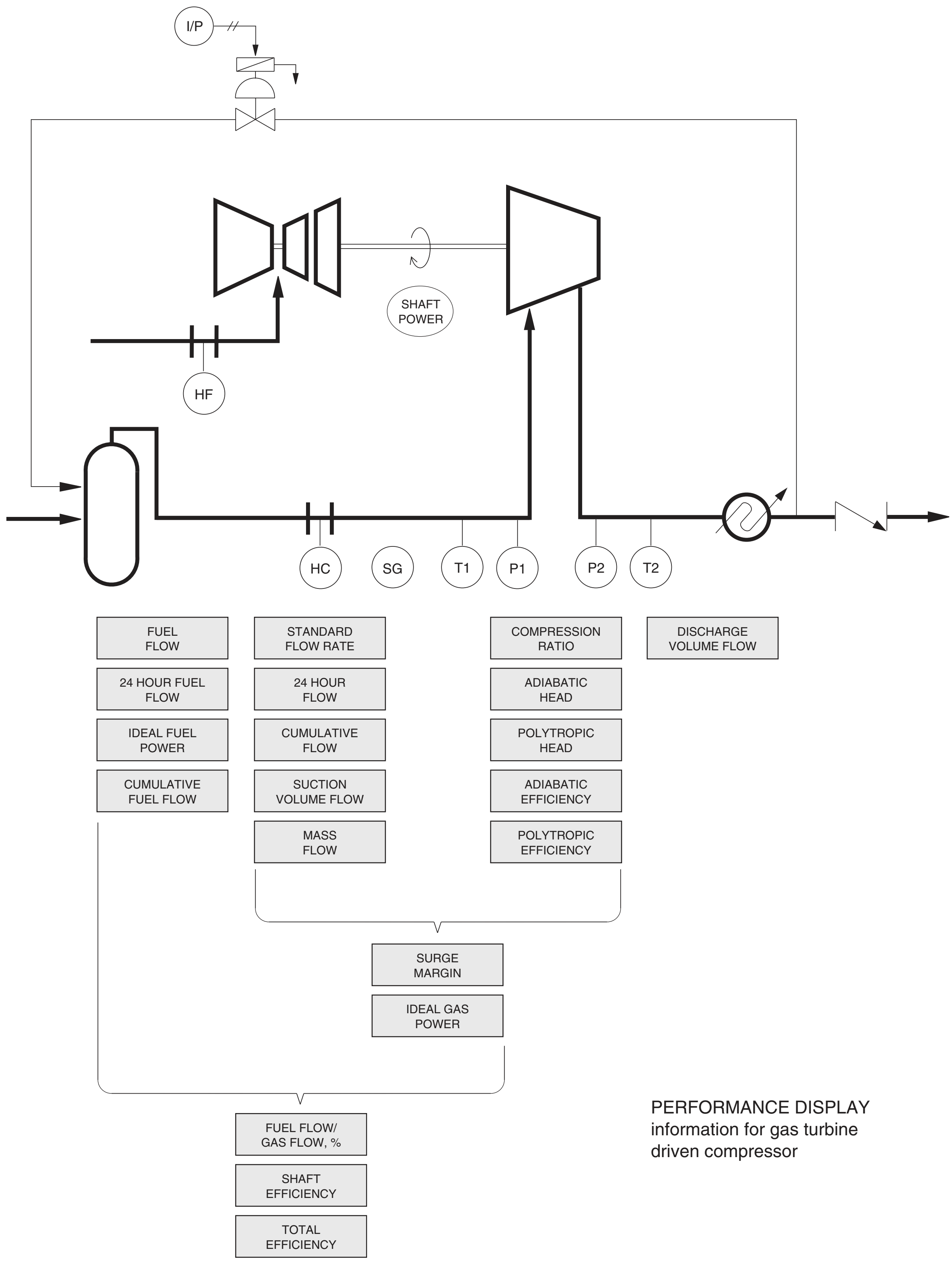
PRODUCT BULLETIN: 99022

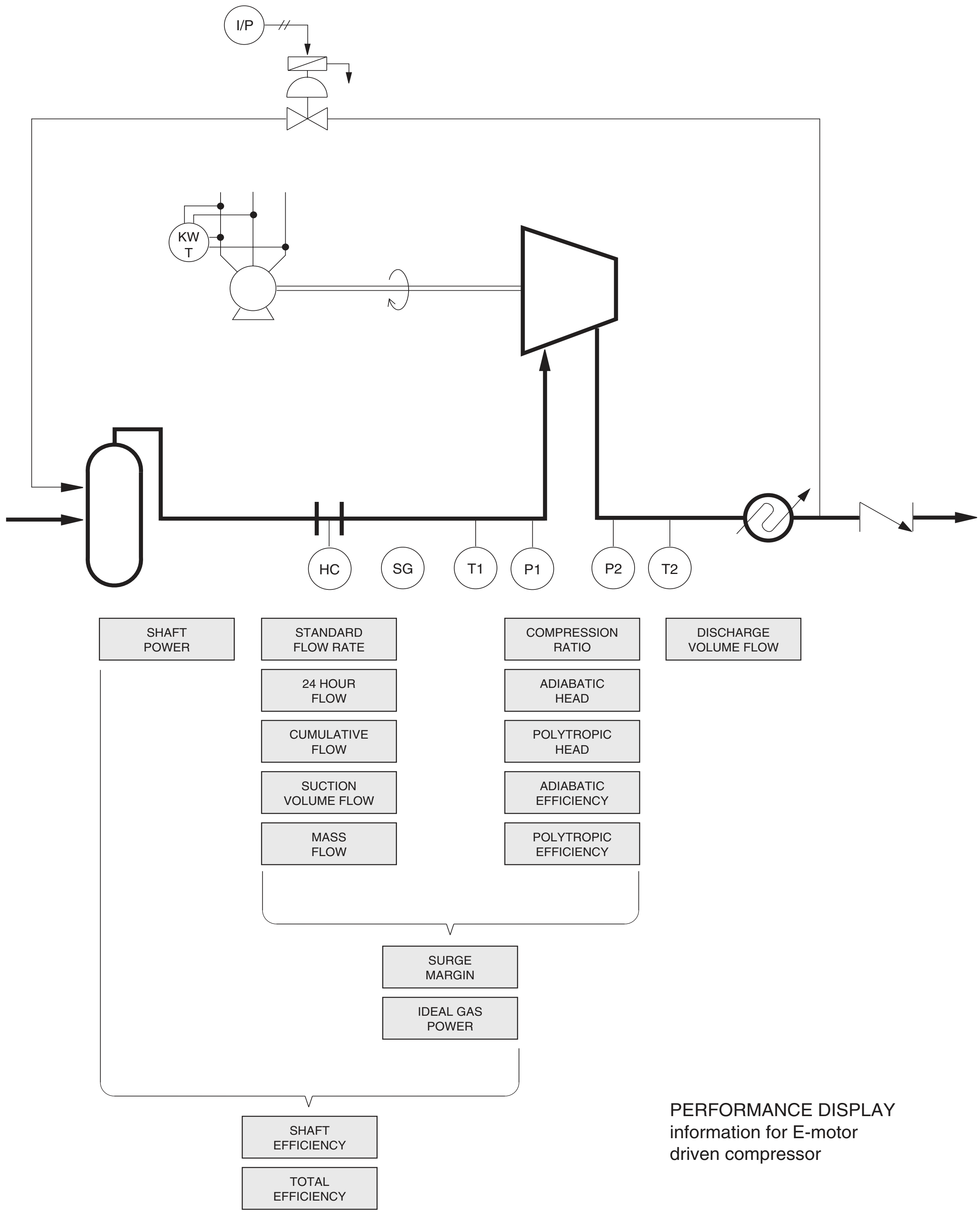
COMPRESSOR PERFORMANCE DISPLAY APPLICATION CONTROL PACKAGE

MAY 2012

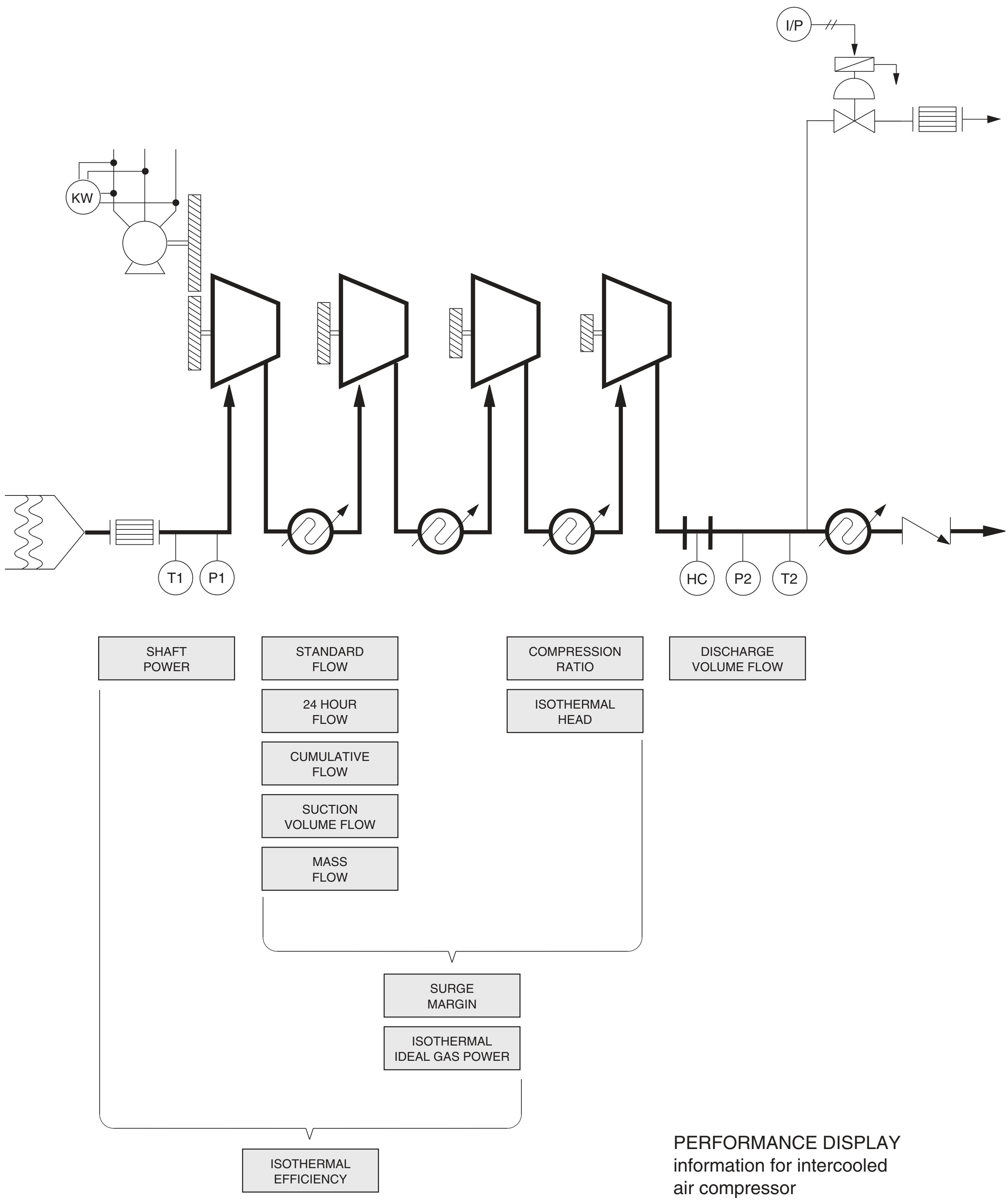


PERFORMANCE DISPLAY
information for gas turbine driven compressor

The Performance Display Option computes flow rate, cumulative flow, heads, efficiencies, and other health and performance information for the compressor and fuel system.



PERFORMANCE DISPLAY
information for E-motor
driven compressor



PERFORMANCE DISPLAY
information for intercooled
air compressor

PERFORMANCE DISPLAY CHANNELS

Display Heading	Description
QSTD	Standard flow through the compressor. Includes recycle if any.
QSTD/P1	Semi-dimensional flow.
QSTD/P2	Semi-dimensional flow.
QMASS	Mass flow.
QVOL1	Inlet volumetric flow.
QVOL2	Outlet volumetric flow.
SURGE MARGIN	Surge margin. More exactly, "the percentage flow could be reduced before reaching the calibrated surge limit at the existing suction and discharge pressures."
24 HR Q	Yesterday's compressor cumulative flow, midnight to midnight.
DAYS	Day's accumulating flow since the last totalizer reset.
CUM Q	Cumulative compressor flow.
P1/P2	Compressor ratio.
ADIA HEAD	Adiabatic head. Adiabatic and isentropic are used interchangeably in the compression industry.
POLY HEAD	Polytropic head.
FUEL Q	Fuel flow.
24HR FQ	Yesterday's cumulative flow, midnight to midnight.
CUM FQ	Cumulative fuel flow.
FUEL POWER	Ideal fuel power. The power that could be generated by the existing fuel flow if the driver were 100% efficient.
GAS POWER	Ideal gas power. The power that would be required to compress the existing gas flow from the existing suction pressure and temperature to the existing discharge pressure in an adiabatic compression.
ADIA EFF	Adiabatic efficiency, from T1, T2, P1, P2 and K. Accuracy is very sensitive to accuracy of K and of temperature measurement.
POLY EFF	Polytropic efficiency, from T1, T2, P1, P2 and K. Accuracy is very sensitive to accuracy of K and of temperature measurement, and always slightly higher than adiabatic efficiency.
SHAFT EFF	Ideal gas power divided by shaft input power. This is a better value for adiabatic efficiency than ADIA EFF. Takes into account gearbox, lube, and seal losses.
TOTAL EFF	Ideal gas power divided by ideal fuel power. Takes into account driver efficiency, gearbox losses, lube and seal losses, compressor efficiency. For a gas turbine driving a compressor through a gearbox, this number may be on the order of 17%. This number is not particularly sensitive to accurately knowing K nor to T2 measurement accuracy. This is a useful channel for monitoring the overall health of the train.
FUEL/Q PCT	Fuel flow as percent of compressor throughout. For low ratio pipeline compressors typically below 1%. For high ratio compressors, such as gas lift compressors, it can be as high as 10%. This is a good channel to monitor to see the effects of changes to the external process on fuel cost.
ITHM HEAD	Isothermal head. Head comparing the process to an isothermal process.
IGAS POWER	Ideal power required to perform the compression in an isothermal process. Always less than power required in an adiabatic process.
ISHAFT EFF	Ideal isothermal gas power divided by actual shaft power. A good measure of actual isothermal efficiency.
ITOTAL EFF	The total efficiency of the compression process, compared against a 100% efficient compressor with infinite intercooling steps, holding the gas at constant temperature.

Calculated Subfactors

CD CALC	Flow factor used in the equation QSTD(mmscfd) = CD SQRT (HCxP) where HC is in inches water and P is in psia.
Z1	Suction gas compressibility calculated from FPV1, using AGA report No.3 algorithm. Valid only for natural gas SG between .55 and 1.
Z2	Discharge gas compressibility.
ZAVG	Average of Z1 and Z2.
CD-FTB	Temperature base factor per AGA report No.3 (usually close to 1.0).
CD-FTF	Flowing temperature factor per AGA report No.3.
CD-FG	Specific gravity factor per AGA report No.3.
CDFPV1	Suction gas supercompressibility factor, calculated.
CALC CDFPV2	Discharge gas supercompressibility factor calculated.
CALC CD-Y	Expansion factor per AGA report No.3.
CD-FR	Reynolds number factor, per AGA report No.3.
(N-1)/N	Polytropic exponent calculated from K, P1, P2, T1, T2.
(K-1)/K	Adiabatic exponent.
CD-FPB	Pressure base factor, per AGA report No.3 (usually close to 1.0).
FE	Look-up table correction factor as a function of HC. Usually used to correct "eye of impeller" flow measurement results.

Calibration Entries

FPV1 FLG	Suction supercompressibility source flag.
FPV2 FLG	Discharge supercompressibility source flag.
CD FLG	CD flow factor source flag, compressor suction or discharge.
FLOW	Flow element location flag, if entered or not calculated.
CONFIG CDCONST	Value of CD, if entered or not calculated.
BSLOPE	Used in calculating Reynolds number correction factor FR. Assumes viscosity is typical for low gravity pipeline natural gas.
BETA4	Used in calculating expansion factor Y.
FUEL CD	Fuel flow factor.
F XMTR	Fuel meter type flag.
FLG CD-PB	CD pressure base.
CD-K	Ratio of specific heats. Cp/Cy.
CD-TB	CD temperature base.
F PWR M	Used in fuel power coefficient equation.

Display Heading	Description
FPV1CON	Manually entered suction supercompressibility factor, if manually entered.
FPV2CON	Manually entered discharge supercompressibility factor, if manually entered.
CMPRSR ID	Compressor identity number for printout.
METRIC	Imperial/metric units selected flag.
FLAG HC1-HC10	HC/FE look-up table entries, to correct for non-linear or
FE1-FE10	non-square root flow element.
M1-M60	Conversion factors to correct imperial values to selected metric or SI values.
C200-C300	Transmitter configuration values.

REQUIRED MEASUREMENTS

Each of the following measurements may be either input by transmitters or keyboard entered.

Channel	Description
1.	Compressor orifice differential
2.	Compressor differential pressure
3.	Suction pressure
4.	Suction temperature
5.	Discharge pressure
6.	Discharge temperature
7.	Shaft input power
8.	Driver fuel flow
9.	Gas specific gravity

CONFIGURATION

The 9500-ASC(M) has approximately 200 configuration channels per stage for entry of flow measurement, transmitter, and constant factors.

PERFORMANCE DISPLAY UNITS

All calculations are performed internally with imperial units. In metric mode, each result is separately converted to metric by multiplying its companion metric conversion factor. The display is easily switched between imperial and metric units.

APPLICATION SERVICES PACKAGE

For the Performance Display option, the Application Services Package includes all required calibration and configuration for the particular compressor and application. Display is in units selected by the owner, plus imperial units.

SCOPE OF SUPPLY

Catalog item 9500-PERFORMANCE Display Option includes:

- Compressor performance and process displays, added to a 9500-ASC(M) application control package operating on a PLC hardware platform.

Not included:

- 500-ASC(M) Multiple-Body Integrated Compressor Control application control pacakge (required).
- PLC hardware.

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