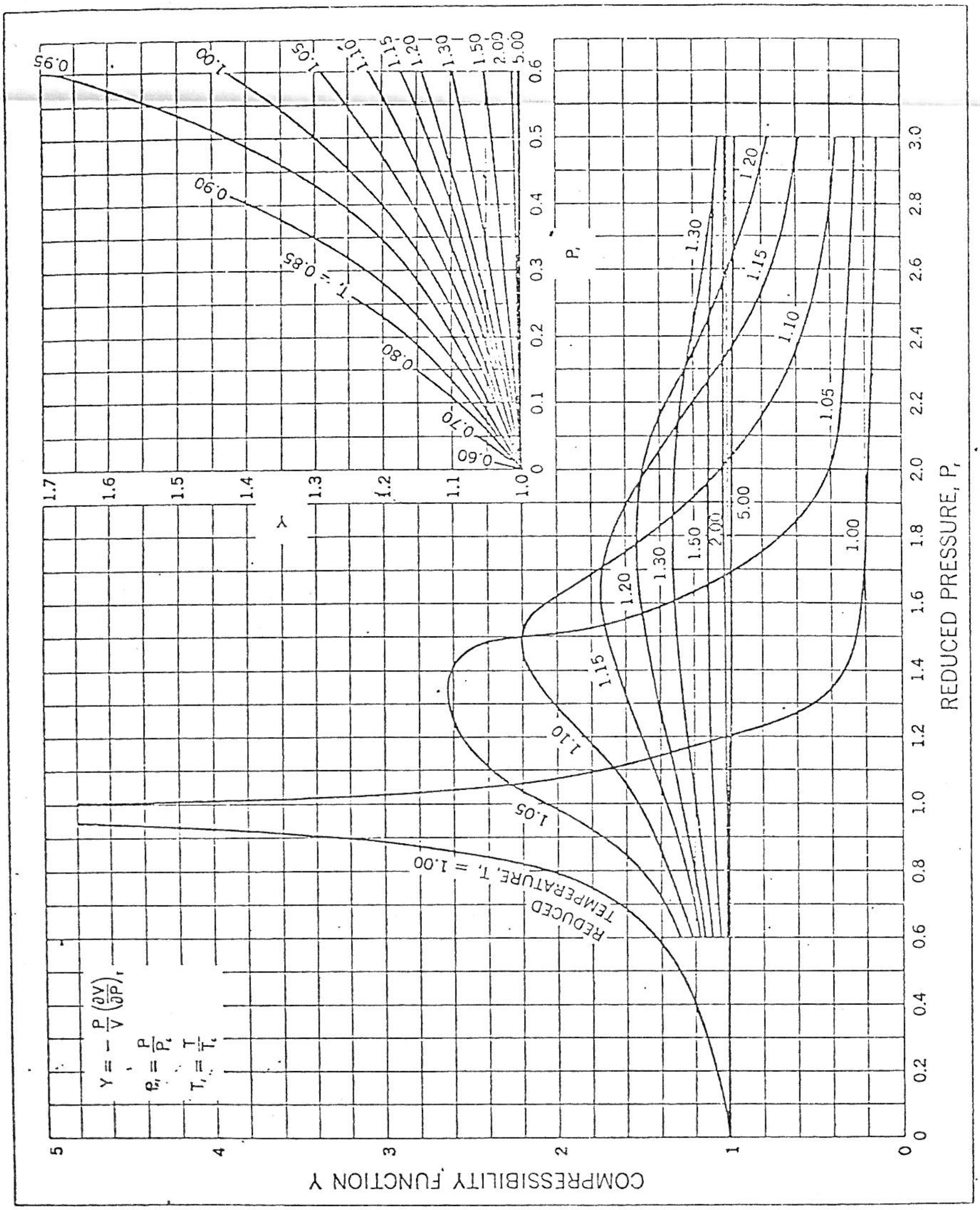



Fig. 3 Generalized compressibility function Y

| DATA SHEET | ISSUE | A | B | C | D | E |
|---|---|---|---|---|---|---|

| | | |
|---|---|---|
| CLIENT G.P.S.A. | PROJECT 4110 | 1 |
| LOCATION GREECE | ITEM NO. C-430 / NO. OFF ONE | 2 |
| PLANT HDPE | LINE DIAGRAM NO. 1341001 / SECTION 13 | 3 |
| SERVICE CYCLE GAS COMP. | MNF REF. DLS ~~-230122~~ LC 261-3 / SHEET 1 OF 16 | 4 |

| COMPRESSOR DUTY | | | | | | | 5 |
|---|---|---|---|---|---|---|---|
| DUTY PER MACHINE | UNITS | DUTY 1 | DUTY 2 | DUTY 3 | DUTY 4 | DUTY 5 | |
| CAPACITY (WEIGHT FLOW) | KG/HR | 258800 | 257500 | 222420 | 261700 | 348500 | 6 |
| VOLUME @ INLET COND. | M3/HR | 13150 | 13150 | 10030 | 12240 | 15820 | 7 |
| VOLUME @ STD. COND. * | | | 4 | | | | 8 |
| SUCTION PRESSURE | BAR A | 21.60 | 21.60 | 21.72 | 21.00 | 21.60 | 9 |
| SUCTION TEMPERATURE | °C | 100 | 100 | 100 | 100 | 100 | 10 |
| DISCHARGE PRESSURE | BAR A | 23.17 | 23.16 | 23.61 | 22.76 | 23.07 | 11 |
| DISCHARGE TEMPERATURE | °C | 105.5 | 105.58 | 106.83 | 105.58 | 105.0 | 12 |
| ~~MEAN~~ COMPRESSIBILITY (SUCT) | | 0.951 | 0.960 | 0.938 | 0.938 | 0.938 | 13 |
| ~~MEAN~~ Cp/Cv (INLET) | | 1.201 | 1.215 | 1.180 | 1.180 | 1.180 | 14 |
| MEAN MOL. WT. | | 26.88 | 27.03 | 29.74 | 29.74 | 29.74 | 15 |
| POLYTROPIC HEAD | Nm/kg | 77555 | 77630 | 61250 | 79340 | 6445 | 16 |
| GAS COMPOSITION | MOL WT | MOL % | MOL % | MOL % | MOL % | MOL % | 17 |
| ETHYLENE | 28.03 | 93.5 | 81.1 | 76.0 | 76.0 | 76.0 | 18 |
| HYDROGEN | 2.00 | 4.5 | 3.9 | 3.5 | 3.5 | 3.5 | 19 |
| NITROGEN | 28.02 | 2.0 | 15.0 | 2.0 | 2.0 | 2.0 | 20 |
| PROPYLENE | | | | 18.5 | 18.5 | 18.5 | 21 |
| | | | | | | | 22 |
| GUARANTEE POINT | | * | | | | | 23 |
| NOTE :- MAX INLET TEMP 108°C / CASING DESIGN MAX 150°C | | | | | | | 24 |
| | | | | | | | 25 |
| POWER | KW | 730 | 7257 | 7007 | 760 | 865 | 26 |
| SPEED | RPM | 2980 | | | | | 27 |
| PARALLEL OPERATION REQUIRED ~~YES~~/NO | | GAS CORROSIVE/ EROSIVE YES/NO | | | | | 28 |

| UTILITIES | | |
|---|---|---|
| | | 29 |
| STEAM | COOLING WATER | 30 |
| SUPPLY PRESSURE | SUPPLY PRESSURE 4.0 BARG (DES 7.5 BARG 70°C) | 31 |
| SUPPLY TEMP. | SUPPLY TEMP. 28°C | 32 |
| EXHAUST PRESSURE | MAX ΔT PERMITTED 12°C | 33 |
| EXHAUST TEMP | MAX ΔP PERMITTED 1 BAR | 34 |
| CONSUMPTION | ACTUAL ΔT | 35 |
| INSTRUMENT AIR | ACTUAL ΔP | 36 |
| SUPPLY PRESSURE normal 6 BARG | FOULING FACTOR 0.0004 $m^2h°C/KCAL$ | 37 |
| PRESSURE USED (DESIGN 9 BARG 70°C) | QUALITY | 38 |
| CONSUMPTION | CONSUMPTION | 39 |

| | | | | |
|---|---|---|---|---|
| ELECTRICAL SUPPLY : MOTORS ABOVE | 150 KW 6000 VOLTS | 3 | PHASE 50HZ | 40 |
| MOTORS BELOW | 150 KW 380 VOLTS | 3 | PHASE 50HZ | 41 |
| Instrument / CONTROLS | 24 VOLT | | DC | 42 |
| ALARMS | VOLT | | AC/DC | 43 |
| HEATERS | | | | 44 |
| | | | | 45 |
| | | | | 46 |
| * STANDARD CONDITIONS ARE | | | | 47 |

| | | | | |
|---|---|---|---|---|
| | | | | 48 |
| | | | | 49 |
| | | | | 50 |
| | | | | 51 |
| 1 | AS DENOTED BY △1 | MHW | | 52 |
| REV. | PAGE AND LINE NUMBER | INITIALS | APPROVAL | 53 |

REPRO. NO 176/1

SEE Conditions...

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CENTRIFUGAL COMPRESSOR | DATE | 24/9/8 | APPENDIX 6 | | | | |
| DATA SHEET | ISSUE | A | B | C | D | E | |

| | | | |
|---|---|---|---|
| CLIENT | PROJECT A110 | | 1 |
| LOCATION | ITEM NO. C-430 | NO. OFF | 2 |
| PLANT | LINE DIAGRAM NO. | SECTION | 3 |
| SERVICE | MNF REF. | SHEET 2 OF 16 | 4 |

**COMPRESSOR DUTY** 5

| DUTY PER MACHINE | UNITS | DUTY 6 | DUTY 7 | OTHER DUTIES/SIDESTREAMS A | B | C | |
|---|---|---|---|---|---|---|---|
| CAPACITY (WEIGHT FLOW) | KG/HR | 261700 | 267854 | | | | 6 |
| VOLUME @ INLET COND. | M³/HR | 11800 | 13185 | | | | 7 |
| VOLUME @ STD. COND. * | | | | | | | 8 |
| SUCTION PRESSURE | BAR A | 21.72 | 21.53 | | | | 9 |
| SUCTION TEMPERATURE | °C | 100 | 105 | | | | 10 |
| DISCHARGE PRESSURE | BAR A | 23.56 | 23.22 | | | | 11 |
| DISCHARGE TEMPERATURE | °C | 106.0 | 110.6 | | | | 12 |
| MEAN COMPRESSIBILITY (SUCT) | | 0.938 | 0.949 | | | | 13 |
| MEAN Cp/Cv (SUCT) | | 1.18 | 1.191 | | | | 14 |
| MEAN MOL. WT. | | 29.74 | 28.09 | | | | 15 |
| POLYTROPIC HEAD | NM/KG | 8019 | 7836 | | | | 16 |
| GAS COMPOSITION | MOL WT | MOL % | MOL % | MOL % | MOL % | MOL % | 17 |
| ETHYLENE | | 76.0 | 94.0 | | | | 18 |
| HYDROGEN | | 3.5 | 2.0 | | | | 19 |
| NITROGEN | | 2.0 | 2.0 | | | | 20 |
| PROPYLENE | | 18.5 | 0.0 | | | | 21 |
| 1-BUTENE | | 0.0 | 2.0 | | | | 22 |
| | | | | | | | 23 |
| | | | | | | | 24 |
| | | | 760 | | | | 25 |
| POWER | KW | 7750 | ~~755~~ | | | | 26 |
| SPEED | RPM | 2970 | → | | | | 27 |

PARALLEL OPERATION REQUIRED YES/NO no GAS CORROSIVE/ EROSIVE YES/NO 28

**UTILITIES** 29

| | | |
|---|---|---|
| STEAM | COOLING WATER | 30 |
| SUPPLY PRESSURE | SUPPLY PRESSURE | 31 |
| SUPPLY TEMP. | SUPPLY TEMP. | 32 |
| EXHAUST PRESSURE | MAX ΔT PERMITTED | 33 |
| EXHAUST TEMP | MAX Δ PERMITTED | 34 |
| CONSUMPTION | ACTUAL ΔT | 35 |
| INSTRUMENT AIR | ACTUAL ΔP | 36 |
| SUPPLY PRESSURE | FOULING FACTOR | 37 |
| PRESSURE USED | QUALITY | 38 |
| CONSUMPTION | CONSUMPTION | 39 |
| ELECTRICAL SUPPLY : MOTORS ABOVE KW | VOLTS PHASE HZ | 40 |
| MOTORS BELOW KW | VOLTS PHASE HZ | 41 |
| CONTROLS | VOLT AC/DC | 42 |
| ALARMS | VOLT AC/DC | 43 |
| HEATERS | | 44 |
| | | 45 |
| | | 46 |
| * STANDARD CONDITIONS ARE | | 47 |

| | | | | |
|---|---|---|---|---|
| | | | | 48 |
| | | | | 49 |
| | | | | 50 |
| | | | | 51 |
| | | | | 52 |
| REV. | PAGE AND LINE NUMBER | INITIALS | APPROVAL | 53 |

REPRO. NO 176/1

Appendix 7.

CENTRIFUGAL COMPRESSOR PROPOSED CHARACTERISTIC CURVE NO C026104 A000

4-nov. 81

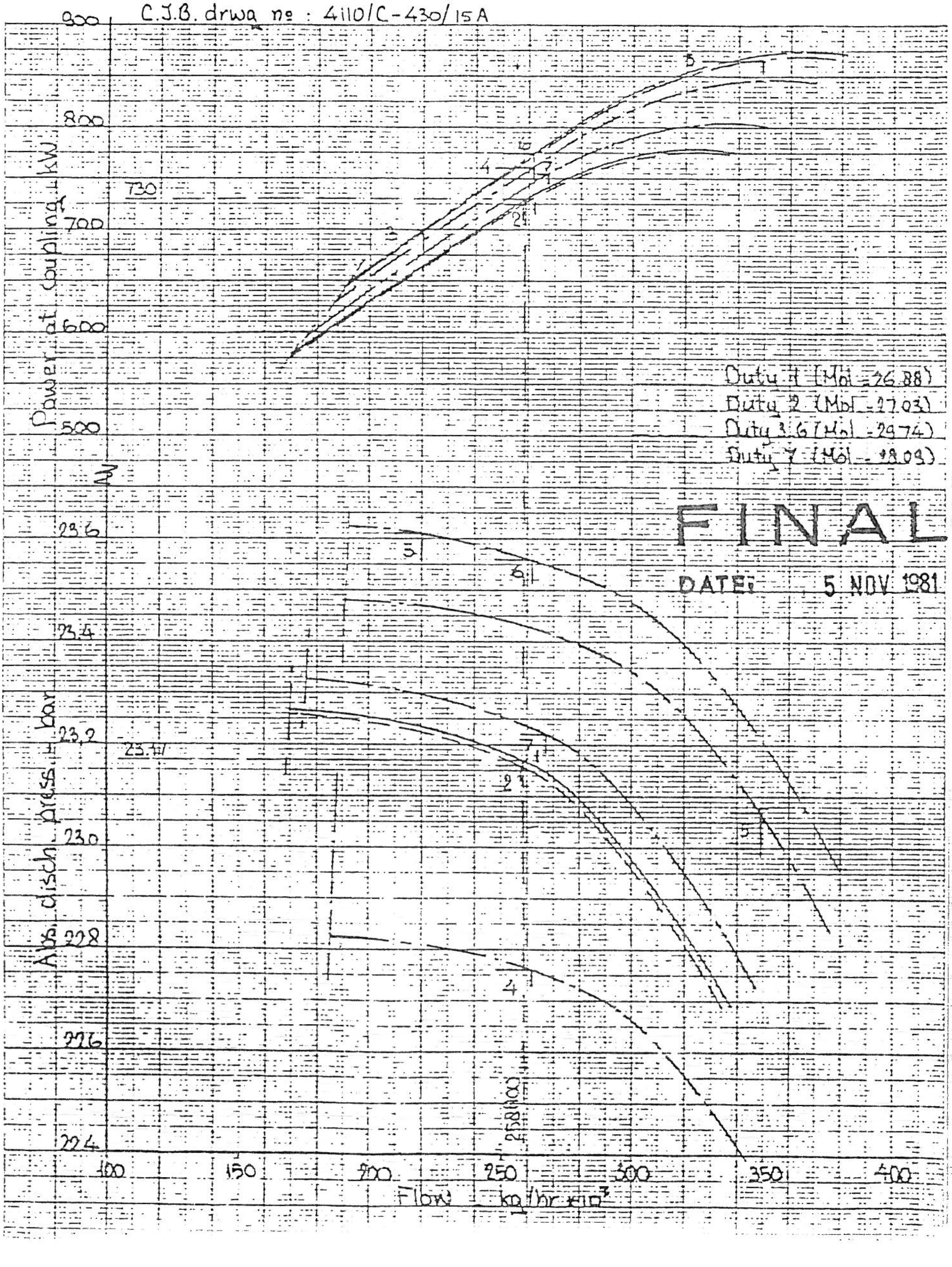
for C.J.B. (PROJECTS) LTD / HDPE Plant for G.P.S.A Greece 4110 LC0261 15 Sept 81

type PV 52 2986 rpm 21.60 bar 100 °C 0.951 1.201 26.88

flow 13150 m³/hr pol. 7755 Nm/kg 23.17 bar 105.5 °C 0.95 1.200 730 kW

C.J.B. order no : 4110/A/4/30/01

C.J.B. drwg no : 4110/C-430/15A




FINAL

DATE: 5 NOV 1981