



Registered To: Toromont Energy Systems - James Storoshenko CoolWare v7.1.2 Customer Name Reference Date 3/12/2008 Run #1 End User Name Atmospheric Pressure 12.90 psi Item Screw Open 3577 ft Project Elevation **COMPRESSOR - TDSH 283L** Compressor Power 1460.1 hp Compression Ratio 5.93 Eff Model Hydrocarbon Mix Speed 3550 rpm Volume Ratio 4.39 Volumetric Eff 74.0% Percent Suct Vol Flow 82.5% Ideal Volume Ratio 4.39 Adiabatic Eff 71.8% Discharge Port Standard Temperature Pressure Mass Flow Volume Flow Standard Volume Flow (MMSCFD) (lbm/min) (°F) (psig) (cfm) (scfm) Suction 80.0 48.6 327.3 1737.7 7144.6 10.288 Discharge 245.0 352.0 382.4 7144.6 10.288 327.3 **OIL SYSTEM** Oil Type CP-1516-100 Oil Cooler Heat Rej 2111.2 kbtu/hr Oil Pump Boost 0.0 psi Oil Flow 97:9 gpm Main Inj Oil Temp 160.0 °F Oil System Pres Drop 10.0 psi Main Inj Oil Flow Bearing Oil Temp 160.0 °F Main Inj Orifice Dia 0.469 in 64.3 gpm Bearing Oil Flow 33.6 gpm Oil Cooling All Oil Main Inj Cv 5.0 Oil Pump Piping All Oil Main Inj Valve Pos 100.0% Main Inj Valve Dia 1.00 in **SYSTEM FLUID** Upstream Temperature 80.0 °F Downstream Temperature 245.0 °F Molecular Weight 17.38 **Upstream Pressure** 48.6 psig Downstream Pressure 352.0 psig Cp/Cv 1.30 Compressibility Z 0.98 Suct Line Superheat 0.0 °F Disc Line Desuperheat 0.0 °F Molecular Weight 17.38 Suct Line Pres Drop Disc Line Pres Drop 0.0 psi 0.0 psi Separator Pres Drop 0.0 psi **ERRORS AND WARNINGS** Disclaimer: the information contained in this program is subject to change without notice. Frick reserves the right to final verification of all rating results





| BY JOHNSON CONTROLS | | | - I <i>J</i> | | | | | |
|---|---------------------|-----------------------------------|------------------------|------------------|----------------|--|--------------------|---------------------------------|
| CoolWare v7.1.2 | | Reg | istered To: Toromo | ont Energy Sys | items - Jai | mes Storoshenko | | |
| Customer Name End User Name Project | | | Referen Item | oce Screw C | pen | Date 3/12/20 Atmospheric Elevation | Pressure | Run # 1 12.90 psi 3577 ft |
| | | COM | PRESSOR - TD | SH 283L | | | | |
| Compressor Power | 1460.1 hp | Compression Ra | atio | | Eff Model | | Hydi | rocarbon Mix |
| Speed | 3550 rpm | Volume Ratio | | 4.39 | Volumetri | c Eff | | 74.0% |
| Percent Suct Vol Flow | 82.5% | Ideal Volume Ra Discharge Port | atio | 4.39 Standard | Adiabatic | Eff | | 71.8% |
| | Temperature (°F) | Pressure (psig) | Mass Flow (lbm/min) | | ne Flow fm) | (scfm) | | SCFD) |
| Suction | 80.0 | 48.6 | 327.3 | | 37.7 | 7144.6 | | 0.288 |
| Discharge | 245.0 | 352.0 | 327.3 | 38 | 32.4 | 7144.6 | 1 | 0.288 |
| | | | OIL SYSTEM | | | | | |
| Oil Type | CP-1516-1 | 00 Oil Cooler He | at Rej | 2111.2 kbt | u/hr Oil F | ump Boost | | 0.0 ps |
| Oil Flow | 97.9 gr | om Main Inj Oil Te | emp | 160.0 | o°F Oil S | system Pres Drop | | 10.0 ps |
| Main Inj Oil Flow | 64.3 gr | m Bearing Oil Te | emp | 160.0 | o°F Mair | ı İnj Orifice Dia | | 0.469 ir |
| Bearing Oil Flow | 33.6 gr | m Oil Cooling | | Al | l Oil Mair | ı Inj Cv | | 5.0 |
| Oil Pump Piping | All (| Oil Main Inj Valve | e Pos | 100 | .0% Mair | ı Inj Valve Dia | | 1.00 ir |
| | | SYSTEM | | | | FI | LUID | |
| Upstream Temperature | 80 | .0 °F Downstrea | m Temperature | | 245.0 °F | Molecular Weight | | 17.38 |
| Upstream Pressure | 48.6 | psig Downstrea | m Pressure | 3 | 52.0 psig | Cp/Cv | | 1.30 |
| Suct Line Superheat | 0 | .0 °F Disc Line D | Desuperheat | • | 0.0 °F | Compressibility Z | | 0.98 |
| Suct Line Pres Drop | 0. | 0 psi Disc Line F | Pres Drop | | 0.0 psi | Molecular Weight | 17.38 | |
| | | Separator I | Pres Drop | | 0.0 psi | | | |
| | | | COMPRESSO | R | | | | |
| | <u>Bearings</u> | | | | | Rotors | | |
| Position | Loa | | L10 (hrs) | | · | | Male | |
| Male Inlet Radial | 50 | | | Rotor Thrust D | | | Norma | |
| Male Outlet Radial | 76 | | | Balance Piston | | | 12112.3 lb | |
| Female Inlet Radial | 56 | | 1 | nlet Blocking D | | | 411 µir 611 µir | • |
| Female Outlet Radial | 115 | | | Outlet Blocking | | | 1014 µii | • |
| Male Axial | 33 | · · | 37915 | Max Rotor Bod | - | Max allowable deflect | • | |
| | | | | | | DOOL AUCIVEALUE CIENTELL | いかしと 1サリ ロロ | L . |
| Female Axial | 36 | 56 | | Rotor Shaft Fa | | | 2.50 | |





| CoolWare v7.1.2 | | Regi | stered To: Toromor | t Energy Sy | stems - Jai | mes Storoshenko | | |
|--|-------------------------------------|---|------------------------------|------------------|--------------------------------------|------------------------------------|---|---------------------------------|
| Customer Name End User Name Project | | | Referenc Item | e Screw (| Open | | Date 3/12/2008 Atmospheric Pressure Elevation | |
| | | COMI | PRESSOR - TDS | H 283L | | | | |
| Compressor Power Speed Percent Suct Vol Flow | 3550 rpm | Compression Ra Volume Ratio Ideal Volume Ra | | 3.82 | Eff Model Volumetric Adiabatic | | Hy | drocarbon Mix 71.4% 72.3% |
| | | Discharge Port | | Standard | | | | |
| | Temperature (°F) | Pressure (psig) | Mass Flow (lbm/min) | | me Flow cfm) | (scfm) | ······ | ISCFD) |
| Suction | 80.0 | 58.6 | 367.1 | | 376.8 | 8015.2 | | 11.542 |
| Discharge | 240.7 | 352.0 | 367.1 | 4 | 26.4 | 8015.2 | | 11.542 |
| | | | OIL SYSTEM | | | | | |
| Oil Type | CP-1516-1 | 00 Oil Cooler Hea | at Rej | 1963.1 kb | tu/hr Oil P | ump Boost | | 0.0 psi |
| Oil Flow | 5, | m Main Inj Oil Te | • | | | rystem Pres Drop | | 10.0 psi |
| Main Inj Oil Flow | | m Bearing Oil Te | emp | | | Inj Orifice Dia | | 0.469 in |
| Bearing Oil Flow | Ψ. | m Oil Cooling | | | II Oil Mair | | | 5.0 |
| Oil Pump Piping | All (| Dil Main Inj Valve | Pos | 100 | 0.0% Mair | Inj Valve Dia | | 1.00 in |
| | | SYSTEM | | | | F | LUID | |
| Upstream Temperature | 80 | .0 °F Downstrear | m Temperature | | 240.7 °F | Molecular Weight | | 17.38 |
| Upstream Pressure | 58.6 | psig Downstrear | m Pressure | | 352.0 psig | Cp/Cv | | 1.30 |
| Suct Line Superheat | 0 | .0 °F Disc Line D | esuperheat | | 0.0 °F | Compressibility Z | | 0.98 |
| Suct Line Pres Drop | 0. | 0 psi Disc Line P | res Drop | | 0.0 psi | Molecular Weight | 17.38 | |
| | | Separator F | Pres Drop | | 0.0 psi | | | |
| | | ERR | RORS AND WAR | VINGS | | | | |
| Di | isclaimer: the information contains | ed in this program is subi | ect to change without notice | . Frick reserves | the right to fina | al verification of all rating resu | lts. | |





| BY JOHNSON CONTROLS | Open System | | | | | | | | |
|--|---|--|--|---|--|--|--|---------------------------------|--------------------------------------|
| CoolWare v7.1.2 | | Reg | istered To: Toro | mont Energy : | Systems | s - Jam | es Storoshenko | | |
| Customer Name End User Name Project | | | Refe Item | erence n Screw Open | | Date 3/12/20 Atmospheric Elevation | | Run # 2 12.90 psi 3577 ft | |
| | | COM | PRESSOR - T | DSH 283L | | | | | |
| Compressor Power Speed Percent Suct Vol Flow | 3550 rpm V 79,2% Id | ompression Ra olume Ratio eal Volume Ra ischarge Port | | 5.1 3.8 3.8 Standar | 32 Volu 32 Adia | lodel metric batic E | | Hyd | rocarbon Mix 71.4% 72.3% |
| | Temperature F | ressure (psig) | Mass Flow (lbm/min) | | lume Fl (cfm) | ow | (scfm) | | SCFD) |
| Suction | 80.0 | 58.6 | 367.1 | | 1676.8 | | 8015.2 | | 1.542 |
| Discharge | 240.7 | 352.0 | 367.1 | | 426.4 | | 8015.2 | | 1.542 |
| | | | OIL SYSTE | EM . | | | | | |
| Oil Type Oil Flow Main Inj Oil Flow Bearing Oil Flow Oil Pump Piping | CP-1516-100 Oil Cooler 96.0 gpm Main Inj O 63.4 gpm Bearing O 32.6 gpm Oil Cooling All Oil Main Inj V | | Inj Oil Temp ing Oil Temp ooling | | 1963.1 kbtu/hr Oil Pu 160.0 °F Oil Sy 160.0 °F Main I All Oil Main I 100.0% Main I | | nj Orifice Dia nj Cv | | 0.0 ps 10.0 ps 0.469 ir 5.0 |
| | S | STEM | | | | | F | LUID | 1. |
| Upstream Temperature Upstream Pressure Suct Line Superheat Suct Line Pres Drop | | F Downstrea ig Downstrea F Disc Line D | | | 352.0 0. | psig 0 °F | Molecular Weight Cp/Cv Compressibility Z Molecular Weight | 17.38 | 17.38 1.30 0.98 |
| | | | COMPRESS | SOR | | | | | |
| Position | <u>Bearings</u> Load It | f | L10 (hrs) | <u> </u> | | | Rotors | Mal | e Female |
| Male Inlet Radial Male Outlet Radial Female Inlet Radial | 5052 7731 5638 | | 78133 93406 81297 | Rotor Thrus Balance Pis Inlet Blockin | ton For | | | Norma 11699.5 lk 415 µi | of 0.0 lbf |
| Female Outlet Radial Male Axial | 11678 633 | | 35431 1000000 | Outlet Block Max Rotor E | king Dia | p. : | tou othoughts dod | 620 μi 1027 μi | n 865 µin n 1386 µin |
| Female Axial | 3612 | | 39309 | l Rotor Shaft | Fatigue | | iax allowable deflect Factor | tion 2140 µi 2.5 | |
| | | FRI | RORS AND W | ARNINGS | | | | | |





Registered To: Toromont Energy Systems - James Storoshenko CoolWare v7.1.2 Date 3/12/2008 Reference Run # 3 **Customer Name** Screw Open Atmospheric Pressure 12.90 psi Item End User Name 3577 ft Project Elevation **COMPRESSOR - TDSH 283L** Hydrocarbon Mix Compressor Power 1460.3 hp Compression Ratio Eff Model Volumetric Eff 69.9% Speed 3550 rpm Volume Ratio 73.0% Adiabatic Eff 77.1% Ideal Volume Ratio 3.38 Percent Suct Vol Flow Discharge Port Standard Volume Flow Standard Volume Flow Mass Flow Temperature Pressure (°<u>F)</u> (MMSCFD) (lbm/min) (cfm) (scfm) (psig) 80.0 409.2 1639.8 8934.5 12.866 68.6 Suction 12.866 Discharge 236.3 352.0 409.2 472.3 8934.5 **OIL SYSTEM** Oil Cooler Heat Rei 1815.6 kbtu/hr Oil Pump Boost 0.0 psi CP-1516-100 Oil Type Oil System Pres Drop 10.0 psi Main Inj Oil Temp 160.0 °F 94.1 gpm Oil Flow 160.0 °F Main Inj Orifice Dia 0.469 in Bearing Oil Temp Main Inj Oil Flow 62.5 gpm 5.0 All Oil Main Inj Cv 31.6 gpm Oil Cooling Bearing Oil Flow 1.00 in 100.0% Main Inj Valve Dia All Oil Main Inj Valve Pos Oil Pump Piping **SYSTEM FLUID** 236.3 °F Molecular Weight 17.38 80.0 °F Downstream Temperature Upstream Temperature 1.30 68.6 psig 352.0 psig Cp/Cv Downstream Pressure Upstream Pressure Compressibility Z 0.98 0.0 °F Disc Line Desuperheat 0.0 °F Suct Line Superheat Molecular Weight 17.38 0.0 psi 0.0 psi Disc Line Pres Drop Suct Line Pres Drop 0.0 psi Separator Pres Drop **ERRORS AND WARNINGS**





Registered To: Toromont Energy Systems - James Storoshenko CoolWare v7.1.2 Run#3 Date 3/12/2008 Reference Customer Name 12.90 psi Atmospheric Pressure Item Screw Open End User Name 3577 ft Elevation Project **COMPRESSOR - TDSH 283L** Eff Model Hydrocarbon Mix Compressor Power 1460.3 hp Compression Ratio 69.9% 3.38 Volumetric Eff Volume Ratio 3550 rpm Speed 73.0% 3.38 Adiabatic Eff 77.1% Ideal Volume Ratio Percent Suct Vol Flow Standard Discharge Port Standard Volume Flow Mass Flow Volume Flow Temperature Pressure (MMSCFD) (scfm) (lbm/min) (cfm) (°F) (psig) 12.866 1639.8 8934.5 409.2 80.0 68.6 Suction 8934.5 12.866 472.3 236.3 352.0 409.2 Discharge **OIL SYSTEM** 0.0 psi 1815.6 kbtu/hr Oil Pump Boost CP-1516-100 Oil Cooler Heat Rej Oil Type Oil System Pres Drop 10.0 psi 160.0 °F 94.1 gpm Main Inj Oil Temp Oil Flow 0.469 in Main Inj Orifice Dia 62.5 gpm Bearing Oil Temp 160.0 °F Main Inj Oil Flow 5.0 All Oil Main Inj Cv Oil Cooling 31.6 gpm Bearing Oil Flow 1.00 in 100.0% Main Inj Valve Dia Main Inj Valve Pos All Oil Oil Pump Piping **FLUID SYSTEM** 236.3 °F Molecular Weight 17.38 80.0 °F Downstream Temperature Upstream Temperature 1.30 Cp/Cv Downstream Pressure 352.0 psig 68.6 psig Upstream Pressure Compressibility Z 0.98 0.0 °F 0.0 °F Disc Line Desuperheat Suct Line Superheat Molecular Weight 17.38 0.0 psi 0.0 psi Disc Line Pres Drop Suct Line Pres Drop 0.0 psi Separator Pres Drop **COMPRESSOR Rotors** Bearings Male Female Load lbf L10 (hrs) Position Normal Normal Rotor Thrust Direction Male Inlet Radial 5078 76828 0.0 lbf 11286.6 lbf Balance Piston Force 89349 7835 Male Outlet Radial 542 µin 79483 Inlet Blocking Dia 420 µin 5676 Female Inlet Radial Outlet Blocking Dia 627 µin 872 µin 34634 11758 Female Outlet Radial 1398 µin 1000000 Max Rotor Body 1039 µin Male Axial 939 40737 Max allowable deflection 2140 µin Female Axial 3570 2.12 Rotor Shaft Fatigue Safety Factor **ERRORS AND WARNINGS** Disclaimer: the information contained in this program is subject to change without notice. Frick reserves the right to final verification of all rating results





Registered To: Toromont Energy Systems - James Storoshenko CoolWare v7.1,2 Date 3/12/2008 Run # 4 Reference Customer Name Screw Open Atmospheric Pressure 12.90 psi Item End User Name 3577 ft Elevation Project **COMPRESSOR - TDSH 283L** Eff Model Hydrocarbon Mix Compressor Power 1460.3 hp Compression Ratio 3.04 Volumetric Eff 69.0% Speed 3550 rpm Volume Ratio 3.04 Adiabatic Eff 73.6% 75.9% Ideal Volume Ratio Percent Suct Vol Flow Discharge Port Standard Volume Flow Standard Volume Flow Temperature Mass Flow Pressure (MMSCFD) (°F) (psig) (lbm/min) (cfm) (scfm) 80.0 453.9 1619.9 9909.0 14.269 Suction 78.6 9909.0 14.269 231.8 352.0 453.9 520.5 Discharge **OIL SYSTEM** CP-1516-100 Oil Cooler Heat Rej 1668.7 kbtu/hr Oil Pump Boost 0.0 psi Oil Type 160.0 °F Oil System Pres Drop 10.0 psi 92.0 gpm Main Inj Oil Temp Oil Flow Bearing Oil Temp 160.0 °F Main Inj Orifice Dia 0.469 in 61.4 gpm Main Inj Oil Flow 5.0 Oil Cooling All Oil Main Inj Cv Bearing Oil Flow 30.6 gpm 1.00 in 100.0% Main Inj Valve Dia Oil Pump Piping All Oil Main Inj Valve Pos SYSTEM **FLUID** 231.8 °F Molecular Weight 17.38 Upstream Temperature 80.0 °F Downstream Temperature 78.6 psig | Downstream Pressure 352.0 psig Cp/Cv 1.30 Upstream Pressure Compressibility Z 0.98 0.0 °F Disc Line Desuperheat 0.0 °F Suct Line Superheat Molecular Weight 17.38 Suct Line Pres Drop 0.0 psi Disc Line Pres Drop 0.0 psi 0.0 psi Separator Pres Drop





Registered To: Toromont Energy Systems - James Storoshenko CoolWare v7.1.2 Date 3/12/2008 Run#4 Reference Customer Name 12.90 psi Screw Open Atmospheric Pressure Item End User Name 3577 ft Elevation Project **COMPRESSOR - TDSH 283L** Hydrocarbon Mix Eff Model Compressor Power 1460.3 hp Compression Ratio 69.0% Volumetric Eff 3.04 3550 rpm Volume Ratio Speed 73.6% 3.04 Adiabatic Eff Ideal Volume Ratio Percent Suct Vol Flow 75.9% Standard Discharge Port Mass Flow Volume Flow Standard Volume Flow Pressure Temperature (MMSCFD) (cfm) (scfm) (lbm/min) (°F) (psig) 14.269 9909.0 453.9 1619.9 80.0 78.6 Suction 9909.0 14.269 352.0 453.9 520.5 231.8 Discharge **OIL SYSTEM** Oil Pump Boost 0.0 psi Oil Cooler Heat Rei 1668.7 kbtu/hr CP-1516-100 Oil Type 160.0 °F Oil System Pres Drop 10.0 psi Main Inj Oil Temp 92.0 gpm Oil Flow 0.469 in Bearing Oil Temp 160.0 °F Main Inj Orifice Dia 61.4 gpm Main Inj Oil Flow Main Inj Cv 5.0 30.6 gpm All Oil Oil Cooling Bearing Oil Flow Main Inj Valve Dia 1.00 in 100.0% Main Inj Valve Pos Oil Pump Piping All Oil **FLUID SYSTEM** Molecular Weight 17.38 231.8 °F Downstream Temperature Upstream Temperature 80.0 °F Cp/Cv 1.30 78.6 psig Downstream Pressure 352.0 psig Upstream Pressure Compressibility Z 0.98 Disc Line Desuperheat 0.0 °F 0.0 °F Suct Line Superheat Molecular Weight 17.38 0.0 psi Disc Line Pres Drop 0.0 psi Suct Line Pres Drop 0.0 psi Separator Pres Drop COMPRESSOR Rotors **Bearings** Female Load lbf L10 (hrs) Male Position Rotor Thrust Direction Normal Normal Male Infet Radial 5231 69592 10873.8 lbf 0.0 lbf 78303 Balance Piston Force 8151 Male Outlet Radial 435 µin 561 µin 70776 Inlet Blocking Dia Female Inlet Radial 5877 652 µin 902 µin Outlet Blocking Dia 31208 Female Outlet Radial 12131 Max Rotor Body 1080 µin 1449 µin 434682 Male Axial 1509 Max allowable deflection 2140 µin 40489 3577 Female Axial 2.06 Rotor Shaft Fatigue Safety Factor **ERRORS AND WARNINGS** Disclaimer: the information contained in this program is subject to change without notice. Frick reserves the right to final verification of all rating results





| CoolWare v7.1.2 | | Regi | stered To: Toromor | nt Energy Sy | stems - Jan | ies Storoshenko | | |
|--|--------------------------------------|---|--|----------------------------------|--|--|-----------------|---|
| Customer Name End User Name Project | | | Referend Item | se Screw (| Open | Date 3/12/20 Atmospheric F Elevation | | Run # 5 12.90 psi 3577 ft |
| | | COM | PRESSOR - TDS | H 283L | | | | |
| Compressor Power Speed Percent Suct Vol Flow | • | np Compression Ra m Volume Ratio % Ideal Volume Ra Discharge Port | | 3.60 2.77 2.77 Standard | | | Hy | drocarbon Mix 68.8% 74.4% |
| Suction Discharge | Temperature (°F) 80.0 227.2 | Pressure (psig) 88.6 352.0 | Mass Flow (lbm/min) 501.8 501.8 | (| me Flow cfm) 614.6 571.6 | Standard (scfm) 10955.8 10955.8 | Volume I (MN | Flow MSCFD) 15.776 15.776 |
| Discrizinge | | | OIL SYSTEM | | | | | |
| Oil Type Oil Flow Main Inj Oil Flow Bearing Oil Flow Oil Pump Piping | 89.8 60.2 29.6 | -100 Oil Cooler He gpm Main Inj Oil Te gpm Bearing Oil Te gpm Oil Cooling Il Oil Main Inj Valve | emp emp | 160 160 <i>A</i> | .0 °F Main III Oil Main | /stem Pres Drop Inj Orifice Dia | | 0.0 psi 10.0 psi 0.469 in 5.0 1.00 in |
| | | SYSTEM | | | | FI | LUID | |
| Upstream Temperature Upstream Pressure Suct Line Superheat Suct Line Pres Drop | | | Desuperheat Pres Drop | | 227.2 °F 352.0 psig 0.0 °F 0.0 psi 0.0 psi | Molecular Weight Cp/Cv Compressibility Z Molecular Weight | 17.38 | 17.38 1.30 0.98 |
| | | ERF | RORS AND WAR | NINGS | | | | |





Registered To: Toromont Energy Systems - James Storoshenko CoolWare v7.1.2 Run # 5 Date 3/12/2008 Reference **Customer Name** 12.90 psi Atmospheric Pressure Item Screw Open End User Name 3577 ft Elevation Project **COMPRESSOR - TDSH 283L** Hydrocarbon Mix 3.60 Eff Model Compressor Power 1460.3 hp Compression Ratio 68.8% 2.77 Volumetric Eff Volume Ratio Speed 3550 rpm 74.4% 2.77 Adiabatic Eff Ideal Volume Ratio Percent Suct Vol Flow 75.5% Standard Discharge Port Mass Flow Volume Flow Standard Volume Flow Temperature Pressure (MMSCFD) (lbm/min) (cfm) (scfm) (°F) (psig) 10955.8 15.776 1614.6 80.0 88.6 501.8 Suction 15.776 10955.8 571.6 227.2 352.0 501.8 Discharge OIL SYSTEM 1521.0 kbtu/hr Oil Pump Boost 0.0 psi CP-1516-100 Oil Cooler Heat Rej Oil Type Oil System Pres Drop 10.0 psi Main Inj Oil Temp 160.0 °F 89.8 gpm Oil Flow 0.469 in 60.2 gpm Bearing Oil Temp 160.0 °F Main Inj Orifice Dia Main Inj Oil Flow All Oil Main Inj Cv 5.0 29.6 gpm Oil Cooling Bearing Oil Flow 100.0% Main Inj Valve Dia 1.00 in All Oil Main Inj Valve Pos Oil Pump Piping **FLUID** SYSTEM 227.2 °F Molecular Weight 17.38 Downstream Temperature Upstream Temperature 80.0 °F 1.30 352.0 psig Cp/Cv Downstream Pressure Upstream Pressure 88.6 psig 0.98 Compressibility Z 0.0 °F Disc Line Desuperheat 0.0 °F Suct Line Superheat Molecular Weight 17.38 0.0 psi 0.0 psi Disc Line Pres Drop Suct Line Pres Drop 0.0 psi Separator Pres Drop COMPRESSOR Bearings Rotors Female Male Load lbf L10 (hrs) Position Normal 59886 Rotor Thrust Direction Normal Male Inlet Radial 5472 10461.0 lbf 0.0 lbf Balance Piston Force 8612 65196 Male Outlet Radial Inlet Blocking Dia 458 µin 592 µin 59414 6194 Female Inlet Radial Outlet Blocking Dia 687 µin 948 µin 26760 12704 Female Outlet Radial 129400 Max Rotor Body 1139 µin 1527 µin 2260 Male Axial 39116 Max allowable deflection 2140 µin Female Axial 3618 Rotor Shaft Fatigue Safety Factor 1.97





| CoolWare v7.1.2 | | Registered To: Toromont Energy Systems - James Storoshenko Reference Date 3/12/2008 Run # 6 | | | | | | | | |
|--|----------------------------|--|-----------------------------|-----------------|--|--|---|---|--|--|
| Customer Name End User Name Project | | | Referenc Item | e Screw (| Open | = | Date 3/12/2008 Atmospheric Pressure Elevation | | | |
| · · · · · · · · · · · · · · · · · · · | | COMI | PRESSOR - TDS | H 283L | | | | | | |
| Compressor Power Speed Percent Suct Vol Flow | 3550 rpm | 1460.4 hp Compression Rat 3550 rpm Volume Ratio 75.6% Ideal Volume Rat | | 2.54 | Eff Model Volumetric Adiabatic I | | Hy | drocarbon Mix 69.0% 75.1% | | |
| | Temperature | Discharge Port Pressure | Mass Flow | 1 | me Flow | Standard (scfm) | l Volume | Flow //SCFD) | | |
| Suction Discharge | (°F) 80.0 222.5 | (psig) 98.6 352.0 | (Ibm/min) 553.0 553.0 | 1 | cfm) 619.6 625.6 | 12072.3 12072.3 | (IVIII | 17.384 17.384 | | |
| Dioditalgo | | | OIL SYSTEM | | | | <u> </u> | | | |
| Oil Type Oil Flow Main Inj Oil Flow Bearing Oil Flow Oil Pump Piping | 87.4 g 58.8 g 28.6 g | 00 Oil Cooler Hea pm Main Inj Oil Te pm Bearing Oil Te pm Oil Cooling Oil Main Inj Valve | emp emp | 160 <i>A</i> | .0 °F Oil S .0 °F Main M. Oil Main | ump Boost ystem Pres Drop Inj Orifice Dia Inj Cv Inj Valve Dia | - | 0.0 ps 10.0 ps 0.469 ir 5.0 1.00 ir | | |
| | | SYSTEM | | | | F | LUID | | | |
| Upstream Temperature Upstream Pressure Suct Line Superheat Suct Line Pres Drop | 98. | D.0 °F Downstrear D.0 °F Disc Line D Disc Line P Separator F | esuperheat res Drop | | 222.5 °F 352.0 psig 0.0 °F 0.0 psi 0.0 psi | Molecular Weight Cp/Cv Compressibility Z Molecular Weight | 17.38 | 17.38 1.30 0.98 | | |
| | | FRR | ORS AND WAR | NINGS | | | | | | |





| BY JOHNSON CONTROLS | | | | pon oje. | | | | | | |
|---|------------------------------------|---|----------------|------------------|-----------------------------|-----------------|---------------|-----------------------------------|-------------------|---------------------------------|
| CoolWare v7.1.2 | | | Regis | stered To: Toron | nont Energy | System | s - Jar | nes Storoshenko | | |
| Customer Name End User Name Project | | | | Refere Item | rence Screw Open | | | Atmospheric Pressure 12.9 | | Run # 6 12.90 psi 3577 ft |
| | | | COMF | RESSOR - TI | OSH 283L | | | | | |
| Compressor Power | 1460.4 hp | Com | pression Rat | io | 3.2 | 1 | Model | | Hyd | Irocarbon Mi |
| Speed | 3550 rpm | | me Ratio | | 2.5 | | umetrio | | | 69.0% |
| Percent Suct Vol Flow | 75.6% | | Volume Rat | io | 2.5 | | abatic | Eff | | 75.1% |
| | | Disch | harge Port | | Standa | | | | | |
| | Temperature | | ssure | Mass Flow | Vo | olume F | low | | d Volume F | |
| | (°F) | | sig) | (lbm/min) | | (cfm) | | (scfm) | | SCFD) 17.384 |
| Suction | 80.0 | | 8.6 | 553.0 | | 1619.6 625.6 | | 12072.3 12072.3 | | 17.3 <u>64</u> 17.384 |
| Discharge | 222.5 | 35 | 52.0 | 553.0 | | 025.0 | | 12072.3 | | 17.504 |
| - | | | | OIL SYSTE | | | | | | |
| Oil Type | | | il Cooler Hea | | 1374.5 | | | ump Boost | | 0.0 ps |
| Oil Flow | | | ain Inj Oil Te | | | 60.0 °F | | ystem Pres Drop | | 10.0 ps |
| Main Inj Oil Flow | ~ | 58.8 gpm Bearing Oil Temp 160.0 °F Main Inj Orifice Dia | | | | | 0.469 i 5. | | | |
| Bearing Oil Flow | 28.6 g | | il Cooling | _ | | | | | | ა. 1.00 i |
| Oil Pump Piping | All | Oil M | ain Inj Valve | Pos | | 100.0% | IVIAIR | Inj Valve Dia | | 1.001 |
| | - | SYS | TEM | | | | | | LUID | |
| Upstream Temperatur | - | | | n Temperature | | | 2.5 °F | Molecular Weight | | 17.38 |
| Upstream Pressure | 98. | 6 psig | Downstream | n Pressure | | |) psig | Cp/Cv | | 1.30 |
| Suct Line Superheat | | | Disc Line D | | | | 0.0 °F | Compressibility Z | 17.38 | 0.98 |
| Suct Line Pres Drop | |).0 psi | Disc Line P | | | | .0 psi | Molecular Weight | 17.30 | |
| | | | Separator F | res Drop | | 0 | .0 psi | | | |
| | | | | COMPRESS | OR | | | | | |
| * | <u>Bearings</u> | | | | | | | <u>Rotors</u> | | |
| Position | | ad Ibf | | L10 (hrs) | | | | | Ma | |
| Male Inlet Radial | | 688 | | 52614 | Rotor Thrus | | | | Norm 10048.2 I | |
| Male Outlet Radial | | 015 | | 55975 | Balance Pi | | гсе | | 480 µ | |
| Female Inlet Radial | | 508 | | 50377 | Inlet Blocki Outlet Bloc | | 5 | | 720 µ | - |
| Female Outlet Radial | | 3 1 93 910 | | 23593 60635 | Max Rotor | _ | , | | 1194 µ | • |
| Male Axial | | 910 640 | | 38410 | IVIAN I VOIDI | Dody | | Max allowable deflec | | • |
| Female Axial | 3 | 040 | | 30410 | Rotor Shaf | t Fatigu | | | 2.2 | |
| | | | ERR | ORS AND WA | ARNINGS | | | | | |
| | Disclaimer: the information contai | ned in this | | | | rves the ri | ght to fin | al verification of all rating res | ults. | |
| | | | | 4 | | | | | | |





| | • | pen cyste. | | | | - | | | | |
|-------------------------------|--|--|--|--|--|---|--|--|--|--|
| | | | | | | | | | | |
| | | Reference Item | | Open | | | Run # 7 12.90 psi 3577 ft | | | |
| | COM | PRESSOR - TDS | H 283L | - | | - | | | | |
| 3550 rpm | Volume Ratio | | 2.35 | Volumetric | | Hy | drocarbon Mix 69.6% 75.8% | | | |
| Temperature (°F) | Pressure (psig) | Mass Flow (lbm/min) | | | (scfm) | | ISCFD) | | | |
| 80.0 217.7 | 108.6 352.0 | 607.9 607.9 | | | 13271.3 13271.3 | | 19.111 19.111 | | | |
| | | OIL SYSTEM | | | | | | | | |
| 84.8 gr 57.3 gr 27.5 gr | om Main Inj Oil Te om Bearing Oil Te om Oil Cooling | emp | 160 160 A | .0 °F Oil S .0 °F Main .ll Oil Main | ystem Pres Drop Inj Orifice Dia Inj Cv | | 0.0 psi 10.0 psi 0.469 in 5.0 1.00 in | | | |
| | SYSTEM | | | | FI FI | LUID | | | | |
| 108.6 | psig Downstrea 0.0 °F Disc Line Disc Line F | m Pressure Desuperheat Pres Drop | | 217.7 °F 352.0 psig 0.0 °F 0.0 psi 0.0 psi | Molecular Weight Cp/Cv Compressibility Z Molecular Weight | 17.38 | 17.38 1.30 0.98 | | | |
| | ERF | ORS AND WAR | VINGS | | | | ···· | | | |
| | 3550 rpm 76.2% Temperature (°F) 80.0 217.7 CP-1516-1 84.8 gp 57.3 gp 27.5 gp All 6 | COMI 1460.4 hp 3550 rpm 76.2% Ideal Volume Ratio Ideal Volume Ideal V | Registered To: Toromon Reference Item COMPRESSOR - TDS 1460.4 hp Compression Ratio Volume Ratio Ideal Volume Ratio Discharge Port Temperature Pressure Mass Flow (PF) (psig) (Ibm/min) 80.0 108.6 607.9 217.7 352.0 607.9 CP-1516-100 Oil Cooler Heat Rej Main Inj Oil Temp Bearing Oil Temp 57.3 gpm 27.5 gpm All Oil Main Inj Valve Pos SYSTEM 80.0 °F Downstream Temperature Downstream Pressure 0.0 °F Disc Line Desuperheat Disc Line Pres Drop Separator Pres Drop | Registered To: Toromont Energy Sy Reference Item | Registered To: Toromont Energy Systems - Jar | Registered To: Toromont Energy Systems - James Storoshenko Reference Item | Registered To: Toromont Energy Systems - James Storoshenko Reference Item Screw Open Date 3/12/2008 Atmospheric Pressure Elevation Atmospheric Pressure Elevation Atmospheric Pressure Elevation Standard Volume Ratio 2.35 Volumetric Eff Adiabatic Eff Standard Standard | | | |





Registered To: Toromont Energy Systems - James Storoshenko CoolWare v7.1.2 Date 3/12/2008 Run # 7 Reference Customer Name 12.90 psi Screw Open Atmospheric Pressure Item End User Name 3577 ft Elevation Project **COMPRESSOR - TDSH 283L** Hydrocarbon Mix Eff Model 1460.4 hp Compression Ratio Compressor Power 69.6% 2.35 Volumetric Eff Volume Ratio 3550 rpm Speed 75.8% Adiabatic Eff 2.35 76.2% Ideal Volume Ratio Percent Suct Vol Flow Standard Discharge Port Volume Flow Standard Volume Flow Mass Flow Temperature Pressure (MMSCFD) (lbm/min) (cfm) (°F) (psig) 19.111 1633.9 13271.3 108.6 607.9 Suction 80.0 19.111 13271.3 607.9 682.8 352.0 217.7 Discharge **OIL SYSTEM** 0.0 psi 1228.9 kbtu/hr Oil Pump Boost Oil Cooler Heat Rej CP-1516-100 Oil Type Oil System Pres Drop 10.0 psi 160.0°F Main Inj Oil Temp 84.8 gpm Oil Flow 0.469 in 160.0 °F Main Inj Orifice Dia Bearing Oil Temp Main Inj Oil Flow 57.3 gpm 5.0 All Oil Main Inj Cv Oil Cooling 27.5 gpm Bearing Oil Flow 1.00 in 100.0% Main Inj Valve Dia All Oil Main Inj Valve Pos Oil Pump Piping **FLUID** SYSTEM 17.38 217.7 °F Molecular Weight Downstream Temperature 80.0 °F Upstream Temperature 1.30 352.0 psig Cp/Cv Downstream Pressure 108.6 psig Upstream Pressure 0.98 Compressibility Z 0.0 °F 0.0 °F Disc Line Desuperheat Suct Line Superheat 17.38 Molecular Weight Disc Line Pres Drop 0.0 psi 0.0 psi Suct Line Pres Drop 0.0 psi Separator Pres Drop COMPRESSOR Rotors Bearings Male Female L10 (hrs) Load lbf Position Rotor Thrust Direction Normal Normal 54914 Male Inlet Radial 5616 9635.3 lbf 0.0 lbf Balance Piston Force 59894 8833 Male Outlet Radial Inlet Blocking Dia 477 µin 623 µin 6563 48991 Female Inlet Radial 712 µin 981 µin Outlet Blocking Dia 25327 Female Outlet Radial 12915 1186 µin 1597 µin Max Rotor Body 2801 67986 Male Axial Max allowable deflection 2140 µin 3519 42537 Female Axial Rotor Shaft Fatigue Safety Factor 1.94 **ERRORS AND WARNINGS**





| BY JOHNSON CONTROLS | | • | pen syste | 111 | | | *** | |
|---|----------------------------|---|------------------------|------------------------|--|--|---|--|
| CoolWare v7.1.2 | | Regi | stered To: Toromor | it Energy Sy | /stems - Jai | mes Storoshenko | | |
| Customer Name End User Name Project | | | | ce Screw Open | | | Date 3/12/2008 Atmospheric Pressure Elevation | |
| | | COMI | PRESSOR - TDS | H 283L | | | | |
| Compressor Power Speed Percent Suct Vol Flow | 3550 rpm | 1460.3 hp Compression Ratio 3550 rpm Volume Ratio 77.5% Ideal Volume Ratio Discharge Port | | | 2.77 Eff Model 2.20 Volumetric Eff 2.20 Adiabatic Eff Standard | | Hydrocarbon I 71. 77. | |
| | Temperature (°F) | Pressure (psig) | Mass Flow (lbm/min) | | me Flow cfm) | Standard (scfm) | | ISCFD) |
| Suction | 80.0 | 118.6 | 671.6 | 100711 | | 14661.1 | | 21.112 |
| Discharge | 212.4 | 352.0 | 671.6 | 7 | 48.4 | 14661.1 | | 21.112 |
| <u>.</u> | | | OIL SYSTEM | | | | | |
| Oil Type Oil Flow Main Inj Oil Flow Bearing Oil Flow Oil Pump Piping | 81.8 g 55.3 g 26.5 g | IOO Oil Cooler Hea pm Main Inj Oil Te pm Bearing Oil Te pm Oil Cooling Oil Main Inj Valve | emp | 160 160 <i>A</i> | .0 °F Oil S .0 °F Mair All Oil Mair | Pump Boost System Pres Drop n Inj Orifice Dia n Inj Cv n Inj Valve Dia | | 0.0 ps 10.0 ps 0.469 i 5. 1.00 i |
| | | SYSTEM | | | | F | LŲID | |
| Upstream Temperature Upstream Pressure Suct Line Superheat Suct Line Pres Drop | 118. | | esuperheat res Drop | | 212.4 °F 352.0 psig 0.0 °F 0.0 psi 0.0 psi | Molecular Weight Cp/Cv Compressibility Z Molecular Weight | 17.38 | 17.38 1.30 0.98 |
| | | EDE | ORS AND WAR | NINGS | | | | |





Registered To: Toromont Energy Systems - James Storoshenko CoolWare v7.1.2 Date 3/12/2008 Run #8 Reference Customer Name 12.90 psi Atmospheric Pressure Screw Open Item End User Name 3577 ft Elevation Project **COMPRESSOR - TDSH 283L** Hydrocarbon Mix 2.77 Eff Model Compression Ratio Compressor Power 1460.3 hp 71.1% 2.20 Volumetric Eff 3550 rpm Volume Ratio Speed 77.0% 2.20 Adiabatic Eff 77.5% Ideal Volume Ratio Percent Suct Vol Flow Standard Discharge Port Standard Volume Flow Volume Flow Mass Flow Temperature Pressure (MMSCFD) (cfm) (scfm) (lbm/min) (psig) (°F) 21.112 1667.7 14661.1 671.6 80.0 118.6 Suction 21.112 748.4 14661.1 671.6 352.0 Discharge 212.4 **OIL SYSTEM** 0.0 psi 1074.5 kbtu/hr | Oil Pump Boost Oil Cooler Heat Rei CP-1516-100 Oil Type * 10.0 psi Oil System Pres Drop 160.0 °F 81.8 gpm Main Inj Oil Temp Oil Flow 160.0 °F Main Inj Orifice Dia 0.469 in Bearing Oil Temp Main Inj Oil Flow 55.3 gpm 5.0 All Oil Main Inj Cv Oil Cooling 26.5 gpm Bearing Oil Flow 1.00 in Main Inj Valve Dia 100.0% All Oil Main Ini Valve Pos Oil Pump Piping **FLUID SYSTEM** 17,38 Molecular Weight 212.4 °F Downstream Temperature Upstream Temperature 80.0 °F Cp/Cv 1.30 352.0 psig Downstream Pressure **Upstream Pressure** 118.6 psig 0.98 Compressibility Z 0.0 °F Disc Line Desuperheat Suct Line Superheat 0.0 °F Molecular Weight 17.38 0.0 psi Disc Line Pres Drop 0.0 psi Suct Line Pres Drop 0.0 psi Separator Pres Drop COMPRESSOR Rotors Bearings Male Female Load lbf L10 (hrs) Position Rotor Thrust Direction Normal Normal 5608 55155 Male Inlet Radial 9222.5 lbf 0.0 lbf Balance Piston Force 64084 8656 Male Outlet Radial 478 µin 632 µin 45943 Inlet Blocking Dia 6691 Female Inlet Radial 981 µin 706 µin Outlet Blocking Dia 26406 12754 Female Outlet Radial 1185 µin 1610 µin 65721 Max Rotor Body 2833 Male Axial Max allowable deflection 2140 µin 46194 3423 Female Axial Rotor Shaft Fatigue Safety Factor 2.31 1.96 **ERRORS AND WARNINGS** Disclaimer: the information contained in this program is subject to change without notice. Frick reserves the right to final verification of all rating results





| BY JOHNSON CONTROLS | | ` | - pun - yuun | • | | | | |
|---|---------------------------------|--------------------------------------|--------------------------------|------------------|-------------------|---|-------|---------------------------------|
| CoolWare v7.1.2 | | Reg | istered To: Toromont | Energy Sy | stems - Jar | nes Storoshenko | | |
| Customer Name End User Name Project | | | Reference Item | Screw (| Open | Date 3/12/200 Atmospheric F Elevation | | Run # 9 12.90 psi 3577 ft |
| | " | COM | PRESSOR - TDSH | 283L | | | | |
| Compressor Power | 1460.1 | hp Compression Ra | atio | 2.58 | Eff Model | <u> </u> | Hy | drocarbon Mix |
| Speed | 3550 rj | pm Volume Ratio | | 2.20 | Volumetric | : Eff | | 72.4% |
| Percent Suct Vol Flow | 78.8 | 8% Ideal Volume Ra Discharge Port | | 2.06 Standard | Adiabatic | Eff | | 77.6% |
| | Temperature (°F) | Pressure (psig) | Mass Flow (lbm/min) | | me Flow cfm) | Standard (scfm) | | MSCFD) |
| Suction | 80.0 | 128.6 | 736.0 | 1698.5 | | 16067.3 | | 23.137 |
| Discharge | 207.3 | 352.0 | 736.0 | 8 | 314.0 | 16067.3 | | 23.137 |
| | **** | | OIL SYSTEM | | | | | |
| Oil Type | CP-151 | 6-100 Oil Cooler He | at Rej | 932.0 kb | tu/hr Oil P | ump Boost | | 0.0 psi |
| Oil Flow | 78.8 | 3 gpm Main Inj Oil Te | emp | | | ystem Pres Drop | - | 10.0 psi |
| Main Inj Oil Flow | 53.3 | 3 gpm Bearing Oil To | emp | | | Inj Orifice Dia | | 0.469 in |
| Bearing Oil Flow | 25.5 | 5 gpm Oil Cooling | | | All Oil Main | | | 5.0 |
| Oil Pump Piping | • | All Oil Main Inj Valve | e Pos | 10 | 0.0% Main | Inj Valve Dia | | 1.00 in |
| | | SYSTEM | | | | FL | .UID | |
| Upstream Temperature | | 80.0 °F Downstrea | m Temperature | | 207.3 °F | Molecular Weight | | 17.38 |
| Upstream Pressure | | 28.6 psig Downstrea | m Pressure | | 352.0 psig | Cp/Cv | | 1.30 |
| Suct Line Superheat | | | Desuperheat | | 0.0 °F | Compressibility Z | | 0.98 |
| Suct Line Pres Drop | | 0.0 psi Disc Line F | Pres Drop | | 0.0 psi | Molecular Weight | 17.38 | |
| | | Separator | Pres Drop | | 0.0 psi | | | |
| | | ERF | RORS AND WARN | INGS | | | | |
| | Disclaimer: the information cor | ntained in this program is sub | ject to change without notice. | Frick reserves | the right to fina | l verification of all rating resul | ts. | |





| | | - | | | | | |
|-------------|--|---|-----------------|------------------|-------------------|--|---------------------------------|
| | Regi | | | stems - Ja | | | |
| | | Referer Item | | Open | | : Pressure | Run # 9 12.90 psi 3577 ft |
| | COM | PRESSOR - TD | | | | | |
| 1460.1 hp | Compression Ra | atio | 2.58 | Eff Mode | | Hydr | ocarbon Mix |
| 3550 rpm | Volume Ratio | | | | | | 72.4% |
| 78.8% | Ideal Volume Ra | ntio | 2.06 | Adiabatio | Eff | | 77.6% |
| | Discharge Port | | Standard | | | | |
| Temperature | Pressure | Mass Flow | Volu | me Flow | Standa | | |
| (°F) | (psig) | (lbm/min) | | | (scfm) | | |
| 80.0 | 128.6 | 736.0 | | | | | 3.137 |
| 207.3 | 352.0 | 736.0 | 8 | 14.0 | 16067.3 | 2 | 3.137 |
| | | OIL SYSTEN | Λ | | | | |
| CP-1516-10 | 00 Oil Cooler He | at Rej | 932.0 kb | | | | 0.0 ps |
| | | | 160 | .0 °F Oil | System Pres Drop | | 10.0 ps |
| | | | 160 | .0 °F Mai | n Inj Orifice Dia | | 0.469 i |
| | | • | | | | | 5.0 |
| | | e Pos | 10 | 0.0% Mai | n Inj Valve Dia | | 1.00 i |
| | SYSTEM | | | | | FLUID | |
| | | m Temperature | | 207.3 °F | Molecular Weight | . " | 17.38 |
| | | | ; | 352.0 psig | Cp/Cv | | .1.30 |
| | | | | | Compressibility Z | | 0.98 |
| _ | | • | | 0.0 ps | Molecular Weight | 17.38 | |
| | | | | | | | |
| | J. Copper | | | • | | | |
| | | COMPRESSO |)R | | | | |
| Bearings | | | ···· | | Rotors | | |
| | d lbf | L10 (hrs) | | | | Male | |
| 58 | 06 | .00 | | | | | |
| 89 | 52 | 57283 | Balance Pisto | n Force | | | |
| 70 | 41 | | | | | • | • |
| 13′ | 124 | I | | - | | | |
| 33 | 59 | | Max Rotor Bo | dy | | | |
| 34 | 21 | 46282 | | | | • | |
| | | <u> </u> | Rotor Shaft F | atigue Saf | ety Factor | 2.2 | 4 1.91 |
| | | | | | | | |
| | 3550 rpm 78.8% Temperature (°F) 80.0 207.3 CP-1516-10 78.8 gp 53.3 gp 25.5 gp All 0 80 128.6 0 0. 0. Bearings Loa 58 89 70 133 | Temperature (°F) 80.0 CP-1516-100 78.8 gpm 53.3 gpm 25.5 gpm All Oil Rownstrea 0.0 °F 128.6 Downstrea 0.0 °F 0.0 psi Disc Line for Separator | COMPRESSOR - TD | Reference Item | Reference Item | Atmospheric Elevation COMPRESSOR - TDSH 283L 1460.1 hp 3550 rpm 78.8% Ideal Volume Ratio 2.20 Volumetric Eff 2.20 Volumetric E | Reference Item |





BY JOHNSON CONTROLS Registered To: Toromont Energy Systems - James Storoshenko CoolWare v7.1.2 Date 3/12/2008 Run # 10 Reference Customer Name 12.90 psi Atmospheric Pressure Screw Open Item End User Name 3577 ft Elevation Project **COMPRESSOR - TDSH 283L** Hydrocarbon Mix Eff Model Compression Ratio 1460.1 hp Compressor Power 73.7% Volumetric Eff Volume Ratio Speed 3550 rpm 77.8% Adiabatic Eff 1.94 Ideal Volume Ratio Percent Suct Vol Flow 80.1% Standard Discharge Port Volume Flow Standard Volume Flow Mass Flow Pressure Temperature (MMSCFD) (lbm/min) (cfm) (°F) (psig) 17509.1 25.213 802.0 1728.8 138.6 80.0 Suction 25.213 17509.1 802.0 880.5 352.0 202.4 Discharge **OIL SYSTEM** Oil Pump Boost 0.0 psi 799.4 kbtu/hr CP-1516-100 Oil Cooler Heat Rei Oil Type 10.0 psi Oil System Pres Drop 160.0 °F Main Inj Oil Temp Oil Flow 75.6 gpm 0.469 in 160.0 °F Main Inj Orifice Dia Bearing Oil Temp 51.2 gpm Main Inj Oil Flow All Oil Main Inj Cv 5.0 24.4 gpm Oil Cooling Bearing Oil Flow 1.00 in 100.0% Main Inj Valve Dia All Oil Main Inj Valve Pos Oil Pump Piping **FLUID** SYSTEM Molecular Weight 17.38 Downstream Temperature 202.4 °F 80.0 °F Upstream Temperature Cp/Cv 1.30 352.0 psig Downstream Pressure 138.6 psig Upstream Pressure 0.98 Compressibility Z 0.0 °F Disc Line Desuperheat 0.0 °F Suct Line Superheat Molecular Weight 17.38 0.0 psi Disc Line Pres Drop 0.0 psi Suct Line Pres Drop 0.0 psi Separator Pres Drop **ERRORS AND WARNINGS**





| Y JOHNSON CONTROLS | | <u> </u> | <u> </u> | | | | | |
|---|------------------------------------|-----------------------------------|------------------------------|----------------------------|-------------|------------------------------------|----------------------|--------------------------------|
| CoolWare v7.1.2 | | Reg | istered To: Toromo | | s - Jan | nes Storoshenko Date 3/12/200 | | |
| Customer Name End User Name Project | | | Referen Item | | Screw Open | | ressure 1 | Run # 10 2.90 psi 577 ft |
| | | COM | IPRESSOR - TDS | | | | | |
| Compressor Power | 1460.1 hp | Compression Ra | atio | 2.41 Eff i | | | Hydro | carbon Mix |
| Speed | | Volume Ratio | | 2.20 Volu | | | | 73.7% |
| Percent Suct Vol Flow | 80.1% | Ideal Volume Ra Discharge Port | atio | 1.94 Adia Standard | abatic E | | | 77.8% |
| | Temperature (°F) | Pressure (psig) | Mass Flow (lbm/min) | Volume F (cfm) | | (scfm) | Volume Flor (MMS) | CFD) |
| Suction | 80.0 | 138.6 | 802.0 | 1728.8 | | 17509.1 | | .213 |
| Discharge | 202.4 | 352.0 | 802.0 | 880.5 | | 17509.1 | 25 | 5.213 |
| | | | OIL SYSTEM | | | | | |
| Oil Type | CP-1516 - 10 | 00 Oil Cooler He | eat Rej | 799.4 kbtu/hr | | ump Boost | | 0.0 ps |
| Oil Flow | | m Main Inj Oil T | | 160.0 °F | | ystem Pres Drop | | 10.0 ps |
| Main Inj Oil Flow | 51.2 gp | m Bearing Oil T | emp | | | Inj Orifice Dia | | 0.469 i |
| Bearing Oil Flow | 24.4 gp | m Oil Cooling | | | Main | • | | 5. |
| Oil Pump Piping | Ali (| Dil Main Inj Valv | e Pos | 100.0% | Main | Inj Valve Dia | | 1.00 i |
| | | SYSTEM | | | | | .UID | |
| Upstream Temperature | 80 | .0 °F Downstrea | am Temperature | 202 | .4 °F | Molecular Weight | | 17.38 |
| Upstream Pressure | 138.6 | psig Downstrea | am Pressure | |) psig | Cp/Cv | | 1.30 |
| Suct Line Superheat | 0 | .0 °F Disc Line | Desuperheat | - |).0 °F | Compressibility Z | 47.00 | 0.98 |
| Suct Line Pres Drop | 0. | 0 psi Disc Line | | | .0 psi | Molecular Weight | 17.38 | |
| | | Separator | Pres Drop | 0 | .0 psi | | | |
| | | | COMPRESSO | R | | | | |
| | Bearings | ··· | _ | | | <u>Rotors</u> | | |
| Position | Loa | d lbf | L10 (hrs) | | | | Male | |
| Male Inlet Radial | 59 | 47 | 100, | Rotor Thrust Direc | | | Normal | |
| Male Outlet Radial | 91 | | V - | Balance Piston For | ·ce | | 8396.9 lbf | |
| Female Inlet Radial | | 14 | | nlet Blocking Dia | | | 513 µin | |
| Female Outlet Radial | | 384 | | Outlet Blocking Dia | 3 | | 754 µin 1272 µin | - |
| Male Axial | | 47 | | Max Rotor Body | | Max allowable deflect | • | • |
| Female Axial | 34 | 15 | 46515 | Rotor Shaft Fatigu | | | ιοπ 2140 μm 2.20 | |
| | | | | | e Sale | ty r actor | 2.20 | 1.01 |
| | | ER | RORS AND WAR | RNINGS | | | | |
| | is also as the information contain | ed in this program is er | ibject to change without not | ice. Frick reserves the ri | ght to fin: | al verification of all rating resu | lts. | |





| BY JOHNSON CONTROLS | | ` | opon oyoto | | | | | |
|---|--------------------------------|---|--|--------------|--|--|-------------------|---|
| CoolWare v7.1.2 | | Reg | istered To: Toromon | t Energy Sy | stems - Jar | nes Storoshenko | | |
| Customer Name End User Name Project | | | Referenc Item | e Screw (| Open | Date 3/12/20 Atmospheric Elevation | | Run # 1 12.90 psi 3577 ft |
| | | COM | PRESSOR - TDS | H 283L | • | | | |
| Compressor Power Speed Percent Suct Vol Flow | 1460.1 hp 3550 rpm 93.3% | Volume Ratio | | 4.02 | Eff Model Volumetric Adiabatic | | Ну | drocarbon Mix 84.8% 76.6% |
| | Temperature (°F) | Pressure (psig) | Mass Flow (lbm/min) | | me Flow cfm) | Standard (scfm) | l Volume I (MN | (ISCFD) |
| Suction Discharge | 80.0 244.0 | 48.6 317.0 | 374.7 374.7 | | 989.8 83.6 | 8181.0 8181.0 | | 11.781 11.781 |
| | | | OIL SYSTEM | | <u> </u> | | | |
| Oil Type Oil Flow Main Inj Oil Flow Bearing Oil Flow Oil Pump Piping | 30.3 g | | emp emp | 160 A | .0 °F Oil S .0 °F Main II Oil Main | ump Boost ystem Pres Drop Inj Orifice Dia Inj Cv Inj Valve Dia | | 0.0 ps 10.0 ps 0.469 ir 5.0 1.00 ir |
| | | SYSTEM | | | | F | LUID | |
| Upstream Temperature Upstream Pressure Suct Line Superheat Suct Line Pres Drop | 48.6 | 0.0 °F Downstrea 6 psig Downstrea 0.0 °F Disc Line I .0 psi Disc Line F Separator | m Pressure Desuperheat Pres Drop | | 244.0 °F 317.0 psig 0.0 °F 0.0 psi 0.0 psi | Molecular Weight Cp/Cv Compressibility Z Molecular Weight | 17.38 | 17.38 1.30 0.98 |
| | | FRI | RORS AND WAR | VINGS | | | | |





| CoolWare v7.1.2 | <u> </u> | | Regis | tered To: Toromo | nt Energy Sy | stems - Ja | mes Storoshenko | | |
|---|-------------------|--------|--------------------------|------------------|------------------|---|-----------------------------|----------------------------------|---------------------|
| Customer Name End User Name Project | Reference Item | | | screw (| Open | Date 3/12/2 Atmospheric Elevation | Pressure 1 | Run # 1 2.90 psi 3577 ft | |
| | | | COMP | RESSOR - TD | | | | | |
| Compressor Power | 1460.1 hp | | ression Rat | io | | Eff Model | | Hydr | carbon Mix 84.8% |
| Speed | 3550 rpm | 1 | ne Ratio | | | Volumetri | | | 76.6% |
| Percent Suct Vol Flow | 93.3% | | Volume Rati arge Port | 0 | 4.02 Standard | Adiabatic | <u>Ε</u> π | | 70.076 |
| | Temperature | Press | | Mass Flow | | me Flow cfm) | Standa (scfm) | rd Volume Flo (MMS | |
| | (°F) | (psi | | (lbm/min) | | 989.8 | 8181.0 | | 1.781 |
| Suction | 80.0 | 48. | | 374.7 374.7 | | 83.6 | 8181.0 | | 1.781 |
| Discharge | 244.0 | 317 | 7.0 | | | 00.0 | 0.0.00 | | |
| | | | | OIL SYSTEM | | | | <u></u> | 0.0 ps |
| Oil Type | CP-1516-1 | 1 | Cooler Hea | | 1889.9 kb | | Pump Boost | | 0.0 ps 10.0 ps |
| Oil Flow | * 88.7 gr | | in Inj Oil Te | | | | System Pres Drop | | 0.469 ii |
| Main Inj Oil Flow | | | aring Oil Te | mp | | .u °F Maii II Oil Maii | n Inj Orifice Dia | | 5.0 |
| Bearing Oil Flow | | | Cooling | _ | | | n Inj Cv n Inj Valve Dia | | 1.00 ii |
| Oil Pump Piping | All | Oil Ma | in Inj Valve | Pos | 10 | 0.0% Wal | | | 1.00 % |
| | | SYST | EM | | | | | FLUID | 47.55 |
| Upstream Temperature | | | | n Temperature | | 244.0 °F | Molecular Weight | | 17.38 |
| Upstream Pressure | 48.6 | | Downstrean | | | 317.0 psig | Cp/Cv | | 1.30 0.98 |
| Suct Line Superheat | | | Disc Line D | | | 0.0 °F | | 17.38 | 0.30 |
| Suct Line Pres Drop | . 0 | | Disc Line P | | | 0.0 psi | Molecular Weight | 17.56 | |
| | | , | Separator P | res Drop | | 0.0 psi | | | |
| | | | | COMPRESSO | OR . | | | | |
| | Bearings | _ | - | | | | <u>Rotors</u> | | |
| Position | | ad lbf | | L10 (hrs) | | | | Male | |
| Male Inlet Radial | 52 | 282 | | 1 | Rotor Thrust | | | Norma | |
| Male Outlet Radial | 77 | 761 | | v | Balance Pisto | | | 10580.7 lb | |
| Female Inlet Radial | == | 253 | | * | Inlet Blocking | | | 435 µii | |
| Female Outlet Radial | | 992 | | | Outlet Blockin | _ | | 636 µii 1069 µii | |
| Male Axial | | 800 | | | Max Rotor Bo | ay | May allowable defe | • | • |
| Female Axial | 38 | 540 | | 41765 | D-1 018 T | ations Oct | Max allowable defle | ection 2140 µii 2.5 | |
| | | | | | Rotor Shaft F | atigue Saf | ety Factor | 2.0 | 2.00 |
| | | | | ORS AND WA | | | | | |





Registered To: Toromont Energy Systems - James Storoshenko CoolWare v7.1.2 Date 3/12/2008 Run#2 Reference **Customer Name** 12.90 psi Atmospheric Pressure Screw Open Item End User Name 3577 ft Elevation Project **COMPRESSOR - TDSH 283L** Eff Model Hydrocarbon Mix 4.61 Compressor Power 1460.0 hp Compression Ratio 81.7% 3.49 Volumetric Eff 3550 rpm Volume Ratio Speed 76.7% 3.49 Adiabatic Eff Ideal Volume Ratio 89.5% Percent Suct Vol Flow Standard Discharge Port Volume Flow Standard Volume Flow Mass Flow Pressure Temperature (MMSCFD) (scfm) (lbm/min) (cfm) (psig) (°F) 9171.2 13.207 1918.7 58.6 420.1 80.0 Suction 9171.2 13.207 538.3 239.0 317.0 420.1 Discharge **OIL SYSTEM** 0.0 psi 1731.2 kbtu/hr | Oil Pump Boost CP-1516-100 Oil Cooler Heat Rei Oil Type 10.0 psi Oil System Pres Drop 160.0 °F 86.6 gpm Main Inj Oil Temp Oil Flow 0.469 in Main Inj Orifice Dia 160.0 °F Bearing Oil Temp Main Inj Oil Flow 57.3 gpm 5.0 Main Inj Cv All Oil Oil Cooling Bearing Oil Flow 29.3 gpm 1.00 in Main Inj Valve Dia 100.0% All Oil Main Inj Valve Pos Oil Pump Piping **FLUID SYSTEM** 17.38 239.0 °F Molecular Weight 80.0 °F Downstream Temperature Upstream Temperature Cp/Cv 1.30 58.6 psig | Downstream Pressure 317.0 psig Upstream Pressure 0.98 Compressibility Z 0.0 °F Disc Line Desuperheat 0.0 °F Suct Line Superheat 17.38 Molecular Weight Disc Line Pres Drop 0.0 psi 0.0 psi Suct Line Pres Drop 0.0 psi Separator Pres Drop **ERRORS AND WARNINGS**





Registered To: Toromont Energy Systems - James Storoshenko CoolWare v7.1.2 Date 3/12/2008 Run#2 Reference Customer Name 12.90 psi Screw Open Atmospheric Pressure ltem End User Name 3577 ft Elevation Project **COMPRESSOR - TDSH 283L** Hydrocarbon Mix 4.61 Eff Model Compression Ratio 1460.0 hp Compressor Power 81.7% 3.49 Volumetric Eff Volume Ratio Speed 3550 rpm 76.7% Adiabatic Eff 3.49 Ideal Volume Ratio 89.5% Percent Suct Vol Flow Standard Discharge Port Volume Flow Standard Volume Flow Mass Flow Pressure Temperature (MMSCFD) (scfm) (lbm/min) (cfm) (psig) (°F) 13.207 9171.2 1918.7 420.1 80.0 58.6 Suction 13.207 9171.2 420.1 538.3 317.0 Discharge 239.0 **OIL SYSTEM** 0.0 psi 1731.2 kbtu/hr Oil Pump Boost CP-1516-100 | Oil Cooler Heat Rej Oil Type - 10.0 psi Oil System Pres Drop 160.0 °F Main Inj Oil Temp Oil Flow 86.6 gpm 0.469 in 160.0 °F Main Inj Orifice Dia Bearing Oil Temp 57.3 gpm Main Inj Oil Flow 5.0 All Oil Main Ini Cv 29.3 gpm Oil Cooling Bearing Oil Flow 1.00 in 100.0% Main Inj Valve Dia All Oil Main Inj Valve Pos Oil Pump Piping **FLUID SYSTEM** Molecular Weight 17.38 239.0 °F Downstream Temperature 80.0 °F Upstream Temperature Cp/Cv 1.30 58.6 psig Downstream Pressure 317.0 psig Upstream Pressure 0.98 Compressibility Z 0.0 °F Disc Line Desuperheat 0.0 °F Suct Line Superheat Molecular Weight 17.38 0.0 psi 0.0 psi Disc Line Pres Drop Suct Line Pres Drop 0.0 psi Separator Pres Drop COMPRESSOR Rotors Bearings Female Male L10 (hrs) Load lbf Position Normal Rotor Thrust Direction Normal 67814 Male Inlet Radial 5271 0.0 lbf 10254.6 lbf Balance Piston Force 88305 7862 Male Outlet Radial 437 µin 583 µin Inlet Blocking Dia 6225 58426 Female Inlet Radial 642 µin 912 µin Outlet Blocking Dia 12007 32293 Female Outlet Radial 1077 µin 1487 µin Max Rotor Body 153827 2134 Male Axial Max allowable deflection 2140 µin 43924 3481 Female Axial 2.08 Rotor Shaft Fatigue Safety Factor **ERRORS AND WARNINGS**





| BY JOHNSON CONTROLS | | (| Open Syste | m | | | ENI | ERGY SYSTEMS |
|---|-------------------------------|--|---|----------------------------------|---|--|-------|---|
| CoolWare v7.1.2 | | Regi | stered To: Toromor | nt Energy Sy | stems - Jar | mes Storoshenko | | |
| Customer Name End User Name Project | Reference | | | | Open | Date 3/12/200 Atmospheric F Elevation | | Run # 3 12.90 psi 3577 ft |
| | · | COM | PRESSOR - TDS | H 283L | | | | |
| Compressor Power Speed Percent Suct Vol Flow | • | np Compression Ra om Volume Ratio '% Ideal Volume Ra Discharge Port | | 4.05 3.09 3.09 Standard | Volumetrio | = | Hy | drocarbon Mix 80.1% 77.1% |
| | Temperature (°F) | Pressure (psig) | Mass Flow (lbm/min) | | me Flow cfm) | Standard (scfm) | | (SCFD) |
| Suction Discharge | 80.0 233.8 | 68.6 317.0 | 469.2 469.2 | | 880.1 96.8 | 10243.7 10243.7 | | 14.751 14.751 |
| | | | OIL SYSTEM | | | | | |
| Oil Type Oil Flow Main Inj Oil Flow Bearing Oil Flow Oil Pump Piping | 84.3 56.0 28.3 | CP-1516-100 Oil Cooler Heat Rej 84.3 gpm Main Inj Oil Temp 56.0 gpm Bearing Oil Temp 28.3 gpm Oil Cooling All Oil Main Inj Valve Pos | | 160 A | .0 °F Oil S .0 °F Mair III Oil Mair | Pump Boost System Pres Drop n Inj Orifice Dia n Inj Cv n Inj Valve Dia | - | 0.0 psi 10.0 psi 0.469 in 5.0 1.00 in |
| | | SYSTEM | | | | FL | .UID | |
| Upstream Temperature80.0 °IUpstream Pressure68.6 psiSuct Line Superheat0.0 °I | | 8.6 psig Downstrea | 0 °F Downstream Temperature psig Downstream Pressure 0 °F Disc Line Desuperheat | | 233.8 °F 317.0 psig 0.0 °F 0.0 psi | Molecular Weight Cp/Cv Compressibility Z Molecular Weight | 17.38 | 17.38 1.30 0.98 |
| Suct Line Pres Drop | | Separator | | | 0.0 psi | 3.1 | | |
| | | ERF | RORS AND WAR | NINGS | | | | |
| Đ | sclaimer: the information con | tained in this program is sub | ject to change without notic | e. Frick reserves | s the right to fina | al verification of all rating resul | ts. | |





| BY JOHNSON CONTROLS | | | Shell Shar | | | | | - | |
|---|-------------------------------|---|---------------------------|---|---|---|--|--------------------------------|---|
| CoolWare v7.1.2 | | Reg | istered To: Torom | ont Energy Sy | ystems - | James St | | | |
| Customer Name End User Name Project | | | Refere Item | nce Screw | Open | | Date 3/12/20 Atmospheric I Elevation | Pressure | Run # 3 12.90 psi 3577 ft |
| | | COM | PRESSOR - TE | SH 283L | | | | | |
| Compressor Power Speed Percent Suct Vol Flow | eed 3550 rpm Volu | | | 4.05 3.09 3.09 Standard | Adiaba | etric Eff | | Hydr | ocarbon Mix 80.1% 77.1% |
| | Temperature (°F) | Pressure (psig) | Mass Flow (lbm/min) | | me Flov (cfm) | ′ | (scfm) | l Volume Flo (MMS | CFD) |
| Suction Discharge | 80.0 233.8 | 68.6 317.0 | 469.2 469.2 | | 880.1 596.8 | | 10243.7 10243.7 | | 4.751 4.751 |
| Discharge | 200.0 | | OIL SYSTEI | | | | | <u> </u> | |
| Oil Type Oil Flow Main Inj Oil Flow Bearing Oil Flow Oil Pump Piping | 84.3 gp 56.0 gp 28.3 gp | Oll Cooler He Main Inj Oil T Bearing Oil T Oil Cooling Main Inj Valve | emp emp | 160 / | 0.0 °F 0 0.0 °F N All Oil N | oil Pump E Oil System Main Inj Oi Main Inj Oi Main Inj Va | Pres Drop rifice Dia V | | 0.0 psi 10.0 psi 0.469 in 5.0 1.00 in |
| | | SYSTEM | | | | | FI | LUID | |
| Upstream Temperature Upstream Pressure Suct Line Superheat Suct Line Pres Drop | 80. 68.6 0. | 0 °F Downstrea psig Downstrea 0 °F Disc Line I 0 psi Disc Line I | m Pressure Desuperheat | | 233.8 317.0 p 0.0 0.0 0.0 | sig Cp/C °F Com psi Mole | ecular Weight Cv pressibility Z ecular Weight | 17.38 | 17.38 1.30 0.98 |
| | | | COMPRESS | OR | | | | | |
| Position | <u>Bearings</u> Load | l lbf | L10 (hrs) | | _ | | Rotors | Male | |
| Male Inlet Radial Male Outlet Radial | 533 79 | 75 | 84220 | Rotor Thrust Balance Pisto | n Force | | | Norma 9841.7 lb 444 µir | f 0.0 lbf |
| Female Inlet Radial Female Outlet Radial Male Axial | 63(121 24 | 08 | 31404 | Inlet Blocking Outlet Blocking Max Rotor Bo | ng Dia | | | 444 µir 652 µir 1096 µir | 924 µin |
| Female Axial | 34 | | 45746 | Rotor Shaft F | atigue S | | illowable deflect tor | tion 2140 µir 2.46 | |
| | | FRI | RORS AND WA | RNINGS | | | | _ | |





| BY JOHNSON CONTROLS | | | 10 - 11 - 17 - 11 | | | | | |
|---|------------------------------------|---|------------------------|------------------------|--|--|-----------------|---|
| CoolWare v7.1.2 | | Regis | stered To: Toromor | nt Energy Sy | stems - J | | | *** |
| Customer Name End User Name Project | | | Referenc Item | ce Screw (| Open | Date 3/12/20 Atmospheric l Elevation | | Run # 4 12.90 psi 3577 ft |
| | | COMF | RESSOR - TDS | H 283L | | | | |
| Compressor Power Speed Percent Suct Vol Flow | | Compression Rat Volume Ratio Ideal Volume Rat Discharge Port | | 2.78 | Eff Mode Volumet Adiabati | ric Eff | Hy | drocarbon Mix 79.5% 77.7% |
| | Temperature (°F) | Pressure (psig) | Mass Flow (lbm/min) | | me Flow cfm) | (scfm) | Volume I (MN | Flow //SCFD) 16.434 |
| Suction Discharge | 80.0 228.4 | 78.6 317.0 | 522.7 522.7 | | 865.7 59.8 | 11412.3 11412.3 | | 16.434 |
| | | | OIL SYSTEM | | | | | |
| Oil Type Oil Flow Main Inj Oil Flow Bearing Oil Flow Oil Pump Piping | 54.4 gg 27.2 gg | OOI Cooler Hea om Main Inj Oil Te om Bearing Oil Te om Oil Cooling Oil Main Inj Valve | emp emp | 160 160 <i>A</i> | .0 °F Oil .0 °F Ma .11 Oil Ma | Pump Boost System Pres Drop iin Inj Orifice Dia iin Inj Cv iin Inj Valve Dia | | 0.0 psi 10.0 psi 0.469 in 5.0 1.00 in |
| | | SYSTEM | | | | F | LŲID | |
| Upstream Temperature Upstream Pressure Suct Line Superheat Suct Line Pres Drop | 78.6 C | 0.0 °F Downstrear 0 psig Downstrear 0.0 °F Disc Line D 0.0 psi Disc Line P | esuperheat res Drop | | 228.4 °F 317.0 psig 0.0 °F 0.0 ps | g Cp/Cv Compressibility Z Molecular Weight | 17.38 | 17.38 1.30 0.98 |
| | | Separator F | CORS AND WAR | NINGS | 0.0 ps | 81 | | <u>.</u> |
| n | isclaimer: the information contain | | | | the right to I | inal verification of all rating resu | ılts. | |
| <u>_</u> | | | | | | | | |





Registered To: Toromont Energy Systems - James Storoshenko CoolWare v7.1.2 Date 3/12/2008 Run # 4 Reference Customer Name 12.90 psi Atmospheric Pressure Screw Open Item End User Name Elevation 3577 ft Project **COMPRESSOR - TDSH 283L** Hydrocarbon Mix Eff Model Compression Ratio 1460.1 hp Compressor Power Volumetric Eff 79.5% 2.78 Volume Ratio 3550 rpm Speed 77.7% Adiabatic Eff 2.78 86.4% Ideal Volume Ratio Percent Suct Vol Flow Standard Discharge Port Standard Volume Flow Volume Flow Mass Flow Pressure Temperature (MMSCFD) (scfm) (cfm) (lbm/min) (psig) (°F) 16.434 11412.3 1865.7 522.7 80.0 78.6 Suction 11412.3 16.434 659.8 522.7 317.0 Discharge 228.4 **OIL SYSTEM** 0.0 psi Oil Pump Boost 1410.0 kbtu/hr CP-1516-100 Oil Cooler Heat Rej Oil Type 10.0 psi Oil System Pres Drop 160.0 °F Main Inj Oil Temp 81.7 gpm Oil Flow 0.469 in Main Inj Orifice Dia 160.0 °F Bearing Oil Temp 54.4 gpm Main Inj Oil Flow 5.0 All Oil Main Inj Cv Oil Cooling 27.2 gpm Bearing Oil Flow 1.00 in 100.0% Main Inj Valve Dia Main Inj Valve Pos All Oil Oil Pump Piping **FLUID** SYSTEM 17,38 228.4 °F Molecular Weight Downstream Temperature 80.0 °F Upstream Temperature 1.30 317.0 psig Cp/Cv Downstream Pressure 78.6 psig Upstream Pressure 0.98 Compressibility Z 0.0 °F Disc Line Desuperheat 0.0 °F Suct Line Superheat Molecular Weight 17.38 0.0 psi Disc Line Pres Drop 0.0 psi Suct Line Pres Drop 0.0 psi Separator Pres Drop COMPRESSOR Rotors Bearings Female Male L10 (hrs) Load lbf Position Normal Normal Rotor Thrust Direction 63454 5378 Male Inlet Radial 9428.9 lbf 0.0 lbf Balance Piston Force 81951 8040 Male Outlet Radial 452 µin 605 µin Inlet Blocking Dia 51686 6459 Female Inlet Radial 936 µin 661 µin **Outlet Blocking Dia** 30854 12173 Female Outlet Radial 1537 µin Max Rotor Body 1114 µin 78638 2669 Male Axial Max allowable deflection 2140 µin 47919 3382 Female Axial 2.06 Rotor Shaft Fatigue Safety Factor **ERRORS AND WARNINGS**





| BY IOHNSON CONTROLS | | | spen dyston | | | | | |
|--|------------------------------------|---|---|--------------|---|--|--------|---|
| CoolWare v7.1.2 | | Regi | stered To: Toromont | Energy Sy | stems - Jan | | | |
| Customer Name End User Name Project | Reference Item Screw Open | | Date 3/12/200 Atmospheric P Elevation | | Run # 5 12.90 psi 3577 ft | | | |
| | | COMI | PRESSOR - TDSH | 1283L | | | | |
| Compressor Power Speed Percent Suct Vol Flow | | · · · · · · · · · · · · · · · · · · · | tio | 3.25 2.53 | Eff Model Volumetric Adiabatic E | | Hy | drocarbon Mix 79.6% 78.3% |
| | Temperature (°F) | Pressure (psig) | Mass Flow (lbm/min) | | me Flow cfm) | Standard (scfm) | | (ISCFD) |
| Suction Discharge | 80.0 223.0 | 88.6 317.0 | 580.5 580.5 | | 867.8 '26.9 | 12674.0 12674.0 | | 18.251 18.251 |
| | | | OIL SYSTEM | | | | | |
| Oil Type Oil Flow Main Inj Oil Flow Bearing Oil Flow Oil Pump Piping | 78.9 gş 52.7 gş 26.2 gş | Oil Cooler Heom Main Inj Oil Toom Bearing Oil Tooling Oil Main Inj Valve | emp | 160 A | 0.0 °F Oil S 0.0 °F Main All Oil Main | ump Boost ystem Pres Drop Inj Orifice Dia Inj Cv Inj Valve Dia | | 0.0 psi 10.0 psi 0.469 in 5.0 1.00 in |
| | | SYSTEM | | | | FL | UID | |
| Upstream Temperature Upstream Pressure Suct Line Superheat Suct Line Pres Drop | 88.6 | 0.0 °F Downstrea 6 psig Downstrea 0.0 °F Disc Line D 0.0 psi Disc Line F | Desuperheat | | 223.0 °F 317.0 psig 0.0 °F 0.0 psi | Molecular Weight Cp/Cv Compressibility Z Molecular Weight | 17.38 | 17.38 1.30 0.98 |
| | | Separator | | IINGS | 0.0 psi | | | |
| | Disclaimer the information contain | | ORS AND WARN | | s the right to fina | al verification of all rating result | s. | |





Registered To: Toromont Energy Systems - James Storoshenko CoolWare v7.1.2 Date 3/12/2008 Run # 5 Reference **Customer Name** 12.90 psi Atmospheric Pressure Screw Open Item End User Name 3577 ft Elevation Project **COMPRESSOR - TDSH 283L** Hydrocarbon Mix 3.25 Eff Model Compression Ratio 1460.1 hp Compressor Power 79.6% Volumetric Eff 2.53 Volume Ratio 3550 rpm Speed 78.3% Adiabatic Eff 2.53 86.4% Ideal Volume Ratio Percent Suct Vol Flow Standard Discharge-Port Standard Volume Flow Volume Flow Mass Flow Pressure Temperature (MMSCFD) (scfm) (cfm) (lbm/min) (psig) (°F) 18.251 12674.0 1867.8 580.5 80.0 88.6 Suction 12674.0 18.251 726.9 580.5 317.0 Discharge 223.0 OIL SYSTEM 0.0 psi Oil Pump Boost 1249.8 kbtu/hr Oil Cooler Heat Rej CP-1516-100 Oil Type -10.0 psi Oil System Pres Drop 160.0 °F Main Inj Oil Temp 78.9 gpm Oil Flow 0.469 in Main Inj Orifice Dia 160.0 °F Bearing Oil Temp 52.7 gpm Main Inj Oil Flow 5.0 All Oil Main Inj Cv 26.2 apm Oil Cooling Bearing Oil Flow 1.00 in 100.0% Main Inj Valve Dia Main Inj Valve Pos All Oil Oil Pump Piping **FLUID SYSTEM** 17.38 223.0 °F Molecular Weight 80.0 °F Downstream Temperature Upstream Temperature 1.30 Cp/Cv 88.6 psig Downstream Pressure 317.0 psig Upstream Pressure 0.98 Compressibility Z Disc Line Desuperheat 0.0 °F 0.0 °F Suct Line Superheat Molecular Weight 17.38 0.0 psi 0.0 psi Disc Line Pres Drop Suct Line Pres Drop 0.0 psi Separator Pres Drop **COMPRESSOR** Rotors Bearings Female Male L10 (hrs) Load lbf Position Normal Normal Rotor Thrust Direction 62122 5412 Male Inlet Radial 0.0 lbf 9016.1 lbf Balance Piston Force 82342 8029 Male Outlet Radial 457 µin 616 µin Inlet Blocking Dia 47824 6611 Female Inlet Radial 944 µin 665 µin Outlet Blocking Dia 30859 12172 Female Outlet Radial 1559 µin Max Rotor Body 1125 µin 2903 61098 Male Axial Max allowable deflection 2140 µin 50366 3326 Female Axial 2.06 Rotor Shaft Fatigue Safety Factor **ERRORS AND WARNINGS**





BY JOHNSON CONTROLS Registered To: Toromont Energy Systems - James Storoshenko CoolWare v7.1.2 Date 3/12/2008 Run#6 Reference Customer Name Screw Open Atmospheric Pressure 12.90 psi ltem End User Name 3577 ft Elevation Project **COMPRESSOR - TDSH 283L** Hydrocarbon Mix 2.96 Eff Model Compressor Power 1460.2 hp | Compression Ratio 80.4% 2.33 Volumetric Eff 3550 rpm Volume Ratio Speed 79.0% Adiabatic Eff 2.33 87.0% Ideal Volume Ratio Percent Suct Vol Flow Discharge Port Standard Volume Flow Standard Volume Flow Mass Flow Temperature Pressure (MMSCFD) (cfm) (scfm) (lbm/min) (psig) (°F) 20.243 14057.4 1885.9 98.6 643.9 80.0 Suction 20.243 799.5 14057.4 643.9 Discharge 217.3 317.0 **OIL SYSTEM** 0.0 psi Oil Pump Boost 1089.5 kbtu/hr CP-1516-100 Oil Cooler Heat Rei Oil Type 10.0 psi 160.0 °F Oil System Pres Drop 75.8 gpm Main Inj Oil Temp Oil Flow Main Inj Orifice Dia 0.469 in 160.0 °F Bearing Oil Temp Main Inj Oil Flow 50.6 gpm 5.0 Main Inj Cv Oil Coolina All Oil 25.2 gpm Bearing Oil Flow 1.00 in Main Inj Valve Dia 100.0% All Oil Main Inj Valve Pos Oil Pump Piping **FLUID SYSTEM** 17.38 Molecular Weight 217.3 °F Downstream Temperature Upstream Temperature 80.0 °F 1.30 Cp/Cv 317.0 psig 98.6 psig Downstream Pressure Upstream Pressure 0.98 Compressibility Z 0.0 °F 0.0 °F Disc Line Desuperheat Suct Line Superheat Molecular Weight 17.38 0.0 psi Disc Line Pres Drop 0.0 psi Suct Line Pres Drop 0.0 psi Separator Pres Drop **ERRORS AND WARNINGS** Disclaimer; the information contained in this program is subject to change without notice. Frick reserves the right to final verification of all rating results





| Y JOHNSON CONTROLS | | | spen byse | | | | | |
|---|-------------|------------------|--------------------|----------------|------------|---------------------|--|---------------------------------|
| CoolWare v7.1.2 | | Regi | istered To: Torome | ont Energy Sy | stems | | | |
| Customer Name End User Name Project | | | Referei Item | | | | heric Pressure | Run # 6 12.90 psi 3577 ft |
| | | COM | PRESSOR - TD | SH 283L | | | | |
| Compressor Power | 1460.2 hp | Compression Ra | atio | | Eff Mod | | Hydr | ocarbon Mix |
| Speed | 3550 rpm ' | /olume Ratio | | | Volume | | | 80.4% |
| Percent Suct Vol Flow | 87.0% | deal Volume Ra | itio | 2.33 | Adiabat | ic Eff | | 79.0% |
| | | Discharge Port | | Standard | | | | |
| | Temperature | Pressure | Mass Flow | Volu | me Flow | Sta | andard Volume Fl | |
| | (°F) | (psig) | (lbm/min) | | cfm) | (scfm) | | CFD) |
| Suction | 80.0 | 98.6 | 643.9 | | 885.9 | 14057 | | 0.243 |
| Discharge | 217.3 | 317.0 | 643.9 | 7 | 799.5 | 14057 | .4 2 | 0.243 |
| | | | OIL SYSTEM | ń | | <u></u> | | |
| Oil Type | CP-1516-100 | Oil Cooler He | at Rej | 1089.5 kb | tu/hr Oi | l Pump Boost | - | 0.0 ps |
| Oil Flow | | Main Inj Oil T | | 160 | ı.0 °F | I System Pres Dro | ор | 10.0 ps |
| Main Inj Oil Flow | | Bearing Oil Te | | 160 | .0 °F M: | ain Inj Orifice Dia | | 0.469 ii |
| Bearing Oil Flow | 25.2 gpn | Oil Cooling | • | | | ain Inj Cv | | 5.0 |
| Oil Pump Piping | | I Main Inj Valve | e Pos | 10 | 0.0% M | ain Inj Valve Dia | | 1.00 ir |
| | 9 | YSTEM | | | | | FLUID | |
| Upstream Temperature | | 1.0.00 | m Temperature | | 217.3° | F Molecular We | eight | 17.38 |
| Upstream Pressure | | sig Downstrea | • | | 317.0 ps | ig Cp/Cv | | 1.30 |
| Suct Line Superheat | | °F Disc Line [| | | 0.0° | | | 0.98 |
| Suct Line Pres Drop | | psi Disc Line F | | | 0.0 p | si Molecular We | eight 17.38 | |
| Oddt Ellie i 163 Diop | | Separator | | | 0.0 p | si | | |
| | | | COMPRESSO |)R | <u> </u> | | ······································ | |
| | Bearings | | | | *** | Rotors | | |
| Position | Load | lbf | L10 (hrs) | | | | Mal | e Female |
| Male Inlet Radial | 549 | | | Rotor Thrust | Direction | | Norma | ıl Normal |
| Male Outlet Radial | 801 | | | Balance Pisto | n Force | | 8603.3 lb | |
| Female Inlet Radial | 686 | | 42212 | Inlet Blocking | Dia | | 464 µi | - |
| Female Outlet Radial | 1222 | | 30442 | Outlet Blockir | ng Dia | | 670 µi | • |
| | 315 | | 47529 | Max Rotor Bo | ody | | 1141 µi | • |
| Male Axiai | | | 50000 | | | Max allowable | deflection 2140 µi | n |
| Male Axial Female Axial | 327 | 0 | 52989 | Rotor Shaft F | | | 2.4 | 4 2.05 |





| BY JOHNSON CONTROLS | | | Op0 | . | | | | | |
|---|---------------------------------------|--------------------|--|---------------|---------------------------------|-----------------|--------------------|-----------------|----------------|
| CoolWare v7.1.2 | · · · · · · · · · · · · · · · · · · · | | Registered To: | Toromont E | nergy Sy | stems - Jar | nes Storoshenko | | |
| Customer Name End User Name Project | Reference Item Screw Open | | Date 3/12/20 Atmospheric Elevation | | Run # 7 12.90 psi 3577 ft | | | | |
| | | | COMPRESSO | R - TDSH | 283L | | | | |
| Compressor Power | 1460.2 hr | | | | | Eff Model | | Hy | drocarbon Mix |
| Speed | , mar 0.256 | Volume Ra | | | 2.20 | Volumetrio | : Eff | | 81.8% |
| Percent Suct Vol Flow | - | Ideai Volur | | | 2.16 | Adiabatic | Eff ' | | 79.9% |
| | | Discharge | Port | ; | Standard | | | | |
| | Temperature (°F) | Pressure (psig) | | Flow /min) | | me Flow cfm) | Standard (scfm) | Volume I (MN | Flow ISCFD) |
| Suction | 80.0 | 108.6 | | 4.2 | 19 | 919.5 | 15591.6 | | 22.452 |
| Discharge | 211.3 | 317.0 | 71 | 4.2 | 8 | 79.0 | 15591.6 | | 22.452 |
| | | | OIL S | /STEM | | | ··· | | |
| Oil Type | CP-1516- | 100 Oil Cool | ler Heat Rej | 4.1. | 929.1 kb | tu/hr Oil P | ump Boost | | 0.0 psi |
| Oil Flow | 72.3 g | pm Main Inj | Oil Temp | | 160 | .0 °F Oil S | ystem Pres Drop | | 10.0 psi |
| Main Inj Oil Flow | 48.2 g | pm Bearing | Oil Temp | | 160 | .0 °F Main | Inj Orifice Dia | | 0.469 in |
| Bearing Oil Flow | 24.1 g | pm Oil Coo | ling | | | JI Oil Main | • | | 5.0 |
| Oil Pump Piping | All | Oil Main Inj | j Valve Pos | | 100 | 0.0% Main | Inj Valve Dia | | 1.00 in |
| | | SYSTEM | | | | | F | LUID | |
| Upstream Temperature | 8 | 0.0 °F Dowr | nstream Tempera | ture | | 211.3 °F | Molecular Weight | | 17.38 |
| Upstream Pressure | 108. | 6 psig Dowi | nstream Pressure | ; | | 317.0 psig | Cp/Cv | | 1.30 |
| Suct Line Superheat | | 0.0 °F Disc | Line Desuperhea | t | | 0.0 °F | Compressibility Z | 4-00 | 0.98 |
| Suct Line Pres Drop | | 0.0 psi Disc | Line Pres Drop | | , . | 0.0 psi | Molecular Weight | 17.38 | |
| | | Sepa | arator Pres Drop | | | 0.0 psi | | | |
| | : | <u> </u> | ERRORS AN | n WARNI | NGS | | | | |





| | Regi | stered To: Toron | ont Fneray Sy | stems - Ja | mes Storoshenko | | 4 |
|-----------------|---|--|------------------|--|----------------------------|------------------------|---|
| | rtegi | Refere | ence | | Date 3/12/200 | | Run # 7 |
| | | Item | Screw (| Open | Atmospheric F Elevation | | 2.90 psi 577 ft |
| | COM | PRESSOR - TI | OSH 283L | | | | |
| 1460.2 hp | Compression Ra | itio | 2.72 | | | Hydro | carbon Mix |
| 3550 rpm | Volume Ratio | | | | | | 81.8% |
| 88.4% | | tio | 2.16 Standard | Adiabatic | Eff | | 79.9% |
| Temperature | | Mass Flow | Volu | me Flow | Standard | Volume Flo | w |
| (°F) | (psig) | (lbm/min) | | | (scfm) | | |
| 80.0 | 108.6 | 714.2 | | | | | 2.452 |
| 211.3 | 317.0 | 714.2 | 8 | 379.0 | 15591.6 | 22 | 2.452 |
| | | OIL SYSTE | M | | | | |
| CP-1516-1(| 0 Oil Cooler He | at Rej | 929.1 kb | | | | 0.0 psi |
| · 72.3 ap | m Main Ini Oil Te | emp | | | | | 10.0 ps |
| Ų. | | | | | | | 0.469 ir |
| | | • | A | ∖ll Oil Mair | n Inj Cv | | 5.0 |
| | | Pos | 10 | 0.0% Maii | n Inj Valve Dia | | 1.00 ir |
| | SYSTEM | | *** | | FL | .UID | |
| | | m Temperature | | 211.3 °F | Molecular Weight | | 17.38 |
| | | • | | 317.0 psig | Cp/Cv | | 1.30 |
| | | | " | 0.0 °F | | | 0.98 |
| | | | | 0.0 psi | Molecular Weight | 17.38 | |
| | | | | 0.0 psi | | | |
| | | | | | | | |
| | | COMPRESS | OR | | | <u> </u> | |
| <u>Bearings</u> | | 1.40 (han) | 1 | | ROTORS | Male | Female |
| | | | Poter Thrust | Direction | | | |
| | | | | | | | |
| | - | | l . | | | | |
| | | | · · · · | | | | |
| | | | | - | | | - |
| | | 54902 | Wax Notor Bu | , u y | Max allowable deflect | • | |
| | | | | | ITION GITCHTON GONDOL | | |
| 32 | 32 | 34302 | Rotor Shaft F | atique Safe | ety Factor | 2.45 | 2.05 |
| | 3550 rpm 88.4% Temperature (°F) 80.0 211.3 CP-1516-10 72.3 gp 48.2 gp 24.1 gp All C | Temperature (°F) 80.0 211.3 CP-1516-100 72.3 gpm 48.2 gpm 24.1 gpm All Oil SYSTEM 80.0 °F 108.6 psig 0.0 °F 108.6 psig 0.0 °F 0.0 psi 0 ldeal Volume Ratio Ideal Volume Ideal V | COMPRESSOR - TI | COMPRESSOR - TDSH 283L 1460.2 hp 3550 rpm 88.4% Volume Ratio 2.20 1460.2 hp 3550 rpm 88.4% Volume Ratio 2.20 1460.2 hp 3550 rpm 88.4% Volume Ratio 2.20 1460.2 hp 2.72 2.20 1460.2 hp 3550 rpm 3550 rpm 88.4% Volume Ratio 2.16 1460.2 hp 2.72 2.20 1460.2 hp 3550 rpm 36.4% 36.4% 1460.2 hp 36.4% 36.4% 36.4% 36.4% 1460.2 hp 36.4% 36.4% 36.4% 36.4% 1460.2 hp 36.4% 36.4% 36.4% 36.4% 36.4% 1460.2 hp 36.4% 36.4% 36.4% 36.4% 1460.2 hp 36.4% 36 | Reference Item | COMPRESSOR - TDSH 283L | Reference Item Screw Open Date 3/12/2008 Atmospheric Pressure 1 |





Registered To: Toromont Energy Systems - James Storoshenko CoolWare v7.1.2 Run #8 Date 3/12/2008 Reference Customer Name 12.90 psi Atmospheric Pressure Item Screw Open End User Name 3577 ft Elevation Project **COMPRESSOR - TDSH 283L** Hydrocarbon Mix 2.51 Eff Model 1460.1 hp Compression Ratio Compressor Power 83.1% 2.20 Volumetric Eff Volume Ratio 3550 rpm Speed 80.2% Adiabatic Eff 2.02 Ideal Volume Ratio 89.6% Percent Suct Vol Flow Standard Discharge Port Volume Flow Standard Volume Flow Mass Flow Pressure Temperature (MMSCFD) (scfm) (cfm) (lbm/min) (°F) (psig) 24,701 17153.4 1951.2 785.7 118.6 Suction 80.0 17153.4 24.701 958.9 317.0 785.7 205.7 Discharge **OIL SYSTEM** 0.0 psi 782.1 kbtu/hr Oil Pump Boost CP-1516-100 Oil Cooler Heat Rej Oil Type 10.0 psi 160.0 °F Oil System Pres Drop Main Inj Oil Temp 68.5 gpm Oil Flow 0.469 in Main Inj Orifice Dia 160.0 °F Bearing Oil Temp 45.5 gpm Main Ini Oil Flow 5.0 All Oil Main Ini Cv Bearing Oil Flow Oil Cooling 23.0 gpm 1.00 in 100.0% Main Inj Valve Dia Main Inj Valve Pos All Oil Oil Pump Piping **FLUID** SYSTEM 205.7 °F Molecular Weight 17.38 80.0 °F Downstream Temperature Upstream Temperature 1.30 Cp/Cv 118.6 psig Downstream Pressure 317.0 psig Upstream Pressure Compressibility Z 0.98 Disc Line Desuperheat 0.0 °F 0.0 °F Suct Line Superheat Molecular Weight 17.38 0.0 psi 0.0 psi Disc Line Pres Drop Suct Line Pres Drop 0.0 psi Separator Pres Drop **ERRORS AND WARNINGS** Disclaimer: the information contained in this program is subject to change without notice. Frick reserves the right to final verification of all rating results.





Registered To: Toromont Energy Systems - James Storoshenko CoolWare v7.1.2 Date 3/12/2008 Run #8 Reference Customer Name Atmospheric Pressure 12.90 psi Item Screw Open End User Name 3577 ft Elevation Project **COMPRESSOR - TDSH 283L** Hydrocarbon Mix Eff Model 1460.1 hp Compression Ratio Compressor Power 83.1% Volumetric Eff 2.20 3550 rpm Volume Ratio Speed 80.2% Adiabatic Eff 2.02 89.6% Ideal Volume Ratio Percent Suct Vol Flow Standard Discharge Port Mass Flow Volume Flow Standard Volume Flow Temperature Pressure (MMSCFD) (scfm) (lbm/min) (cfm) (psig) 24.701 1951.2 17153.4 785.7 80.0 118.6 Suction 17153.4 24.701 958.9 317.0 785.7 205.7 Discharge OIL SYSTEM 0.0 psi 782.1 kbtu/hr Oil Pump Boost Oil Cooler Heat Rej CP-1516-100 Oil Type Oil System Pres Drop 10.0 psi 160.0 °F Main Inj Oil Temp 68.5 gpm Oil Flow 0.469 in Main Inj Orifice Dia Bearing Oil Temp 160.0 °F 45.5 gpm Main Ini Oil Flow 5.0 All Oil Main Inj Cv Oil Cooling Bearing Oil Flow 23.0 gpm 1.00 in 100.0% Main Inj Valve Dia Main Inj Valve Pos Oil Pump Piping All Oil **FLUID SYSTEM** 205.7 °F Molecular Weight 17.38 80.0 °F Downstream Temperature Upstream Temperature 1.30 Cp/Cv 118.6 psig Downstream Pressure 317.0 psig Upstream Pressure Compressibility Z 0.98 0.0 °F Disc Line Desuperheat 0.0°F Suct Line Superheat Molecular Weight 17.38 Disc Line Pres Drop 0.0 psi 0.0 psi Suct Line Pres Drop 0.0 psi Separator Pres Drop **COMPRESSOR** Rotors Bearings Female Male Load lbf L10 (hrs) Position Normal Normal Rotor Thrust Direction 5671 53157 Male Inlet Radial 0.0 lbf 7777.6 lbf Balance Piston Force 80069 8097 Male Outlet Radial 671 µin Inlet Blocking Dia 481 µin 33122 Female Inlet Radial 7381 Outlet Blocking Dia 686 µin 992 µin 28993 Female Outlet Radial 12402 Max Rotor Body 1180 µin 1673 µin 25757 3871 Male Axial Max allowable deflection 2140 µin 56248 3206 Female Axial 2.02 Rotor Shaft Fatigue Safety Factor **ERRORS AND WARNINGS**