

## Chapter 2 Specifications

This chapter lists machine technical specifications, environmental requirements, services, supplies, and torque specifications.

Husky reserves the right to change specifications without prior notice.

### 2.1 Machine Weights

The clamp and injection unit weights listed in Table 2-1 through to Table 2-8 are approximate and are given to assist in planning lifting requirements. Actual weight varies according to machine configuration. Consult the installation drawing in the Site Preparation Manual for your specific machine.

**Table 2-1 Clamp and Injection Unit Weights - Q/QL1350 Models**

Clamp + Clamp Base		Q1350 kg (lb)	QL1350 kg (lb)
		59000 (129800)	61000 (134200)
Injection Unit	Injection Unit Weight kg (lb)	Total Machine Weight kg (lb)	Total Machine Weight kg (lb)
RS95	10000 (22050)	69000 (151850)	71000 (156250)
RS115	16000 (35200)	75000 (165000)	77000 (169400)
RS135	18000 (39600)	77000 (169400)	79000 (173800)
RS155	21000 (46200)	80000 (176000)	82000 (180400)



**Table 2-2 Clamp and Injection Unit Weights - Q/QL1650 Models**

Clamp + Clamp Base		Q1650	QL1650
		kg (lb)	kg (lb)
		75 000 (165 000)	77 000 (169 400)
Injection Unit	Injection Unit Weight kg (lb)	Total Machine Weight kg (lb)	Total Machine Weight kg (lb)
RS115	16 000 (35 200)	91 000 (200 200)	93 000 (204 600)
RS135	18 000 (39 600)	93 000 (204 600)	95 000 (209 000)
RS155	21 000 (46 200)	96 000 (211 200)	98 000 (215 600)
RS170	29 000 (63 800)	104 000 (228 800)	106 000 (233 200)

**Table 2-3 Clamp and Injection Unit Weights - Q/QL2000 Models**

		Q2000	QL2000
		kg (lb)	kg (lb)
Stationary Platen + Clamp Base		45 000 (99 000)	49 000 (107 800)
Moving Platen		40 000 (88 000)	40 000 (88 000)
Total Clamp <sup>1</sup> Unit Weight		93 000 (204 600)	97 000 (213 400)
Injection Unit	Injection Unit Weight kg (lb)	Total Machine Weight kg (lb)	Total Machine Weight kg (lb)
RS135	18 000 (39 600)	111 000 (244 200)	115 000 (253 000)
RS155	21 000 (46 200)	114 000 (250 800)	118 000 (259 600)
RS170	29 000 (63 800)	122 000 (268 400)	126 000 (277 200)
RS185	32 000 (70 400)	125 000 (275 000)	129 000 (283 800)
RS200	37 000 (81 400)	130 000 (286 000)	134 000 (294 800)

(1) Clamp weight includes tiebars and other components installed after reassembly of platens.



**Table 2-4 Clamp and Injection Unit Weights - Q/QL2350 Models**

		<b>Q2350 kg (lb)</b>	<b>QL2350 kg (lb)</b>
<b>Stationary Platen + Clamp Base</b>		64000 (140800)	68000 (149600)
<b>Moving Platen</b>		45000 (99000)	45000 (99000)
<b>Total Clamp<sup>2</sup> Unit Weight</b>		109000 (239800)	113000 (248600)
<b>Injection Unit</b>	<b>Injection Unit Weight kg (lb)</b>	<b>Total Machine Weight kg (lb)</b>	<b>Total Machine Weight kg (lb)</b>
RS135	18000 (39600)	127000 (279400)	131000 (288200)
RS155	21000 (46200)	130000 (286000)	134000 (294800)
RS170	29000 (63800)	138000 (303600)	142000 (312400)
RS185	32000 (70400)	141000 (310200)	145000 (319000)
RS200	37000 (81400)	146000 (321200)	150000 (330000)

[2] Clamp weight includes tiebars and other components installed after reassembly of platens.

**Table 2-5 Clamp and Injection Unit Weights - Q/QL2700 Models**

		<b>Q2700 kg (lb)</b>	<b>QL2700 kg (lb)</b>
<b>Stationary Platen + Clamp Base</b>		64000 (140800)	68000 (149600)
<b>Moving Platen</b>		55000 (121000)	55000 (121000)
<b>Total Clamp<sup>3</sup> Unit Weight</b>		132000 (290400)	136000 (299200)
<b>Injection Unit</b>	<b>Injection Unit Weight kg (lb)</b>	<b>Total Machine Weight kg (lb)</b>	<b>Total Machine Weight kg (lb)</b>
RS135	18000 (39600)	150000 (330000)	154000 (338800)
RS155	21000 (46200)	153000 (336600)	157000 (345400)
RS170	29000 (63800)	161000 (354200)	165000 (363000)
RS185	32000 (70400)	164000 (360800)	168000 (369600)
RS200	37000 (81400)	169000 (371800)	173000 (380600)
RS235	40000 (88000)	172000 (378400)	176000 (387200)

[3] Clamp weight includes tiebars and other components installed after reassembly of platens.



**Table 2-6 Clamp and Injection Unit Weights - Q/QL3150 Models**

		Q3150 kg (lb)	QL3150 kg (lb)
Clamp Base		12000 (26400)	17000 (37400)
Moving Platen		68000 (149600)	68000 (149600)
Stationary Platen		53000 (116600)	53000 (116600)
Total Clamp <sup>4</sup> Unit Weight		160000 (352000)	165000 (363000)
Injection Unit	Injection Unit Weight kg (lb)	Total Machine Weight kg (lb)	Total Machine Weight kg (lb)
RS135	18000 (39600)	178000 (391600)	183000 (402600)
RS155	21000 (46200)	181000 (398200)	186000 (409200)
RS170	29000 (63800)	189000 (415800)	194000 (426800)
RS185	32000 (70400)	192000 (422400)	197000 (433400)
RS200	37000 (81400)	197000 (433400)	202000 (444400)
RS235	40000 (88000)	200000 (440000)	205000 (451000)

[4] Clamp weight includes tiebars and other components installed after reassembly of platens.

**Table 2-7 Clamp and Injection Unit Weights - Q/QL4000 Models**

		Q4000 kg (lb)	QL4000 kg (lb)
Clamp Base		13500 (29700)	18500 (40700)
Moving Platen		85000 (187000)	90000 (198000)
Stationary Platen		56500 (124300)	61500 (135300)
Total Clamp <sup>5</sup> Unit Weight		205000 (451000)	210000 (462000)
Injection Unit	Injection Unit Weight kg (lb)	Total Machine Weight kg (lb)	Total Machine Weight kg (lb)
RS155	21000 (46200)	226000 (497200)	231000 (508200)
RS170	29000 (63800)	234000 (514800)	239000 (525800)
RS185	32000 (70400)	237000 (521400)	242000 (532400)
RS200	37000 (81400)	242000 (532400)	247000 (543400)
RS235	40000 (88000)	245000 (539000)	250000 (550000)

[5] Clamp weight includes tiebars and other components installed after reassembly of platens.



**Table 2-8 Clamp and Injection Unit Weights - Q/QL5400 Models**

		Q5400 kg (lb)	QL5400 kg (lb)
Clamp Base		21 000 (46 200)	31 000 (68 200)
Moving Platen		130 000 (286 000)	130 000 (286 000)
Stationary Platen		107 000 (235 400)	107 000 (235 400)
Total Clamp <sup>6</sup> Unit Weight		300 000 (660 000)	310 000 (682 000)
Injection Unit	Injection Unit Weight kg (lb)	Total Machine Weight kg (lb)	Total Machine Weight kg (lb)
RS185	32 000 (70 400)	332 000 (730 400)	342 000 (752 400)
RS200	37 000 (81 400)	337 000 (741 400)	347 000 (763 400)
RS235	40 000 (88 000)	340 000 (748 000)	350 000 (770 000)

[6] Clamp weight includes tiebars and other components installed after reassembly of platens.

## 2.2 Environmental Requirements

The production room ambient room temperature and ventilation system must meet requirements in Table 2-9.

**Table 2-9 Environmental Requirements**

	Requirement
Ambient Room Temperature without the Tropical Cooling Option	0°C to 40°C (32°F to 104°F)
Ambient Room Temperature with the Tropical Cooling Option	0°C to 48°C (32°F to 118°F)
Ventilation	Suitable ventilation system to remove all harmful gases, vapors or dust released when processing certain plastic resins.



## 2.3 Electrical Power Specifications

The machine and mold (optional) electrical power supplies must conform to specifications in the System Information drawing located in Chapter 5 in the Site Preparation Manual. The specifications are also listed on the electrical nameplate and the electrical schematics.

All power cables must be rated accordingly.

Voltage of supply to equipment may vary up to  $\pm 10\%$  (of the value on the electrical cabinet nameplate, and electrical schematic).

The supply to the electric drives on the machine must come from a solidly grounded wye (star) source. If a solidly grounded wye source is not used to supply the machine, then an isolation transformer must be installed to create the solidly grounded wye source for the drive system. Husky can provide additional details for the specific machine if required.

Frequency of supply to equipment may vary by up to  $\pm 1\%$  continuously (of the value on the electrical cabinet nameplate, and electrical schematic).

The prospective short circuit fault level at the main equipment terminals shall be no more than 10,000 A RMS symmetrical.



## 2.4 Machine Cooling Water Specifications

### 2.4.1 Cooling Water Guidelines

---

**CAUTION!**

**Failure to abide by these guidelines for tower and chilled water quality could result in damages to the injection molding system, and may void the warranty.**

---

Cooling water treatment is required to protect

- molds,
- injection molding machines,
- chillers,
- cooling towers,
- piping,

and other water cooled equipment from corrosion and deposit fouling inside the cooling channels. Corrosion can lead to water leaks and failure of mold/machine components. Deposits in the cooling channels reduce heat transfer resulting in:

- reduced efficiencies,
- longer molding cycles,
- reduced part quality,
- increased maintenance,
- increased costs.

Since local water supplies vary widely in quality, Husky recommends that you work with reputable water treatment company in your area to establish a water treatment program that is best suited for your needs. A good water treatment program must be developed specifically for each facility, taking into account the;

- municipal water conditions,
- cooling system design, and
- water usage patterns.

### 2.4.2 Cooling Water Treatment Procedure

The first step of a water treatment program is to have a qualified laboratory perform an analysis of the following.

- Municipal water supply.
- Chilled water system.



- Tower water system.

For a sample report showing the typical criteria of the analysis, see Table 2-10, together with Husky's recommended values.

Once this analysis is completed, a water treatment specialist can recommend the appropriate water treatment. This analysis and treatment of the cooling water should be performed on a regular basis.

**Table 2-10 Typical Cooling Water Analysis Report**

Constituents	Units	Sample Locations	
		Closed Loop Chiller	Tower Water
pH	pH units	7.2 - 9.5	7.2 - 9.0
Conductivity	µmhos/cm	< 3,000	1000 - 2000
Total Hardness [as CaCO <sub>3</sub> ]	mg/L or ppm	< 10	60 - 800
Calcium Hardness [as CaCO <sub>3</sub> ]	mg/L or ppm	< 10	60 - 800
*M Alkalinity (Total) [as CaCO <sub>3</sub> ]	mg/L or ppm	NA	< 500
<b>Cations</b>			
Total Iron [as Fe]	mg/L or ppm	< 0.5	< 1.0
Copper [as Cu]	mg/L or ppm	< 0.05	< 0.1
Aluminum [as Al]	mg/L or ppm	< 0.1	< 0.1
<b>Anions</b>			
Free Chlorine [as Cl <sub>2</sub> ]	mg/L or ppm	< 0	< 1.0
Chloride [as Cl]	mg/L or ppm	< 400	< 400
Sulfate [as SO <sub>4</sub> ]	mg/L or ppm	< 300	< 300
Silica as [SiO <sub>2</sub> ]	mg/L or ppm	< 150	< 150
<b>Microbiological Activity</b>			
Sulfate Reducing Bacteria	Col./ml	< 1	< 1
Total Aerobic Bacteria	Col./ml	< 10,000	< 10,000
<b>Solids</b>			
Suspended Solids	mg/L or ppm	< 10	< 10
Solid Size (< 5 µm side stream filters recommended)	µm	< 5	< 5
<b>Maximum Corrosion Rate (of 90 day test specimens, if used)</b>			
Mild Steel	µm Per Year	< 25.4	< 76.2
Copper	µm Per Year	< 12.7	< 12.7
Aluminium	µm Per Year	< 12.7	< 12.7



**NOTE:** The values specified in the above table are typical recommended values that may be achievable in most cooling systems. Deviations from these values may be necessary, but should be reviewed with your water treatment company.

**NOTE:** The recommended values above represent conditions under which most problems associated with poor water quality can be controlled using normal water treatment additives - **THEY DO NOT REPRESENT WATER WHICH CAN BE USED UNTREATED.** Meeting the recommended values does not in itself guarantee that cooling water will not be corrosive. It is important that all the metals in the cooling system (steel, stainless steel, cast iron, aluminum, copper, zinc, nickel plating, etc.) be protected using suitable corrosion inhibitors.

**Table 2-11 Machine Cooling Water Specifications**

Description	Value
Inlet temperature range	10 to 34°C (50 to 93°F) - Non -condensing <sup>7</sup>
Inlet pressure (minimum to maximum)	0.45 to 0.6 MPa (60 to 90 psi)
Pressure drop (minimum)	0.2 MPa (30 psi)

[7] The temperature of the water supply must be above the temperature at which condensation will occur.

**Table 2-12 Machine Cooling Water Flow Rates**

Electric Motor		Water Flow			
		m <sup>3</sup> /hr at 35°C		USG/hr at 95°F	
HP	KW	Hydraulic System Oil Cooler	Electric Motor	Hydraulic System Oil Cooler	Electric Motor
200	150	10.3	1.2	2720	320
250	185	12.7	1.5	3350	400
300	225	15.3	1.8	4040	480
350	260	18.5	1.8	4890	480
400	300	20.6	2.7	5440	630
450	335	22.6	2.7	5970	710
500	370	25.4	3.0	6710	790
550	410	27.6	3.0	7291	790



## 2.5 Compressed Air Supply

Compressed air supply must meet specifications in Table 2-13.

**Table 2-13 Compressed Air Supply Specifications**

Description	Value
Compressed air supply	14 000 NI/min (500 cfm/min at 14.5 psi)
Inlet pressure (minimum to maximum)	0.6 to 1.03 MPa (90 to 150 psi)

**NOTE:** Refer to the Manufacturer's Robot Manual for compressed air requirements for the robot.

**Table 2-14 Compressed Air Flow Specifications<sup>(8)</sup>**

Compressed Air Consumer	Level	Peak Flow
Air Function 1/2"	ISO 2	2200 NI/min
Air Function 3/4"	ISO 3	4316 NI/min
Air Service	n/a	n/a
Robot	n/a	n/a
Pneumatic valve gate control	ISO 1	1300 NI/min
Pneumatic core pull	ISO 2	2200 NI/min

(8) Compressed air flow specifications depends on consumer layout and cycle conditions.

## 2.6 Oil Capacity Data

**Table 2-15 Oil Capacity Data - Standard Machines**

RS Size	Capacity - litres (U.S. Gallons)							
	RS95	RS115	RS135	RS155	RS170	RS185	RS200	RS235
Q(L)1350	2600 (687)	2600 (687)	2600 (687)	3400 (898)				
Q(L)1650		2600 (687)	2600 (687)	2600 (898)	3800 (1004)			
Q(L)2000			2600 (687)	3400 (898)	3800 (1004)	3800 (1004)	4000 (1057)	
Q(L)2350			2600 (687)	3400 (898)	3800 (1004)	3800 (1004)	4000 (1057)	



Table 2-15 Oil Capacity Data - Standard Machines

RS Size	Capacity - litres (U.S. Gallons)							
	RS95	RS115	RS135	RS155	RS170	RS185	RS200	RS235
Q(L)2700			2600 (687)	3400 (898)	3800 (1004)	3800 (1004)	4000 (1057)	7650 (2021)
Q(L)3150			2600 (687)	3400 (898)	3800 (1004)	3800 (1004)	4000 (1057)	7650 (2021)
Q(L)4000				3400 (898)	3800 (1004)	3800 (1004)	4000 (1057)	7650 (2021)
Q(L)5400						3800 (1004)	4000 (1057)	7650 (2021)

Table 2-16 Oil Capacity Data - Dual and Tandem Machines

Machine Type	Injection Unit Size	l	US gal
QD16500	All	3370	890
QD2350	RS180 - RS235	8500	2245
QT1350, QT2000, and QT2700	RS155	3500	925
	RS170	3900	1030
QT13150	RS135 - RS155	4470	1180

Table 2-17 Gearbox Oil Capacity - Electric Screw Drives Only

Injection Unit	Oil Capacity	
	l	US gal
RS115	58	15.3
RS135	58	15.3

## 2.7 Hydraulic Oil Specifications

Hydraulic fluid must comply with the hydraulic fluid specification in Section 2.7.1. Husky guarantees compliance of recommended and equivalent fluids listed in Table 2-18.



### IMPORTANT!

It is customer's responsibility to ensure hydraulic fluid compliance should they decide to use a fluid that is not listed under recommended or equivalent fluids. The test apparatus and test data confirming compliance of such fluids must be available upon Husky's request.



**CAUTION!**

Avoid mixing different brands or grades of lubricants or greases. Mixing lubricants or greases can cause premature breakdown of the lubricant or grease which will result in machine damage.

**2.7.1 Detailed Hydraulic Fluid Specification**

- Viscosity grade classification, ISO 3448: 1992 Industrial liquid lubricants - ISO viscosity classification: VG46 with a viscosity of 46 cSt  $\pm$  10% at 40°C.
  - Specific mass of 840 to 900 kg/m<sup>3</sup> @ 15°C.
  - Additives classification ISO 6743-4:1999 Lubricants, industrial oils and related products (class L) - Classification - Part 4: Family H (Hydraulic systems) HM hydraulic fluids. (Hydraulic Oil DIN 51 524 - HLP 46)
  - Approved by Denison HF-0 hydraulic fluid performance evaluation on vane pumps and piston pumps at 25 MPa (3625 psi), 1700 rpm, high temperature, with and without presence of water.
    - A current listing of all HF-0 approved oils can be obtained from:  
Parker (Denison Hydraulics Division)  
14249 Industrial Parkway  
Marysville, Ohio, 43040  
USA  
Tel: 937 644 3915  
Fax: 937 642 3738  
Web: <http://www.parker.com>
  - Base stock identification: Group "I and II", base stock (API category 1 and 2)
  - Upper limit of Cleanliness level, ISO 4406: 17/14/11 (4  $\mu$ m/6  $\mu$ m/14  $\mu$ m).
  - Pressure/Temperature, ISO 6743-4:1999; HM hydraulic fluids, general hydraulic systems which included highly loaded components, operating temperatures -20°C to 90°C. Operating pressure 20 MPa.
  - Additives shall remain uniformly distributed throughout the oil at all temperatures from the pour point up to 90°C. The oil shall retain the homogeneity once is cooled below its pour point.
  - Service life based on ISO 4263-1/ASTM D943 TOST of minimum 2500 hours. (Oil life expectancy goal: 8000 hours)
  - Worldwide availability, quality and consistency in composition.
  - Compatibility:
    - Residual oil. (Traces of Shell Tellus S 46 will be present in new machines from test and assembly)
    - Elastomer/Paint compatibility
      - Nitrile of Buna-N NBR (O-Rings)
      - Fluorocarbon FKM, FPM rubber (Viton) (O-Rings)
      - Turcon,-Polytetrafluoroethylene (PTFE) (Glyd-Rings)
- <http://www.busakind.com/cms/Products/Fluid+Sealing+Systems/Piston+Seals>



- Luytex, -Polyester based (Wear-Rings)  
<http://www.busakind.com/cms/Products/Fluid+Sealing+Systems/Wear+Rings>

- Neoprene (Hose material)

The machine is equipped with the hydraulic hoses supplied by Manuli Rubber Industries. Check the "Fluid Compatibility" section on Manuli website for compatibility with preferred fluid:

<http://www.manuli-hydraulics.com>

The following hose types are to be checked: Wire Spiral (Rockmaster, Shieldmaster), Wire Braid (Tractor, Rockmaster and Shieldmaster), Textile Braid (Astro)

Only the fluids with "Good" and "Excellent" compatibility are to be used.

If preferred oil is not listed please contact:

Manuli Rubber Industries S.p.A  
Piazza della Repubblica, 14/16  
20124 Milano, Italy  
Tel: +39 02 627 13.1

- Any concerns regarding the reservoir paint contact Husky Technical Support.

- Minimum failure load stage requirement of 10 in the FZG gear test rig. (DIN 51 354 part of DIN 51 524 part 2, requirement)

**NOTE:** All Husky machines are tested with Shell Tellus 46 S hydraulic oil. To ensure maximum machine performance, only use one of the oils listed below. Check with local supplier that the oil is compatible with the existing Shell Tellus S 46 oil in the machine. Only use new oil in the machine.

Table 2-18 Approved Hydraulic Oils List

	Details	
Recommended oil	Shell Tellus S 46	
Other approved oils	Chevron AW 46	Shell Tellus Premium 46
	Petro-Canada Hydrex AW46	Texaco Rando HD 46
	Shell Tellus 46	TotalFinaElf Azolla ZS 46

### 2.7.1.1 Notes About Oil

1. Hydraulic oils with a high zinc content as part of the anti-wear additive package (>400 ppm Zn), will most likely experience a corresponding increase in the copper content as noted in the oil sample over time. While this copper (in solution with the oil) poses no threat as particulate contamination, it is known that it can increase the rate of oxidation of the fluid and thus an extremely high content (>100 ppm Cu) is undesirable.
2. Zinc-free (ashless) oils are gaining popularity in industry. Their alternative anti-wear additive packages contain no heavy metals. This results in the oils being considered more environmentally-friendly at time of disposal and as such are preferred by Husky as a hydraulic fluid. Care must be taken to assure compatibility when mixing zinc-based fluids with zinc-free alternatives. Contact your oil supplier for availability of suitable fluids.



3. Group II hydraulic fluids are those which have been formulated to resist the processes of oxidation and additive depletion. Although being slightly more expensive, these oils may be preferred by customers who would like to extend the interval of fluid replacement. Customers should contact their oil supplier for availability of suitable fluids.
4. Group III (semi-synthetic) and Group IV (synthetic) fluids have been emerging as preferred upper-tier fluid alternatives for customers who wish to attain maximum life out of their oil. Customers should contact their oil supplier for availability of suitable fluids.
5. Husky does not endorse the usage of fire resistant or higher flashpoint hydraulic oils due to a possible incompatibility with seals and excess wear on hydraulic components.

## 2.8 Lubricant Specifications

### CAUTION!

Do not mix different brands or grades of lubricants or greases. Mixing lubricants or greases can cause premature breakdown of the lubricant or grease which will result in machine damage.

### 2.8.1 Grease Specifications

Greases used in the machine must meet specifications in Table 2-19.

Table 2-19 Lubricant Specifications

Type	Trade Name	Where Used
NLGI Grade 2 - Lithium-based grease	Staburags NBU 8-EP Shell Alvania EP2	Electric motor bearings
Non-food grade grease	Shell Albida SDM 1	Automatic lubrication system (ALS)
Automatic lubrication cartridge	Shell Alvania EP2 Perma Classic	Clamp piston locking cylinder linkage arms
Static application grease	Dow Corning ZEPF FE12 Paste	Anti-corrosion compound for application to non-moving components
High temperature anti-seize grease	Optimoly Paste TA	Screws and fasteners exposed to high temperatures (see Table 2-31)
O-ring lubricant	Lubriplate FGL - 2 Molykote G with MOS2	Hydraulic fittings using O-rings



## 2.8.2 Extruder Motor Oil Specifications

Extruder motor oil must meet specifications in Table 2-20.

**Table 2-20 Extruder Motor Housing Oil Data - Two-Stage Injection Units Only**

	Details
Specifications	Synthetic gear oil ISO viscosity grade: 220 (EP) AGMA: #5 EP

## 2.8.3 Gearbox Oil Specifications

Gearbox oil must meet specifications in Table 2-21.

**Table 2-21 Gearbox Oil Specifications - Electrical Screw Drives Only**

	Details
Type	Heavy-duty industrial gear lubricant, ISO Viscosity Grade 220 Petroleum with Extreme Pressure Additives.
Trade names	Mobilgear 630 (recommended) Amogear EP 220 Compound EP 220 Degol BG 220 Energear EP 220 Energol GR-XP220 Meropa 220 Omala 220 Spartan EP 220

## 2.9 Nitrogen Volume for Hydraulic Accumulators

Nitrogen volume supply specifications are dependant upon the machine configuration. Refer to Table 2-22 for nitrogen volumes and accumulator sizes. Note that RS115 and RS235 injection units have no accumulators.



### **WARNING!**

**Explosion hazard – risk of death or serious injury. To prevent an explosion, use pure nitrogen gas to precharge the accumulator. Nitrogen gas must be at least 99.995% pure.**



**Table 2-22 Nitrogen Volume for Hydraulic Accumulators**

Injection Unit	Injection Accumulator	
	l	US gal
RS135	105	27.7
RS155	160	42.3
RS170	240	63.4
RS185	240	63.4
RS200	280	74
Pilot Accumulator (All Sizes)	4	1.1

## 2.10 Rust Inhibitor Specifications

Rust inhibitor used on the machine must meet specifications in Table 2-23.

**Table 2-23 Rust Inhibitor Specifications**

	Details
Type	Water-borne corrosion resistant non-hardening film
Trade name	Cortec Corp. VCI-389

## 2.11 Machine Data

Table 2-24, Table 2-25, Table 2-26 and Table 2-27 list the various machine settings or limits.

**Table 2-24 Hydraulic System Settings**

Description	Value
Hydraulic oil filtration	$\beta_3 \geq 1000$
Hydraulic oil operating temperature - minimum/ maximum	47/53°C (117/127°F)
Hydraulic system operating pressure	18.3 MPa (2683 psi)
Accumulator precharge pressure at operating temperature	14 Mpa (2030 psi)

**Table 2-25 Pneumatic Settings**

Air Regulator Setting	Value
Inlet pressure	0.6 MPa (90 psi)



**Table 2-26 Injection Temperature Limit**

Injection Temperature	Value
Maximum permissible temperature for plasticizing	415°C (779°F)

**Table 2-27 Machine Level/Nozzle Concentricity Specification**

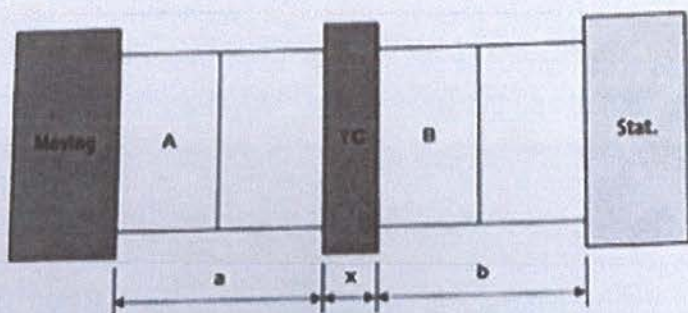
	Maximum Tolerance
Machine Level	0.05 mm per m (0.002 in per ft)
Nozzle Concentricity	1 mm (0.04 in)



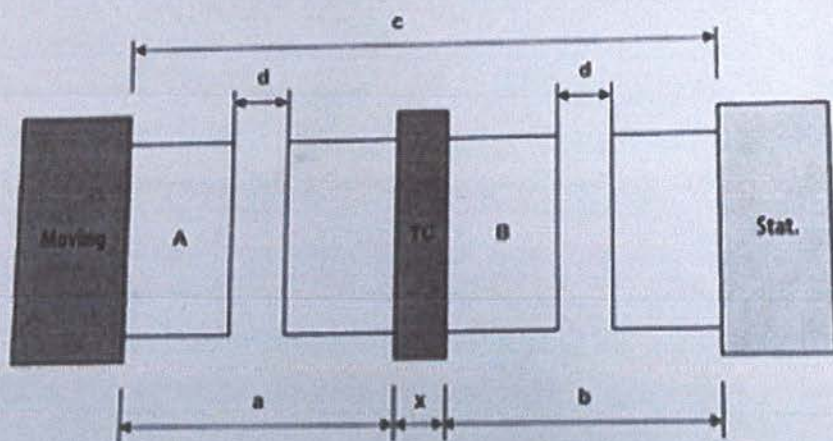
## 2.12 Tandem Specifications

**Table 2-28 Tandem Mold Specifications**

Machine Type	a (Min) (2)	b (Max) (2)	b (Min) (2)	b (Max) (2)	x (TC)	c	d (3)
QT (D) 1350	550	1302	550	1302	300	3620	358 / 1110
QT (D)L 1350	800	1552	800	1552	300	4120	358 / 1110
QT (D) 2000	670	1515	670	1515	400	4200	385 / 1230
QT (D)L 2000	920	1765	920	1765	400	4700	385 / 1230
QT (D) 2700	700	1590	700	1590	400	4500	460 / 1350
QT (D)L 2700	950	1840	950	1840	500	460	460 / 1350



- x - Tandem Carrier thickness
- a - Min/Max Shut-height
- b - Min/Max Shut-height
- c - Daylight (max.)
- d - Mold Opening stroke
- A - Mold A
- B - Mold B





## 2.13 Standard Torque Specifications

### 2.13.1 General

The following torque specification standards shown in Table 2-29 apply to all threaded connections, unless specified on the assembly drawing.

#### CAUTION!

Use of improper torque can result in equipment damage. Consult assembly drawings for torque specifications before using torque charts in this section.

Table 2-29 Torque Standards

Application	Hardware		Torque Specification Standard
Mechanical connections	Screws and threaded rods	DIN 912-12.9 (SHCS) DURLOK-12.9-UNB DIN 912-10.9 (HHCS) DIN 976-12 & 10.9 ASTM A574	HGT-35 HGT-50 HGT-80 <sup>9</sup>
	Setscrews	ISO 898/ 5 - 45H ASTM F912	HGT-SS
Hydraulic, lubrication, pneumatic, and water connections	Fittings & Plugs	O-ring Face Seal JIC (37° Flared) NPT, BSPP, Ferrule (Bite) SAE Straight Thread	HGT-FT
Electrical connections	Screws	Steel, AL & Cu, Brass	HGT-EL

[9] The maximum allowable torque for 10.9 SHCS, HHCS, and threaded rods is HGT-50.

Table 2-30 HGT Torque Standards

Preload Class	
HGT-35	Recommended for all aluminum casting and wrought aluminum alloy applications
HGT-50	Recommended for parts manufactured from ductile iron castings or mild carbon steel. Standard torque for most Husky Machine and Mold applications
HGT-80	Recommended for the majority of Hot Runner products in high strength and/or high fatigue applications using grade 12.9 bolts that will not crush, gall, warp or fracture the joint material under preload (e.g. high-strength alloy steel).



## 2.13.1.1 Torque Tolerances

The more accurate the method of controlling tightness the more of the strength of the fastener can be utilized. The tolerance values specified in this standard pertain to the tool's accuracy and not the induced fastener's load that is affected by other variables such as lubrication, clamped materials, temperature, etc.

For example, assembly torque wrenches should be calibrated to stay within  $\pm 4\%$  when applying HGT-50, 80 or 35 and the fastener's induced load accuracy can be expected to range from  $\pm 10-20\%$ .

## 2.13.1.2 Lubricants and Adhesives

Apply the correct lubricant to all threads and contacting surfaces before installation.

**Table 2-31 Lubricants for General Applications**

Application	Lubricant	
	Food Grade	Non Food Grade
Mechanical (Fastener Threads) - Low Temperature (<150°C)	FGL-1	Shell Tellus 46, LUB 3000, Molykote G (MoS2) or Equivalent
Mechanical (Fastener Threads) - High Temperature (>150°C)	Not Available	Optimoly Paste TA or Equivalent
Electrical (Fastener Threads) - High Temperature e.g. Heater Bands		
Generic Hydraulic Oil	Refer to Section 2.7	
Roller and Ball Bearing (Open Cage)	FGL-1 or FGL-2	LUB 3000
Linear Bearing	FGL-1	LUB 730-1
Gear Box	SFG0 Ultra 220	PG220 FUCHS
Dynamic Joints (Rod Ends, Plain Bearing, Linkages, Tie Bar Shoe, etc.)	FGL-1 (Automatic Greasing) or FGL-2	LUB 3000
Seals (before and after installation)	SFG0 Ultra 46	Shell Tellus 46, Fiske AW46, etc.



**Table 2-32 Adhesives for Soft Joint Mechanical Applications<sup>10</sup>**

Connection				Product Name
Fasteners M5 and smaller	Removable with hand tools	Low Strength	-55 to 150°C	Loctite 222 (purple)
Fasteners M6 to M20		Medium Strength	-54 to 149°C	Loctite 242 (blue)
Fasteners M10 to M25 (or greater)	Removable with heat and hand tools	High Strength	-54 to 150°C	Loctite 271 (red)

[10] Example of soft joint application: rigid clamping systems for hoses and pipes

**Table 2-33 Lubricants List (From Light to Extreme Pressure)**

Mineral Oil	Synthetic Oil	Grease	Paste
Shell Tellus 46	SFG0 Ultra 46(H1) <sup>11</sup>	FGL-1	Molykote G (MoS <sub>2</sub> )
Gulf Harmony 46 AW	SFG0 Ultra 220 (H1)	FGL-2	
Mobil DTE 25	PG220 FUCHS (Alpha gearboxes)	LUB 3000 (NLGI-2)	
Texaco Rando HDZ46		LUB 730-1	
Sunoco Sunvis 821 WR			
Conoco Hydroclear AW46			
Chevron AW46			

[11] H1 = non-toxic and edible



**Table 2-34 Lubricants for Fittings**

Application	Connection		Food Grade	Non Food Grade
Hydraulic	Steel	SAE, ORFS, BSPP	FGL-2 (surface of contact of o-ring)	Shell Tellus 46 or Equivalent (threads)
Lubrication	Steel	SAE, ORFS, BSPP		
Air	Steel, Aluminum and Brass	NPT	Not Available	Loctite 592
		NPT (0 to 1 inch)	Teflon Tape (White)	Teflon Tape (White)
		NPT (1 inch and higher)		
	JIC	Not Available	Shell Tellus 46 or Equivalent	
	Steel			SAE, BSPP
Brass	SAE, BSPP	No Lubrication		
Water	Steel and Brass	NPT	Teflon Tape (Orange)	Loctite 592
		SAE, BSPP, JIC	Not Available	Shell Tellus 46 or Equivalent
	Aluminum	NPT	Teflon Tape (Orange)	Loctite 592
	Stainless Steel	NPT		
		JIC, SAE (SAE plugs included)	Not Available	Kleen-Flo Anti-Seize Compound



## 2.13.2 HGT-35 Standard (Screws)

The torque values shown in Table 2-35 must be applied to screws in order to produce 35% Preload.

**Table 2-35 Torque Values for Metric and Imperial Screws**

Grade 12.9 and 10.9 Fasteners				ASTM A574 Fasteners			
<ul style="list-style-type: none"> <li>• Socket Head Cap Screws</li> <li>• Hex Head Cap Screw</li> <li>• Flat Head Cap Screw</li> <li>• Button Head Cap Screw</li> </ul>				<ul style="list-style-type: none"> <li>• Imperial Socket Head Cap Screw</li> </ul>			
Size	Torque (±4%)		Induced Screw Load (N)	Size	Torque (±4%)		Induced Screw Load (N)
	Nm	lb-ft			Nm	lb-ft	
M4	2.1	1.5	2980	#8	1	1	2670
M5	4	3	4800	#10	3	2	3100
M6	9	7	7800	1/4	7	5	5800
M8	19	14	14200	5/16	14	10	9800
M10	37	27	22000	3/8	23	17	14200
M12	50	37	24500	7/16	38	28	20000
M16	125	90	49000	1/2	58	42	26700
M20	250	185	79000	5/8	110	81	41000
M24	440	325	115000	3/4	180	135	60000
M30	875	650	182000	7/8	300	220	83000
M36	1530	1130	265000	1	450	330	111000
				1 1/8	620	460	138000
				1 1/4	890	660	175000
				1 3/8	1170	860	208000
				1 1/2	1550	1140	254000
				1 3/4	2450	1790	342000

**NOTE:** 1 Nm = 0.737 lb-ft; 1 lb-ft = 1.356 Nm



## 2.13.3 HGT-50 Standard (Screws and Threaded Rods)

The torque values shown in Table 2-36 must be applied to screws in order to produce 50% Preload.

Table 2-36 Torque Values for Metric and Imperial Screws

Grade 12.9 and 10.9 Fasteners				ASTM A574 Fasteners			
<ul style="list-style-type: none"> <li>• Socket Head Cap Screws</li> <li>• Durllok Hex Head Cap Screw</li> <li>• Threaded Rod (DIN 976)</li> </ul>				<ul style="list-style-type: none"> <li>• Imperial Socket Head Cap Screw</li> </ul>			
Size	Torque (±4%)		Induced Screw Load (N)	Size	Torque (±4%)		Induced Screw Load (N)
	Nm	lb-ft			Nm	lb-ft	
M4	3	2.2	4250	#8	3	2	4360
M5	6.2	4.6	8900	#10	4	3	5450
M6	10	7	9800	1/4	11	8	9900
M8	25	18	17800	5/16	22	16	16300
M10	53	40	31500	3/8	40	30	
M12	95	70	47000	7/16	60	45	33000
M14	130	95	56000	1/2	95	70	44000
M16	220	160	85000	5/8	180	135	68000
M18	270	200	93000	3/4	310	230	100000
M20	390	290	124000	7/8	490	360	139000
M24	660	490	171000	1	750	550	182000
M30	1300	960	272000	1 1/8	1040	770	230000
M36	2300	1700	396000	1 1/4	1480	1090	291000
M42	3700	2700	544000	1 3/8	1940	1430	347000
M48	5500	4000	714000	1 1/2	2580	1900	423000
				1 3/4	4050	2990	570000

NOTE: 1 Nm = 0.737 lb-ft; 1 lb-ft = 1.356 Nm





## 2.13.4 HGT-80 Standard (Screws and Threaded Rods)

The torque values shown in Table 2-37 must be applied to screws in order to produce 80% Preload.

**Table 2-37 Torque Values for Metric and Imperial Screws**

Grade 12.9 Fasteners				ASTM A574 Fasteners			
<ul style="list-style-type: none"> <li>• Socket Head Cap Screws</li> <li>• Durlok Hex Head Cap Screw</li> <li>• Threaded Rod (DIN 976)</li> </ul>				<ul style="list-style-type: none"> <li>• Imperial Socket Head Cap Screw</li> </ul>			
Size	Torque ( $\pm 4\%$ )		Induced Screw Load (N)	Size	Torque ( $\pm 4\%$ )		Induced Screw Load (N)
	Nm	lb-ft			Nm	lb-ft	
M4	4.6	3.4	6800	#8	5	4	7000
M5	9.5	7.1	11000	#10	7	5	8700
M6	16	12	15600	1/4	16	12	15800
M8	39	29	28400	5/16	35	25	26100
M10	77	57	45000	3/8	60	45	38000
M12	135	100	65000	7/16	95	70	53000
M14	215	160	90000	1/2	150	110	71000
M16	330	245	122000	5/8	290	210	108000
M20	650	480	190000	3/4	500	360	160000
M24	1100	810	273000	7/8	790	580	222000
M30	2250	1660	435000	1	1180	865	291000
M36	3850	2840	634000	1 1/8	1680	1240	367000
M42	6270	4630	870000	1 1/4	2400	1750	466000
M48	8560	6320	1140000	1 3/8	3100	2300	555000
				1 1/2	4100	3040	676000
				1 3/4	6500	4800	911000

**NOTE:** 1 Nm = 0.737 lb-ft; 1 lb-ft = 1.356 Nm



## 2.13.5 HGT-SS Standard (Set Screws)

The following torque values in Table 2-38 must be applied to set screws.

Table 2-38 Torque Values for Setscrews

Metric Setscrews			Imperial Setscrews		
Size	Torque ( $\pm 4\%$ )		Size	Torque ( $\pm 4\%$ )	
	Nm	lb-ft		Nm	lb-ft
M3	0.9	0.66	#5	1.1	0.8
M4	2.2	1.6	#6	1.1	0.8
M5	4	3	#8	2.7	2
M6	7.2	5.3	#10	4	3
M8	17	12.6	1/4	9.5	7
M10	33	24	5/16	19	14
M12	54	40	3/8	33	24
M16	134	99	1/2	70	52
M20	237	175	9/16	70	52
M24	440	325	5/8	150	110
			3/4	270	200
			7/8	410	300
			1	570	420



## 2.13.6 HGT-FT Standard (Fittings)

The following tables provide the recommended torque values required for the safe and effective operation of the fittings using a torque wrench or other methods such as "Turn From Finger Tight", "Flats From Finger Tight" or "Flats from Wrench Resistance". For TFFT or FFFT, the joint should be hand tightened snugly and then tightened with a wrench by the number of flats or turns indicated by the table. For "FFWR", the joint should be tightened snugly with a wrench and then tightened again with the same wrench by the number of flats indicated by the table.

**NOTE:** The torque method of assembly is the preferred method of assembly. It reduces the risk of human error during assembly that is more prevalent in the "FFWR" method. To ensure the most accurate assembly of the fitting, it is strongly recommended that the torque method be utilized.

Table 2-39 Torque Values for O-ring Face Seal Fittings, Tube Ends

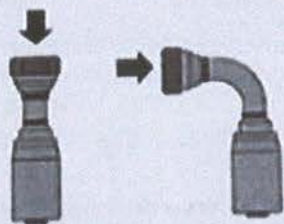
O-Ring Face Seal Tube Ends				
SAE Dash Size	Thread Size in	Tube Side Torque (+10% -0) Nm (lb-ft)	FFWR <sup>12</sup> Tube Nuts (min - max)	FFWR Swivel & Hose Ends (min - max)
-4	9/16 - 18	25 (18)	1/4 - 1/2	1/2 - 3/4
-6	11/16 - 16	40 (30)	1/4 - 1/2	1/2 - 3/4
-8	13/16 - 16	55 (40)	1/4 - 1/2	1/2 - 3/4
-10	1 - 14	80 (60)	1/4 - 1/2	1/2 - 3/4
-12	1-3/16 - 12	115 (85)	1/4 - 1/2	1/3 - 1/2
-16	1-7/16 - 12	150 (110)	1/4 - 1/2	1/3 - 1/2
-20	1-11/16 - 12	190 (140)	1/4 - 1/2	1/3 - 1/2
-24	2 - 12	245 (180)	1/4 - 1/2	1/3 - 1/2

[12] FFWR - Flats From Wrench Resistance



**Table 2-40 HGT-FT ORFS Hose Ends (Manuli Hose Fittings)**

O-ring Face Seal

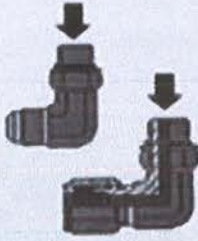

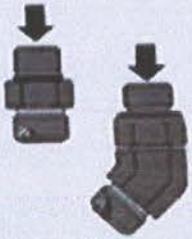


SAE Dash Size	Hose ID	Thread Size	Recommended Torque Values		Tooling mm/in	FFFT Hose Ends
-4	1/4"	9/16"-18	14-16	10-12	19	1/2
-6	3/8"	11/16"-16	24-26	18-20	22	1/2
-8	1/2"	13/16"-16	43-47	31-35	24	1
-12	3/4"	1 3/16"-12	91-95	65-69	36	1/4
-16	1"	1 7/16"-12	125-135	92-100	41	1/4
-20	1 1/4"	1 11/16"-12	170-190	125-139	50	1/4
-24	1 1/2"	2"-12	200-230	150-164	2 3/8"	1/2








**Table 2-41 Torque Values for Fittings with SAE or BSPP Straight Thread Ends**

Adjustable and Non-Adjustable SAE and BSPP Ends (Plugs excluded)

SAE Dash Size	Thread Size	Torque (+10% -0)		
		JIC, Ferrule Fittings	JIC, Ferrule & Pipe Fittings	Face Seal Fittings
		Adjustable 	Straight 	Adjustable & Straight 
	in	Nm (lb-ft)	Nm (lb-ft)	Nm (lb-ft)
-4	7/16 - 20	20 (15)	29 (15)	20 (15)
-6	9/16 - 18	40 (30)	40 (30)	46 (35)
-8	3/4 - 16	70 (52)	70 (52)	80 (60)
-10	7/8 - 14	115 (85)	115 (85)	135 (100)
-12	1-1/16 - 12	183 (135)	183 (135)	185 (135)
-14	1-3/16 - 12	237 (175)	237 (175)	235 (175)
-16	1-5/16 - 12	271 (200)	271 (200)	270 (200)
-20	1-5/8 - 12	339 (250)	339 (250)	340 (250)
-24	1-7/8 - 12	414 (305)	414 (305)	415 (305)



**Table 2-42 HGT-FT JIC Ends**

JIC (37° Flared Tube) Ends				
				
SAE Dash Size	Size in	Assembly Torque (+10% -0) Nm (lb-ft)	Tube End FFFT <sup>13</sup>	Hose End of Swivel Nut FFFT <sup>13</sup>
-4	7/16 - 20	16 (12)	2	2
-6	9/16 - 18	29 (22)	1.5	1.25
-8	3/4 - 16	63 (46)	1.5	1
-10	7/8 - 14	75 (55)	1.5	1
-12	1-1/16 - 12	115 (85)	1.25	1
-14	1-3/16 - 12	140 (103)	1	1
-16	1-5/16 - 12	165 (122)	1	1
-20	1-5/8 - 12	230 (170)	1	1
-24	1-7/8 - 12	270 (200)	1	1
-32	2-1/2 - 12	365 (270)	1	1

[13] FFFT - Flats From Finger Tight



Table 2-43 HGT-FT NPT and BSP Plugs and Fittings

## NPT and BSPT Fittings and Plugs



NPTF in	BSPT in	NPT TFFT <sup>14</sup> (min-max)
1/8 - 27	1/8 - 28	2 - 3
1/4 - 18	1/4 - 19	2 - 3
3/8 - 18	3/8 - 19	2 - 3
1/2 - 14	1/2 - 14	2 - 3
3/4 - 14	3/4 - 14	2 - 3
1 - 11-1/2	1 - 11	1.5 - 2.5
1-1/4 - 11-1/2	1-1/4 - 11	1.5 - 2.5
1-1/2 - 11-1/2	1-1/2 - 11	1.5 - 2.5
2 - 11-1/2	2 - 11	1.5 - 2.5

[14] TFFT - Turns From Finger Tight





**Table 2-44 HGT-FT Flareless Tube Ends**
**Ferrule (Bite) Fittings**


SAE Dash Size	Size in	Nut FFFT <sup>15</sup> (min-max)
4	7/16 - 20	1/3 - 1/2
6	9/16 - 18	1/3 - 1/2
8	3/4 - 16	1/3 - 1/2
10	7/8 - 14	1/3 - 1/2
12	1-1/16 - 12	1/3 - 1/2
14	1-3/16 - 12	1/3 - 1/2
16	1-5/16 - 12	1/3 - 1/2
20	1-5/8 - 12	1/3 - 1/2
24	1-7/8 - 12	1/3 - 1/2
32	2-1/2 - 12	1/3 - 1/2

[15] FFFT - Flats From Finger Tight



Table 2-45 HGT-FT SAE Plugs

SAE Straight Thread Plugs			
SAE Dash Size	Thread Size	Torque (+10% -0)	
		Hollow Hex Plug	Hex Plug
			
	in	Nm (lb-ft)	Nm (lb-ft)
-2	5/16 - 24	3.5 (2.6)	10 (7.4)
-4	7/16 - 20	13.5 (10)	29 (21)
-6	9/16 - 18	46 (34)	40 (30)
-8	3/4 - 16	80 (60)	70 (52)
-10	7/8 - 14	135 (100)	115 (85)
-12	1-1/16 - 12	185 (135)	183 (135)
-14	1-3/16 - 12	235 (175)	237 (175)
-16	1-5/16 - 12	270 (200)	271 (200)
-20	1-5/8 - 12	340 (250)	339 (250)
-24	1-7/8 - 12	415 (305)	414 (305)
-32	2-1/2 - 12	510 (375)	509 (375)



**Table 2-46 HGT-FT Bulkhead Locknuts**





Bulkhead Locknuts		
SAE	Torque (+ 10% -0)	
	O-ring Face Seal Ends	JIC or Ferrule Ends
		
	Nm (lb-ft)	Nm (lb-ft)
4	20 (15)	20 (15)
6	34 (25)	40 (30)
8	75 (55)	70 (50)
10	100 (75)	115 (85)
12	170 (125)	183 (135)
14	230 (170)	237 (175)
16	270 (200)	271 (200)
20	330 (240)	339 (250)
24	365 (270)	414 (305)



Table 2-47 Torque Values for BSPP and Metric Plugs

BSPP Plugs		Metric Plugs	
			
Thread Size	Torque (+10% -0)	Thread Size	Torque (+10% -0)
Inch	Nm (lb-ft)	Metric	Nm (lb-ft)
1/8 - 28	15 (11)	M42	400 (295)
1/4 - 19	30 (22)	M48	500 (370)
3/8 - 19	60 (44)	M52	600 (440)
1/2 - 14	90 (66)	M60	800 (590)
3/4 - 14	135 (100)	M64	850 (630)
1 - 11	210 (155)	M68	1000 (740)
1-1/4 - 11	360 (265)	M70	1100 (810)
1-1/2 - 11	450 (330)	M75	1300 (960)
		M80	1550 (1150)
		M85	1800 (1330)
		M90	2000 (1480)

**REMINDER:**

- Torque values shown are for steel components lubricated as described in Table 2-31.
- For brass fittings (NPT excluded), use approximately 65% of the torque values shown.
- For stainless steel fittings (NPT excluded), use 110% of the torque values shown.
- For NPT elbows, never back-off to achieve alignment.
- For ferrule (bite) fittings, manually screw the nut on the fitting body until finger tight. Continue to tighten the joint with a wrench by the number of flats indicated in the table. If the fitting body is used for ferrule pre-set, the nut must be re-tightened to the same fitting body used in pre-set.
- Assembled parts (nut and adapter) must have identical plating.
- Fittings displayed in tables are for reference only.
- Torque values shown in the tables apply to the referenced end of the displayed fittings, as indicated by arrows.



## 2.13.7 HGT-EL Standard (Electrical Applications)

The torque values shown apply to screws used in electrical connections.

Table 2-48 Torque Values for Screws (Electrical)

Size		Metric and Imperial Screws					
		Torque (+ 10% -0)					
		Steel		Aluminum and Copper		Brass	
		Nm	lb-ft	Nm	lb-ft	Nm	lb-ft
M3	#4	0.7	0.5	0.3	0.2	0.6	0.4
M3.5	#6	1	0.7	0.5	0.4	0.8	0.6
M4	#8	1.3	1	0.7	0.5	1.2	0.9
M5	#10	1.9	1.4	1	0.7	1.7	1.2
M6	1/4	6	4	3	2	5	3
M8	5/16	8	6	4	3	5	4
M10	3/8	10	7	5	4	8	6



## 2.13.8 Supplier Recommended Torque Specifications

The following torque values are recommended by suppliers and are also specified on the assembly drawings.

Table 2-49 Torque Values for Hydraulic Manifold Valves Mounting Bolts

Torque Nm (lb-ft) min. – max.

Bolt Size	Bosch			Beezroth			Moog/Hydroflux			Hyd. Option Segment Manifold
	Prop Valves	Direct Valves	Cartridges	Prop Valves	Direct Valves	Cartridges	Prop Valves	Direct Valves	Cartridges	
M5	6-8 (4.4-5.9)	6-8 (4.4-5.9)		6.2-8.9 (4.6-6.6)	6.2-8.9 (4.6-6.6)		5.8-7.8 (4.2-5.7)	7.2-8 (5.3-5.9)		8.9-9.8 (6.6-7.2)
M6	11-14 (8.1-10.3)	11-14 (8.1-10.3)		11-15.5 (8.1-11.4)	11-15.5 (8.1-11.4)		9.4-12.6 (6.9-9.3)	11.7-13 (8.6-9.6)		15.5-17 (11.5-12.6)
M8			26-31 (19-23)			23-32 (17-23)			27-30 (20-22)	32-35 (23-26)
M10	40-50 (30-37)	50-60 (37-44)		53-75 (39-55)	53-75 (39-55)		46-62 (34-45)	50-55 (37-40)		75-83 (55-61)
M12	90-120 (66-88)	85-100 (63-73)	90-105 (66-77)	91-130 (67-96)	91-130 (67-96)	77-110 (57-81)	80-108 (59-80)	90-100 (66-74)	90-100 (66-74)	110-121 (81-89)
M16			240-260 (178-192)			189-270 (139-199)			270-300 (199-221)	270-297 (200-219)
M20	450-560 (332-410)		450-500 (332-369)	301-430 (222-317)	301-430 (222-317)	364-520 (268-383)	391-529 (288-390)	495-550 (365-406)	495-550 (365-405)	520-572 (385-422)
M24						630-900 (464-664)			810-900 (598-664)	900-990 (665-730)
M30						1260-1800 (929-1327)			1620-1800 (1195-1328)	1800-1980 (1330-1460)
Lubricant	Hydraulic Oil									Grease



**Table 2-50 Torque Values for Orifices on Hydraulic Manifolds**

Bolt Size	Torque ( $\pm 4\%$ )	
	Nm	lb-ft
M5	4	3
M6	6	4.5
M8	13.5	10
M10	27	20
Lubricant	Grease	

**Table 2-51 Torque Values for Hose/Pipe Clamps Mounting Bolts**

Clamp Type	Lubricant	Bolt Size	Clamp Size	Torque in Nm (lb-ft) ( $\pm 4\%$ ) with Clamping Material			
				Aluminum (AL)	Polypropylene (PP)	Polyamid (PA)	
Single clamp Light series	Loctite	M6	0 to 6	12 (9)	8 (5.9)	10 (7.4)	
Single clamp Heavy series		M10	1				
			2	30 (22)	12 (9)	20 (15)	
			3	35 (26)	15 (11)	25 (18)	
		M12	4	55 (40)	30 (22)	40 (30)	
		M16	5	120 (90)	45 (33)	55 (40)	
M20		6	220 (160)	80 (60)	150 (110)		
M24		7	250 (180)	110 (80)	250 (180)		
Twin clamp		M6	1	N/A	5 (3.7)	6 (4.4)	
			2	N/A	12 (8.9)	12 (8.9)	
	M8	3	N/A				
		4	N/A				
		5	N/A	8 (5.9)	8 (5.9)		

**Table 2-52 Torque for Hydraulic Motor Mounting Bolts**

Torque Nm (lb-ft) $\pm$ Tolerance Value	
Bolt Size	Hagglungs Hydraulic Motors
M16	280 $\pm$ 15 (205 $\pm$ 11)
M20	540 $\pm$ 20 (400 $\pm$ 15)



**Table 2-52 Torque for Hydraulic Motor Mounting Bolts**

Torque Nm (lb-ft) ± Tolerance Value	
Bolt Size	Hagglungs Hydraulic Motors
M24	900 ± 30 (665 ± 22)
Lubricant	Hydraulic Oil

**Table 2-53 Torque for AMPCO 18 Mounting Screws**

Size	Maximum Tightening Torque (+ 0 / - 10%)		Size	Maximum Tightening Torque (+ 0 / - 10%)	
	Nm	lb-ft		Nm	lb-ft
M4	2	1.5	M16	69	51
M5	3	2.2	M18	92	68
M6	5	3.7	M20	131	97
M8	11	8	M22	178	131
M10	22	16	M24	240	177
M12	26	19	M27	296	218
M14	44	32	M30	456	336



## 2.13.9 Split Flange Assemblies

### CAUTION!

Lightly torque all screws before applying the final recommended torque values to avoid breaking the flange halves during installation.

Table 2-54 Split Flange Assemblies (ISO 6162:1994)

4 Bolt Split Flange Assemblies Code 61 (25 bar to 350 bar series)			4 Bolt Split Flange Assemblies Code 62 (400 bar series)		
Bolt Size	Torque <sup>16</sup> (+25% -0)		Bolt Size	Torque <sup>16</sup> (+25% -0)	
	Nm	lb-ft		Nm	lb-ft
M8	25	18	M8	25	18
M10	53	40	M10	53	40
M12	95	70	M12	95	70
M16	220	160	M14	150	110
-	-	-	M16	220	160
-	-	-	M20	390	290
Lubricant	Lubriplate FGL-1 or Molykote G - rapid plus with MoS2				

[16] The recommended torque values are consistent with the HGT-50 general standard with the exception of M14 bolts (refer to the assembly drawing). The recommended torque values may be increased by 25% when flange head type 12.9 screws are used with Unbrako Durlok-12.9 screws.