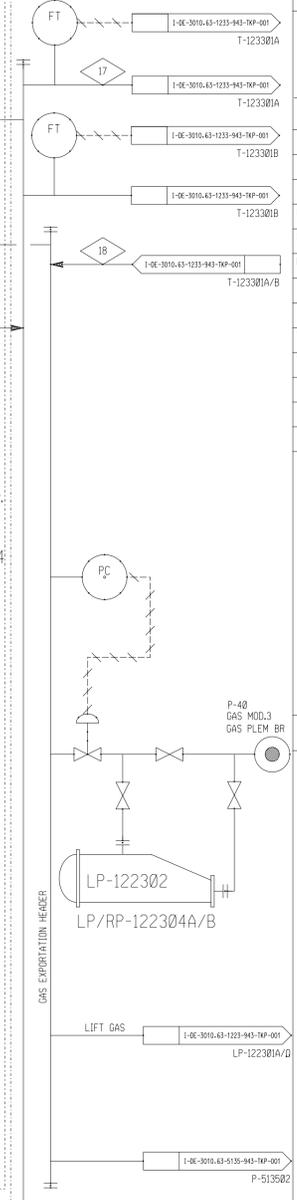
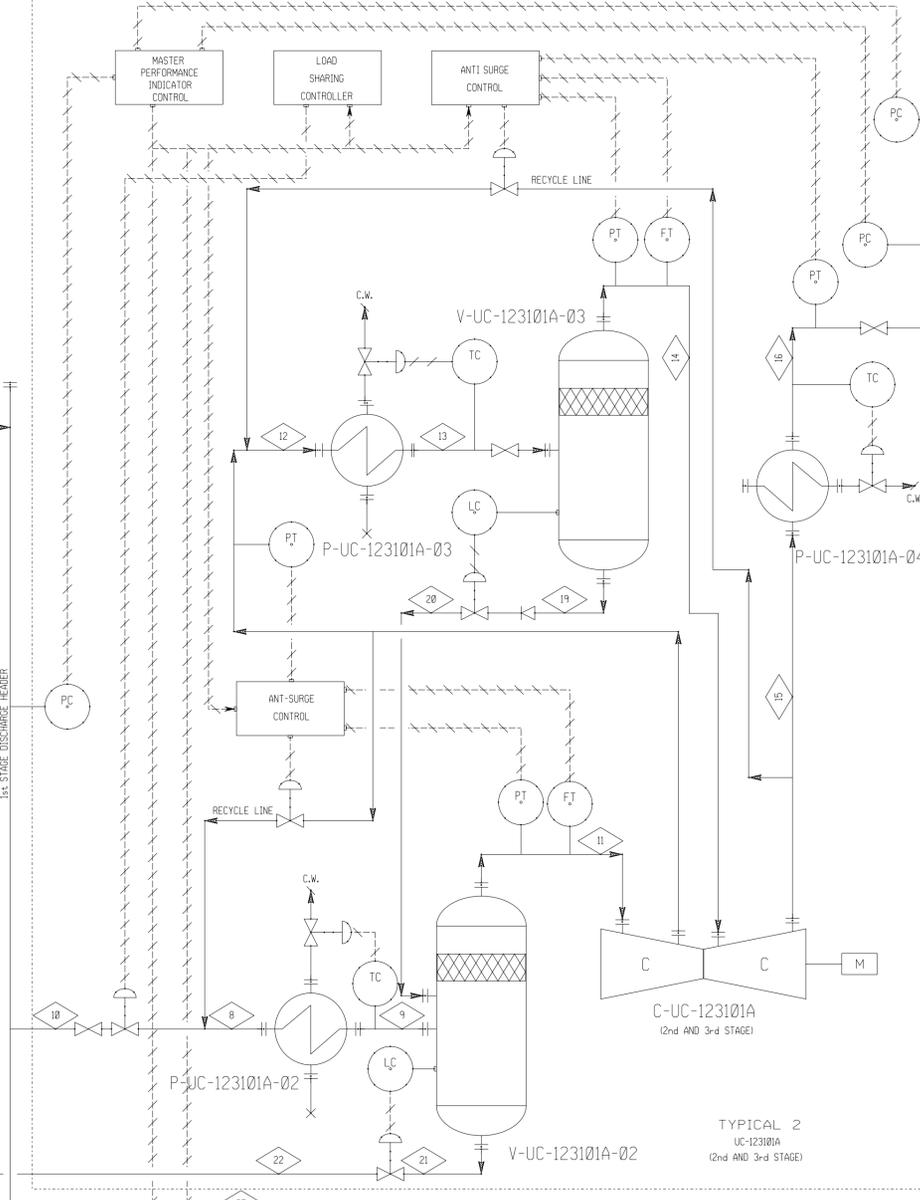
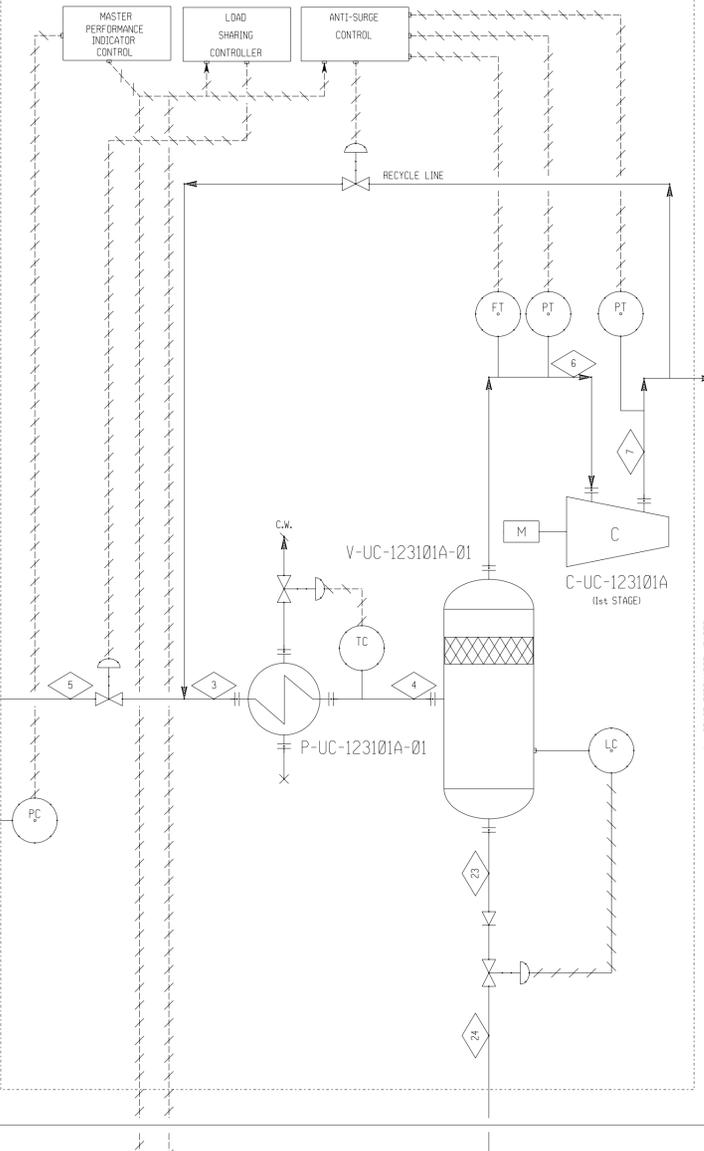


# NUOVO PIGNONE

## SCOPE OF SUPPLY

(NOTE 9)

TYPICAL 1  
UC-123101A (1st STAGE)



### REFERENCE DOCUMENTS

I-ET-3000.00-1200-941-TKP-002 REV.G - SYMBOLS AND ABBREVIATIONS.  
I-DE-3010.63-1231-943-PPC-001 REV.D - GAS COMPRESSION SYSTEM (MAXIMUM OIL/GAS)

### EQUIPMENT

| TAG                       | DESCRIPTION                                 | TYPE           | CAPACITY (NOTES 1,3)       |
|---------------------------|---|----------------|----------------------------|
| C-UC-123101A/C (3x502)    | GAS COMPRESSION UNIT COMPRESSOR             | CENTRIFUGAL    | 2.000.000m <sup>3</sup> /d |
| P-UC-123101A/C-01 (3x502) | GAS COMPRESSION UNIT 1st STAGE INLET COOLER | SHELL AND TUBE | 18,80 x 10 <sup>6</sup> W  |
| P-UC-123101A/C-02 (3x502) | GAS COMPRESSION UNIT 1st STAGE AFTERCOOLER  | SHELL AND TUBE | 8,46 x 10 <sup>6</sup> W   |
| P-UC-123101A/C-03 (3x502) | GAS COMPRESSION UNIT 2nd STAGE COOLER       | SHELL AND TUBE | 4,69 x 10 <sup>6</sup> W   |
| P-UC-123101A/C-04 (3x502) | GAS COMPRESSION UNIT DISCHARGE COOLER       | SHELL AND TUBE | 5,66 x 10 <sup>6</sup> W   |
| V-123101 (1x1002)         | SAFETY GAS K.O.DRUM                         | VERTICAL       | 6000000m <sup>3</sup> /d   |
| V-UC-123101A/C-01 (3x502) | 1st STAGE INLET GAS K.O.DRUM                | VERTICAL       | 2.000.000m <sup>3</sup> /d |
| V-UC-123101A/C-02 (3x502) | 1st STAGE DISCHARGE GAS K.O.DRUM            | VERTICAL       | 2.000.000m <sup>3</sup> /d |
| V-UC-123101A/C-03 (3x502) | 2nd STAGE DISCHARGE GAS K.O.DRUM            | VERTICAL       | 2.000.000m <sup>3</sup> /d |
| UC-123101A/C (3x502)      | GAS COMPRESSION UNIT                        | -              | 2.000.000m <sup>3</sup> /d |
| LP-122302 (1x1002)        | GAS PIPELINE PIG LAUNCHER                   | -              | -                          |
| LP/RP-122304A/B (2x1002)  | GAS PIPELINE PIG LAUNCHER/RECEIVER          | -              | -                          |

### GENERAL NOTES

- THE PERFORMANCE CHARACTERISTICS OF EQUIPMENTS AND SYSTEMS, AS SHOWN ON THE UPPER PART OF THIS DRAWING, ARE DESIGN DATA AND MAY NOT AGREE WITH THE BALANCE INFORMATION HEREUNDER WHICH ARE ACTUAL EQUILIBRIUM VALUES.
- TP VANE TYPE MIST ELIMINATOR.
- GAS CAPACITY AT 20°C AND 101,3 kPa abs.
- THIS FLOW SHOWS WATER PRESENT ONLY IN THE LIQUID PHASE, THIS VALUE MUST BE CORRECTED TO SEA WATER DENSITY EQUAL AT 1030 kg/m<sup>3</sup>.
- OIL VOLUMETRIC FLOW RATE AND OIL DENSITY ARE THE ACTUAL VALUES IN DRY BASIS.
- GAS FLOW RATE AT PRESSURE AND TEMPERATURE OPERATION CONDITIONS.
- CHARACTERISTICS OF FRACTIONS:  
C12- FROM 3-MLS-2-RIS: PM-654, API-16,5  
C20- FROM 4-RJS-0442: PM-479, API-6,7
- MASS AND ENERGY BALANCE REFERS TO YEAR 2007 (MAXIMUM OIL/GAS).
- FOR FINAL FIGURE SEE NUOVO PIGNONE DOCUMENTS:  
I-DE-3010.63-1231-944-NOO-003 - PROCESS FLOW DIAGRAM E MATERIAL BALANCE.  
I-DE-3010.63-1231-944-NOO-004 - PROCESS GAS COMPRESSION UNIT SYSTEM P&ID.

| STREAM CHARACTERISTICS COMPOSITION (% MOLAL) AND FLOW RATES | 1        | 2        | 3      | 4       | 5       | 6      | 7       | 8      | 9      | 10     | 11     | 12     | 13     | 14     | 15     | 16     | 17     | 18     | 19     | 20     | 21     | 22     | 23     | 24     | 25     | 26   | 27 | 28 | 29 | 30 |
|---|----------|----------|--------|---------|---------|--------|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|------|----|----|----|----|
| WATER H <sub>2</sub> O                                      | 7.36     | 7.36     | 7.36   | 7.36    | 7.36    | 0.82   | 0.82    | 0.82   | 0.82   | 0.82   | 0.19   | 0.19   | 0.19   | 0.10   | 0.10   | 0.10   | 0.10   | 0.00   | 100.00 | 100.00 | 24.06  | 24.06  | 69.36  | 69.36  | 69.36  | -    | -  | -  | -  |    |
| NITROGEN N <sub>2</sub>                                     | 0.12     | 0.12     | 0.12   | 0.12    | 0.12    | 0.13   | 0.13    | 0.13   | 0.13   | 0.13   | 0.14   | 0.14   | 0.14   | 0.14   | 0.14   | 0.14   | 0.14   | 0.00   | 0.00   | 0.00   | 0.01   | 0.01   | 0.00   | 0.00   | 0.00   | -    | -  | -  | -  |    |
| CARBON DIOXIDE CO <sub>2</sub>                              | 0.44     | 0.44     | 0.44   | 0.44    | 0.44    | 0.48   | 0.48    | 0.48   | 0.48   | 0.48   | 0.49   | 0.49   | 0.49   | 0.49   | 0.49   | 0.49   | 0.49   | 0.50   | 0.00   | 0.00   | 0.15   | 0.15   | 0.02   | 0.02   | 0.02   | -    | -  | -  | -  |    |
| METHANE C <sub>1</sub>                                      | 75.79    | 75.80    | 75.80  | 75.80   | 75.80   | 83.68  | 83.68   | 83.68  | 83.68  | 83.68  | 85.81  | 85.81  | 85.81  | 85.89  | 85.89  | 85.89  | 85.97  | 0.00   | 0.00   | 12.15  | 12.15  | 1.09   | 1.09   | 1.09   | -      | -    | -  | -  |    |    |
| ETHANE C <sub>2</sub>                                       | 4.12     | 4.12     | 4.12   | 4.12    | 4.12    | 4.52   | 4.52    | 4.52   | 4.52   | 4.52   | 4.57   | 4.57   | 4.57   | 4.58   | 4.58   | 4.58   | 4.58   | 0.00   | 0.00   | 2.81   | 2.81   | 0.31   | 0.31   | 0.31   | -      | -    | -  | -  |    |    |
| PROPANE C <sub>3</sub>                                      | 3.83     | 3.83     | 3.83   | 3.83    | 3.83    | 4.14   | 4.14    | 4.14   | 4.14   | 4.14   | 4.06   | 4.06   | 4.06   | 4.07   | 4.07   | 4.07   | 4.07   | 0.00   | 0.00   | 6.57   | 6.57   | 0.88   | 0.88   | 0.88   | -      | -    | -  | -  |    |    |
| I-BUTANE I-C <sub>4</sub>                                   | 0.79     | 0.79     | 0.79   | 0.79    | 0.79    | 0.83   | 0.83    | 0.83   | 0.83   | 0.83   | 0.77   | 0.77   | 0.77   | 0.77   | 0.77   | 0.77   | 0.77   | 0.00   | 0.00   | 2.69   | 2.69   | 0.42   | 0.42   | 0.42   | -      | -    | -  | -  |    |    |
| N-BUTANE N-C <sub>4</sub>                                   | 2.14     | 2.14     | 2.14   | 2.14    | 2.14    | 2.21   | 2.21    | 2.21   | 2.21   | 2.21   | 2.00   | 2.00   | 2.00   | 2.00   | 2.00   | 2.00   | 2.00   | 0.00   | 0.00   | 9.15   | 9.15   | 1.47   | 1.47   | 1.47   | -      | -    | -  | -  |    |    |
| I-PENTANE I-C <sub>5</sub>                                  | -        | -        | -      | -       | -       | -      | -       | -      | -      | -      | 0.73   | 0.73   | 0.73   | 0.73   | 0.73   | 0.73   | 0.73   | 0.73   | 0.00   | 0.00   | 8.69   | 8.69   | 1.98   | 1.98   | 1.98   | -    | -  | -  | -  |    |
| N-PENTANE N-C <sub>5</sub>                                  | 1.06     | 1.06     | 1.06   | 1.06    | 1.06    | 0.97   | 0.97    | 0.97   | 0.97   | 0.97   | 0.73   | 0.73   | 0.73   | 0.73   | 0.73   | 0.73   | 0.73   | 0.00   | 0.00   | 8.69   | 8.69   | 1.98   | 1.98   | 1.98   | -      | -    | -  | -  |    |    |
| N-HEXANE N-C <sub>6</sub>                                   | -        | -        | -      | -       | -       | -      | -       | -      | -      | -      | 0.12   | 0.12   | 0.12   | 0.12   | 0.12   | 0.12   | 0.12   | 0.12   | 0.00   | 0.00   | 9.46   | 9.46   | 7.00   | 7.00   | 7.00   | -    | -  | -  | -  |    |
| N-HEPTANE N-C <sub>7</sub>                                  | 1.03     | 1.03     | 1.03   | 1.03    | 1.03    | 0.40   | 0.40    | 0.40   | 0.40   | 0.40   | 0.12   | 0.12   | 0.12   | 0.12   | 0.12   | 0.12   | 0.12   | 0.12   | 0.00   | 0.00   | 3.54   | 3.54   | 6.22   | 6.22   | 6.22   | -    | -  | -  | -  |    |
| N-OCTANE N-C <sub>8</sub>                                   | 0.71     | 0.71     | 0.71   | 0.71    | 0.71    | 0.12   | 0.12    | 0.12   | 0.12   | 0.12   | 0.02   | 0.02   | 0.02   | 0.02   | 0.02   | 0.02   | 0.02   | 0.02   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | -    | -  | -  | -  |    |
| N-NONANE N-C <sub>9</sub>                                   | -        | -        | -      | -       | -       | 0.00   | 0.00    | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.12   | 0.12   | 1.40   | 1.40   | 1.40   | -    | -  | -  | -  |    |
| N-DECANE N-C <sub>10</sub>                                  | 0.14     | 0.14     | 0.14   | 0.14    | 0.14    | 0.00   | 0.00    | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.02   | 0.02   | 0.64   | 0.64   | 0.64 | -  | -  | -  | -  |
| N-UNDECANE N-C <sub>11</sub>                                | 0.06     | 0.06     | 0.06   | 0.06    | 0.06    | 0.00   | 0.00    | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | -    | -  | -  | -  |    |
| N-DODECANE N-C <sub>12</sub>                                | 0.01     | 0.01     | 0.01   | 0.01    | 0.01    | 0.00   | 0.00    | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | -    | -  | -  | -  |    |
| N-TRIDECANE N-C <sub>13</sub>                               | 0.00     | 0.00     | 0.00   | 0.00    | 0.00    | 0.00   | 0.00    | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | -    | -  | -  | -  |    |
| N-TETRADECANE N-C <sub>14</sub>                             | 0.00     | 0.00     | 0.00   | 0.00    | 0.00    | 0.00   | 0.00    | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | -    | -  | -  | -  |    |
| N-PENTADECANE N-C <sub>15</sub>                             | 0.00     | 0.00     | 0.00   | 0.00    | 0.00    | 0.00   | 0.00    | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | -    | -  | -  | -  |    |
| N-HEXADECANE N-C <sub>16</sub>                              | 0.00     | 0.00     | 0.00   | 0.00    | 0.00    | 0.00   | 0.00    | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | -    | -  | -  | -  |    |
| N-HEPTADECANE N-C <sub>17</sub>                             | 0.00     | 0.00     | 0.00   | 0.00    | 0.00    | 0.00   | 0.00    | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | -    | -  | -  | -  |    |
| N-OCTADECANE N-C <sub>18</sub>                              | 0.00     | 0.00     | 0.00   | 0.00    | 0.00    | 0.00   | 0.00    | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | -    | -  | -  | -  |    |
| N-NONADECANE N-C <sub>19</sub>                              | 0.00     | 0.00     | 0.00   | 0.00    | 0.00    | 0.00   | 0.00    | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | -    | -  | -  | -  |    |
| C12- (NOTE 5) 3-MLS-2-RJS                                   | C12-     | 0.00     | 0.00   | 0.00    | 0.00    | 0.00   | 0.00    | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | -    | -  | -  | -  |    |
| C20- (NOTE 5) 4-RJS-0442                                    | C20-     | 0.00     | 0.00   | 0.00    | 0.00    | 0.00   | 0.00    | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | 0.00   | -    | -  | -  | -  |    |
| TOTAL   | 100.00   | 100.00   | 100.00 | 100.00  | 100.00  | 100.00 | 100.00  | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | -    | -  | -  | -  |    |
| MOLAR FLOW RATE (kgmol/h)                                   | 9597.5   | 9597.1   | 4798.5 | 4798.5  | 4798.5  | 4340.3 | 4340.3  | 4340.3 | 4340.3 | 4340.3 | 4214.4 | 4214.4 | 4214.4 | 4210.7 | 4210.7 | 4210.7 | 4210.7 | 4206.5 | 3.7    | 3.7    | 129.7  | 129.7  | 458.2  | 458.2  | 458.2  | -    | -  | -  | -  |    |
| MASS FLOW RATE (kg/h)                                       | 223809   | 223776   | 111888 | 111888  | 111888  | 92705  | 92704.7 | 92705  | 92705  | 92705  | 85765  | 85765  | 85765  | 85698  | 85698  | 85698  | 85698  | 85624  | 66     | 66     | 7006   | 7006   | 19183  | 19183  | 19183  | -    | -  | -  | -  |    |
| OIL VOLUMETRIC FLOW RATE (m <sup>3</sup> /h)                | 0        | 0        | 0      | 0       | 0       | 0      | 0       | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | -    | -  | -  | -  |    |
| GAS VOLUMETRIC FLOW RATE (NOTE 6) (m <sup>3</sup> /h)       | 29932.31 | 29933.01 | 15276  | 12095.3 | 14966.5 | 12091  | 3978.5  | 3998   | 2574   | 3878.5 | 2574.2 | 1405.8 | 998.3  | 998.3  | 615.6  | 410.2  | 410.2  | 410.3  | 0.0    | 0.0    | 0.0    | 45.8   | 0.0    | 365.4  | 365.4  | -    | -  | -  | -  |    |
| WATER VOLUMETRIC FLOW RATE (m <sup>3</sup> /h)              | 0        | 0        | 0      | 0       | 0       | 0      | 0       | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | -    | -  | -  | -  |    |
| MOLECULAR WEIGHT (kg/kmol)                                  | 23.32    | 23.32    | 23.32  | 23.32   | 23.32   | 21.36  | 21.36   | 21.36  | 21.36  | 21.36  | 20.35  | 20.35  | 20.35  | 20.35  | 20.35  | 20.35  | 20.35  | 20.35  | 18.02  | 18.02  | 54.03  | 54.03  | 41.87  | 41.87  | 41.87  | -    | -  | -  | -  |    |
| PRESSURE (kPa abs)  | 981      | 981      | 961    | 912     | 981     | 912    | 3923    | 3903   | 3834   | 3923   | 3834   | 8748   | 8748   | 8679   | 19711  | 19643  | 19643  | 19643  | 3854   | 3854   | 981    | 912    | 101    | 101    | 101    | -    | -  | -  | -  |    |
| TEMPERATURE (°C)  | 102      | 102      | 102    | 40      | 102     | 40     | 160     | 160    | 38     | 160    | 37     | 109    | 38     | 38     | 111    | 38     | 38     | 38     | 38     | 38     | 38     | 31     | 40     | 36     | 36     | -    | -  | -  | -  |    |
| OIL DENSITY (kg/m <sup>3</sup> )                            | 0        | 0        | 0      | 659     | 0       | 0      | 0       | 0      | 597    | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 0      | 597    | 622    | 659    | 671    | -    | -  | -  | -  |    |

Figura 2.4-11 - Sistema Principal de Compressão de Gás da UEP P-51

FOR PNBV COMMENT

REV. DESCRIPTION DATE EXEC. CHECK APPROV.

THIS DOCUMENT IS PROPERTY OF PETROBRAS AND IT IS PROTECTED IN ACCORDANCE WITH PREVAILING LAW. IT SHALL ONLY BE USED FOR THE PURPOSE IT IS DELIVERED. STANDARDIZED FORM BY N-381 (PETROBRAS) REV.F - ANNEX A

FSTP Technip

CONTRACT N.º 899.2.010.03-9

TECHNICAL RES.º Roberto Jourdan Aguiar

ENGENHARIA / IEMS

CLIENT USER: UN - RIO / ATP - MLS

JOB OR PROJECT: MARLIM SUL FIELD DEVELOPMENT

AREA OR UNIT: PETROBRAS 51 (P-51)

TITLE: PROCESS FLOW DIAGRAM GAS COMPRESSION SYSTEM (MAXIMUM OIL/GAS)

DESIGN BY: TKP DRAWN BY: CHECKED BY: APPROVED BY:

SCALE: NO SCALE DRAWING TITLE: A1 CC: SHEET 1 of 1

DATE: 19/JAN/05 PB N.º: I-DE-3010.63-1231-943-TKP-001

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