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NOTICE OF APPROVAL
AVIS D'APPROBATION

G-130

Ottawa, June 16, 1980

DRESSER INDUSTRIES LIMITED/PCC NINETEEN 80
ELECTRONIC PRESSURE, TEMPERATURE, AND
SUPERCOMPRESSIBILITY COMPENSATED
GAS VOLUME MEASUREMENT SYSTEM

Apparatus

1. Electronic Volume Corrector

Manufactured by:	P. C. Compteurs Limited Cheadle Hulme Cheadle, U. K.
Model:	Nineteen 80
Type:	A
Volume Readout:	7 digit non-resettable for corrected volume 7 digit non-resettable for actual volume
Maximum Volume Counter Freq.:	150 pulses/minute
Corrector Input Freq. Range @ Max. Flowrate:	125 to 4000 Hz
Power Requirements:	100/150v @ 50/60Hz
Environmental Temp. Range:	$-10^{\circ}C$ to $50^{\circ}C$

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Base Pressure: 14.73 psia or 101.325 kPa

Base Temp.: 60°F or 15°C

2. Resistance Thermometer

Manufactured by: RdF Corporation
Hudson, New Hampshire, U.S.A.

Model No.: 21 B-11-A-5 1/4-A-4-B

Temp. Range: -30°C to 40°C

Resistance: 100 ±0.1 ohms @ 0°C

Temp.Coefficient of Resistance: 0.003850Ω/Ω/°C

Environmental Temp. Range: -40°C to 50°C

Note: The Dresser Industries Model Nineteen 80 Flow Computer approved in this circular can be used in conjunction with any approved and compatible "Resistance Temperature Device".

3. Meter/Pulser (Peppler and Fuchs High Frequency)

Manufactured by: Dresser Industries Canada Limited
6688 Kitimat Road
Mississauga, Ontario.
L5N 1P8

All approved non-T.C., non-instrument drive, Roots type positive displacement meters, with the addition of a PFHF Counter unit are suitable. The PFHF Counter Unit contains a pulse generator manufactured by Peppler and Fuchs. Environmental Temperature Range: -40°C to 50°C

Note: The Dresser Industries Model Nineteen 80 Flow Computer approved in this circular can be used in conjunction with any approved and compatible meter/pulser combination.

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4. Pressure Transducer

Manufactured by:	Penny & Giles Limited Christchurch, Hants., U. K.
Bourdon Tube Type:	D11730, Mk 1, Model 01
Ranges:	0-160, 0-200, 0-300, 0-400, 0-500, 0-1000, psig
Diaphragm Type:	D11729, Mk 7, Model 01
Ranges:	0-6, 0-10, 0-15, 0-30, 0-60, 0-100, psig
Output:	0 to 5v, all models
Environmental Temp. Range:	$-40^{\circ}C$ to $+70^{\circ}C$

NOTE: The Dresser Industries Model Nineteen 80 Flow Computer approved in this circular is RESTRICTED for use with the type and models of Pressure Transducers approved in this circular.

Description

The Nineteen 80 Corrector is designed to solve the equation

$$Vc = Vm \times \left(\frac{Pm + Pa}{Pb}\right) \times \left(\frac{Tb}{T_f}\right) (Fpv)^2$$

Where:

Vc	=	Volume corrected to reference temperature and pressure
Vm	=	Volume measured at line conditions
Pm + Pa	=	System Gauge Pressure + Mean Atmospheric Pressure
P_b	=	Absolute Reference Pressure (14.73 psia or 101.325 kPa)
T_b	=	Absolute reference temperature ($460 + 60^{\circ}F$ or $273.15 + 15^{\circ}C$)
T_f	=	Absolute system temperature
$(Fpv)^2$	=	Gas law deviation correction

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Nineteen 80 accepts a pulse signal from a meter that is proportional to volume and analog signals for pressure (voltage change) and temperature (resistance change). Electro-magnetic counters for uncorrected volume and corrected volume are mounted on the front of the unit. Pulse output for corrected and uncorrected volume and an analog output for rate of flow are available; however, these are not approved for custody transfer applications.

Supercompressibility factors are of fixed factor type for systems operating below 60 psig. However, for those operating above 60 psig, they are calculated automatically following the equation:

$$Fz = 1 + \frac{pg}{A + BT} = \frac{1}{Z}$$

where:

A and B are constants programmed into the Corrector depending on the characteristics of the gas.

T = absolute temperature

Pg = gauge pressure

For further details regarding specifications and operation, refer to manufacturer's bulletin, Publication No. P110Z. However, note that there are options appearing on this bulletin which are not covered by this Notice of Approval.

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The meter driven pulser consists of a slotted disc that changes the resistance of a transistor oscillator, depending on whether a slot or the disc metal is close to the oscillator. This resistance change is used to switch a transistor amplifier, which results in a square wave output.

The pressure transducer consists of a diaphragm or bourdon tube sensor that is connected to the wiper of a potentiometer in a bridge circuit so that increased pressure produces a proportional output voltage signal up to a maximum of 5 volts.

The resistance thermometer is a platinum resistance temperature detector.

These systems are factory calibrated and have no adjustments that can be made by a customer or inspector. The manufacturer is required to supply a copy of the completed application questionnaire for each installation to the appropriate District Office (Electricity and Gas). Appendix to this Notice of Approval shows a sample of this questionnaire.

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Installation Requirements (Electrical)

Line resistance for each connection must be less than 100 ohms and must be balanced to within 0.1 ohms for the resistance theremometer lines connected to terminals 5, 6 and 7. Shielded cable must be used between the flow-meter and the corrector.

Installation Requirements (Mechanical)

Meter:

Must be installed following normal procedures used for the installation of Roots meters, or other compatible meters.

Pressure Transducer:

Pressure should be measured at the upstream pressure tap of the meter, or within 30.0 cm upstream of the meter. The transducer must not be mounted in direct sunlight.

Resistance Thermometer:

Must be mounted in the line within 30.0 cm down-stream of the meter and be protected from direct sunlight.

Nineteen 80 Corrector:

Must be mounted where it is protected from inclement weather, direct sunlight and large sources of heat such as boilers.

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SEALING REQUIREMENTS

Meter:

The pulser is to be sealed to the main body of the meter by passing a sealing wire from one screw in the main body to one screw in the pulser housing. Also, this same wire is to pass through the Cannon female connector used at the meter end of the line between the meter and corrector.

Pressure Transducer:

Sealing is accomplished by passing a sealing wire through the two screws that latch the cover to the body.

Resistance Thermometer:

Sealing is accomplished by passing a sealing wire through a hole in the rib section of the cover and around the electrical conduit (or cable) that goes into the head of the resistance thermometer.

Nineteen 80 Corrector:

Sealing is accomplished by passing a sealing wire through the door latch. Sealing is to be performed after the system is installed and commissioned.

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Nameplate Marking Requirements

Meter:

Manufacturer's name
Model No.
Serial No.
Approved Flow Range ACFH or m^3/h
Maximum Working Pressure psig or kPa
Direction of Flow
Meter Factor pulses/ft^3 or pulses/m^3

Pressure Transmitter:

Manufacturer's name
Model No.
Serial No.
Pressure Range psig or kPa
Ambient Temperature Range ^oF or ^oC
Input Voltage Volts
Output Voltage Volts

Resistance Thermometer:

Manufacturer's name
Model No.
Serial No.
Temperature Correction Range ^oF or ^oC

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Corrector:

Manufacturer's name:	
Model No.	
Serial No.	
Base Pressure	psig or kPa
Programmed Atmospheric Pressure	psig or kPa
Pressure Range	psig or kPa
Base Temperature	^{o}C or ^{o}F
Temperature Input Range	^{o}C or ^{o}F
Meter Factor	pulses/ft^3 or pulses/m^3
Supercompressibility	fixed or automatic
Z_p (if fixed)	
Pressure Input Signal	volts
Ambient Operating Temperature Limits	^{o}F or ^{o}C
Power Supply	

Refer to Technical Gas Circular G-80-2 for a description of the required field test procedures.

Approval granted to: Dresser Industries Limited,
6688 Kitimat Road,
Mississauga, Ontario.
L5N 1P8

D. L. Smith, Chief,
Electricity and Gas Division,
LEGAL METROLOGY BRANCH.

Ref. G6635-D2

APPLICATION QUESTIONNAIRE

FOR

DRESSER/PCC NINETEEN 80 ELECTRONIC GAS FLOW CORRECTOR

1. Customer: _____

Address: _____ Phone No. _____

Customer's Representative: _____ Position: _____

Brief Description of Application: _____

_____

Probable Quantity: _____

2. Information to be supplied by customer:

A. Flow Meter/Transmitter

1. Model/Type: _____

2. Rated Maximum Flow (Q rated): _____ CFH

3. Operating Maximum Flow: _____ CFH

4. Integral Pulse Transmitter (supply information below if not Dresser product):

(a) Model/Type _____

(b) Frequency at rated maximum flow: _____ Hertz

(c) Power Supply Voltage: _____ v Current: _____ ma

(d) Pulse Amplitude: _____ voltage

(e) Pulse Width: _____ m.sec

NOTE: Pulser must be an approved type.

B. Gas Property (average values):

Density: _____

Mole & Carbon Dioxide: _____

Mole & Nitrogen: _____

Is Gas Corrosive? YES: _____ NO: _____

C. Gas Pressure

1. Maximum Pressure: _____ PSIG

2. Normal (calibrated) Pressure: _____ PSIG

3. Transducer Range: _____ PSIG
(Select from 0-3, 6, 10, 15, 30, 60, 100, 160, 200, 300 PSIG)

4. Mean Site Atmospheric Pressure: _____ PSIA

5. Reference Pressure: 101.325 kPa or 14.73 PSIA

D. Gas Temperature

1. Maximum Operating Temperature: _____ ^{o}C or ^{o}F

2. Minimum Operating Temperature: _____ ^{o}C or ^{o}F

3. Normal (calibrated) Temperature: _____ ^{o}C or ^{o}F

4. Reference Temperature: $60^{o}F$ or $15^{o}C$

E. Gas Compressibility, Z may be fixed if maximum operating pressure is 60 psig or less.

1. Do you require:

(a) Fixed factor Z correction: YES: _____ NO: _____
(If Yes, supply Z value) Z = _____

(b) Automatic Z correction: YES: _____ NO: _____
(If Yes, supply Z value at calibrated temperature and pressure) Z = _____