

Specification for Subsurface Sucker Rod Pump Assemblies, Components, and Fittings

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Introduction

This specification has been developed by users, purchasers, suppliers and manufacturers of subsurface sucker rod pumps intended for use in the petroleum and natural gas industry worldwide. This specification is intended to give requirements and information to all parties in the design, manufacture and selection of subsurface sucker rod pumps and their components. Furthermore, this specification addresses the minimum requirements with which the manufacturer is to claim conformity with this specification.

Included within this specification are normative annexes specifying requirements and informative annexes providing general information.

Attention is brought to users of this specification that requirements above those outlined in this specification can be required for individual applications. This specification is not intended to inhibit a manufacturer from offering, or the user or purchaser from accepting alternative equipment or other engineering solutions. This can be particularly applicable where there is innovative or developing technology. Where an alternative is offered, it is the responsibility of the manufacturer to identify any variations from this specification.

In this specification, quantities expressed in United States Customary (USC) units are also, where practical, expressed in International System (SI) units, either in parentheses in the text or on separate data sheets. USC units shall be the controlling units, SI units are included as a convenience for the user of this specification.

Specification for Subsurface Sucker Rod Pump Assemblies, Components, and Fittings

1 Scope

This specification provides the requirements and guidelines for the design of subsurface sucker rod pumps and their components as defined herein for use in the sucker rod lift method for the petroleum and natural gas industry.

This specification covers subsurface sucker rod pump assemblies (including insert and tubing), components, and fittings, in commonly used bore sizes for the sucker rod lift method. Sufficient dimensional and material requirements are provided to assure interchangeability and standardization of all component parts.

This specification does not cover specialty subsurface sucker rod pump accessories or special design components. Installation, operation, and maintenance of these products are not included in this specification; however, recommendations can be found in API 11AR.

2 Normative References

The following referenced documents are indispensable for the application of this document for manufacture of products. The following referenced documents shall be informative for products that are not manufactured. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

API Specification 5B, *Specification for Threading, Gauging and Thread Inspection of Casing, Tubing, and Line Pipe Threads*

API Recommended Practice 11AR, *Recommended Practice for Care Use of Subsurface Pumps*

API Specification 11B, *Specification for Sucker Rods, Polished Rods and Liners, Couplings, Sinker Bars, Polished Rod Clamps, Stuffing Boxes, and Pumping Tees*

API Specification Q1, *Specification for Quality Management System Requirements for Manufacturing Organizations for the Petroleum and Natural Gas Industry*

ANSI/ASQ Z1 ¹, *Sampling Procedures and Tables for Inspection by Attributes*

ANSI/ASQ Z1.4, *Single Sampling Plan for Normal Inspection*

ASNT-TC-1A ², *Personnel Qualifications and Certification in Nondestructive Testing*

¹ American National Standards Institute, 25 West 43rd Street, 4th Floor, New York, New York 10036, www.ansi.org.

² American Society for Nondestructive Testing, 1711 Arlingate Lane, P.O. Box 28518, Columbus, Ohio 43228, www.asnt.org.

3 Terms, Definitions, Symbols, and Abbreviations

3.1 Terms and Definitions

For the purposes of this document the following terms and definitions apply. For quality system related terms used in this Specification and not defined below, see API Q1.

3.1.1

100 % inspection

Inspect each part in the lot.

3.1.2

batch lot processing

Material is processed in a machine in defined quantities or volumes.

3.1.3

calibration standards

Basic measurement tools (such as thread wires or gauge blocks) which are traceable to International Standard Units (SI units) through a national standards organization such as NIST and are used to calibrate measurement tools, inspection equipment, thread form gauges, and plain form gauges.

3.1.4

carbonitrided

Carbon and nitrogen diffused surface hardening process.

3.1.5

carburized

Carbon diffused surface hardening process.

3.1.6

continuous processing

Material flows steadily through the processing equipment in an undefined quantity or volume.

3.1.7

discontinuity

Interruption in the normal physical structure or configuration such as cracks, laps, seams, pits, and laminations.

3.1.8

documented processing instructions

Standard operating procedures (SOP), approved by a qualified person, which include the necessary work instructions for the requirements of a particular process.

3.1.9

dual lapped seat

A valve seat that has been lapped for both API (V12) and Alternate (V12A) size balls.

3.1.10

hard lined

Welded hardface process in which a hard material is overlaid on the base material.

3.1.11

induction case hardened

Surface hardening process by means of induction heating.

3.1.12**material test report**

A document from a mill or certifying laboratory that states at a minimum the material type or grade, chemical properties, and mechanical properties. Additionally, it may state hardness.

3.1.13**nickel carbide composite**

Nickel alloy coating with carbide particles suspended therein.

3.1.14**nitrided**

Nitrogen diffused surface hardening process.

3.1.15**qualified person**

Personnel with characteristics or abilities, gained through training and/or experience as measured against established requirements, standards or tests, that enable the individual to perform a required function.

3.1.16**quality assurance**

a system of maintaining documents and procedures to a given standard.

3.1.17**quality control**

a system of maintaining product characteristics and attributes in manufactured products.

3.1.18**thread wires**

A set of precision ground wires used in conjunction with a micrometer to measure the thread pitch diameter on an external (pin) thread.

3.1.19**total indicator runout (circular)**

Total gauge reading as circular part is rotated 360°.

3.1.20**working gauge**

Gauge used for direct measurement of product.

3.2 Symbols**3.2.1 General Symbols**

APL	actual plunger length, soft packed
D_3	diameter, valve rod makeup
D_A	diameter, seating, nipple
D_{ANG}	diameter, face of angle
D_{ALT}	diameter, alternate ball size
D_B	diameter, standard ball size
D_F	diameter, contact face, sucker rod connection
D_H	diameter, hole
D_{MBA}	diameter, outside, seating, mechanical bottom
D_{MBC}	diameter, pitch length, seating mechanical bottom

D_{MTA}	diameter, seating, mandrel
D_{od}	diameter, tube, plunger
D_{PD}	diameter, mechanical top lock
D_Q	counterbore diameter
D_{RX}	diameter, ring radii centers
L_1	length, fishing neck knob
L_2	length, fishing neck
L_3	length, valve rod makeup
L_4	length, cup base
L_5	length, cup throw
L_6	length, cup
L_7	length, cup ring
L_B	length, seating
L_{CB}	counterbore length
L_{CBT}	length, thread, minimum full form S15, S16
L_{CU}	length, barrel coupling, upper
L_{CL}	length, barrel coupling, lower
L_L	length, puller thread
L_{MBB}	length, seating mechanical bottom
L_{MC1}	length, mandrel, cup, makeup
L_{MC2}	length, mandrel, cup, clearance
L_{PL}	pitch length
L_{PL1}	pitch length, mechanical top lock
L_q	counterbore length
L_{qm}	counterbore length
L_{R2}	length, cup ring clearance
L_{R3}	length, cup ring pitch length
L_{SL}	length, sealing, plunger
L_t	length, mandrel, thread
L_{wa}	length, clutch flats, external
L_{wb}	length, clutch flats, internal
L_{wc}	length, clutch
R	radius, cup ring

3.2.2 Gauge Symbols

DBD4	diameter of collar on plug gauge, B1 thread
DBD7	major diameter of plug gauge at gauge point, B1 thread

DBDG	diameter of notch on plug gauge, B1 thread
DBDO	major thread diameter at end of barrel, B1 thread
DBE7	pitch diameter at gauge point, B1 thread
DBKO	thread root diameter at end of barrel, B1 thread
LBL2	length of effective thread (on barrel), B1 thread
LBL4	total length of thread (to vanish point), B1 thread
LBL7	length from gauge point to end of barrel, B1 thread
LBLN	total depth of box (including undercut, if any), B1 thread
LBS	gauge standoff, B1 thread

3.2.3 Thread Dimensional Symbols

D_{CF}	diameter, thread, C132
D_{CJ}	diameter, thread relief, C11
L_{CA}	length, thread, C11, C21, C31
L_{CBM}	length, thread, minimum full form C12
L_{CE}	length, thread, C22

3.2.4 Thread Designation Symbols

S, S1, S2, C11, C12, C21, C22, C31, C32, A, L, B1, B2, F1, LP, F32, F42, F22, H1, H2, P1, P2

3.3 Abbreviations

ANSI	American National Standards Institute
ASNT	American Society for Non-Destructive Testing
ASQ	American Society for Quality
EU	external upset
ID	inside diameter
KSI	thousand pounds per square inch
MTR	Material Test Report
NIST	National Institute of Standards and Technology
NDE	non-destructive examination
nom	nominal dimension
OD	outside diameter
TIR	total indicator runout
UNS	Unified Numbering System

4 Functional Requirements

To order products which conform to this specification, the user or purchaser may determine the applicable well and environmental operational conditions, specify the requirements and/or identify the manufacturer's specific products. Additional detailed ordering information can be found in the normative annexes. Requirements may be conveyed to the manufacturer by means of the manufacturer's part number, data sheet, or other suitable documentation.

When pump assemblies are specified by the purchaser, functional testing of assembled pumps shall be conducted in accordance with agreed upon procedures. Documentation of specified testing shall be provided when so required.

In lieu of ordering products by the manufacturer's part numbers, or by API 11AX product number, the following requirements should be specified, as applicable:

- a) production rate;
- b) material type;
- c) well depth, casing size, tubing size, pump size, or other mechanical well parameters;
- d) well bore configuration (such as deviation, dog-legs, etc.);
- e) produced fluid chemical and physical composition, including produced solids (sand production, scale, etc.), to which the products are exposed during their full life cycle;
- f) the selected surface drive system;
- g) bottom hole static and producing temperature and pressure;
- h) planned chemical treatments.

5 Technical Requirements

5.1 General Requirements

Products shall conform to the requirements of this specification.

5.2 Design Requirements

5.2.1 General

When design of a product is required, component parts shall be designed and manufactured in accordance with this specification, shall comply with the dimensions given in Annex C, and shall be constructed of materials listed in Annex F. Sucker rod pumps shall be identified per Annex E and assembled in accordance with Annex B.

Special processes shall be validated. These include but are not limited to heat treating, plating, spray metal coating and metallurgical surface bonding processes such as carbo-nitriding, nickle carbide coating, etc. The validation of these processes shall be covered in the manufacturer's documentation and be part of the design package.

5.2.2 Design Documentation

Design documentation shall as a minimum include drawings, and as applicable: assumptions, formulas, calculations, design requirements, testing, and acceptance criteria. Design documentation media shall be

clear, legible, reproducible, and retrievable. It shall include design verification, validation, reviews, and any necessary actions.

5.2.3 Design Review

Designs shall be reviewed and verified by a qualified person other than the person(s) who developed the original design to evaluate the ability of the design to meet requirements.

5.2.4 Design Verification

Design verification shall be performed to ensure that each product design meets the manufacturer's technical specifications.

5.2.5 Design Changes

Design changes and changes to design documents that affect conformance to this specification shall require the same control features as the original design.

5.3 Materials

The manufacturer shall develop documented specifications which conform to the requirements of Annex F for all materials used in products manufactured to this specification.

6 Manufacturer Requirements

6.1 General

As a minimum, each of the following topics shall be addressed by the manufacturer.

6.2 Quality Control

6.2.1 General

To maintain accuracy, equipment used to measure, test and gauge products manufactured in accordance with this specification shall be identified, controlled, calibrated and adjusted, if necessary. This shall be performed at specified intervals in accordance with the manufacturer's specifications and the requirements of this specification.

Technologies for inspections with verifiable accuracies equal to or better than those listed in this specification may be applied with appropriate documentation approved by a qualified person.

6.2.2 Inspection/Measuring/Testing Equipment Calibration

6.2.2.1 Reference master thread gauges are not required for threads defined by this specification. Manufacturers shall have (or have access to) setting plugs to be used to validate and calibrate the thread ring gauges.

6.2.2.2 Inspection, measuring, and testing equipment used for acceptance shall be identified, inspected, calibrated, and adjusted at specific intervals in accordance with documented procedures and this specification. Inspection, measuring, and testing equipment shall be used only within the calibrated range. The calibration or verification of measuring and testing equipment used for product acceptance shall be traceable to International Standard Units (SI units) through a national standards organization such as NIST.

6.2.2.3 Calibration intervals for inspection, measuring, and testing equipment shall be established based on historical calibration data measurements. Calibration intervals shall be a maximum of three months until a recorded calibration history is established. Intervals may be lengthened or shortened based on calibration history. A calibration interval cannot be increased to more than twice the previous interval. In the event of

suspected damage or misuse, the inspection, measuring, or testing equipment shall be immediately removed from service until calibration is verified.

6.2.2.4 Calibration standards used to calibrate inspection, measuring, and testing equipment shall be validated and approved at a minimum of once a year by a national standards organization such as NIST or an organization accredited by a signatory of the ILAC Mutual Recognition Arrangement.

6.2.2.5 Pressure gauges or transducers shall be accurate to at least 3 % of full-scale range. These devices shall be calibrated at a minimum of once a year with a master measuring device or a dead weight tester to at least three equidistant points distributed across the full scale (0 % to 100 %), excluding zero and full scale, as required points of calibration, using approved procedures.

6.2.3 Personnel Qualifications

All personnel performing quality control activities directly affecting material and product quality shall be qualified in accordance with the manufacturer's documented requirements. This is separate from Quality Assurance activities.

6.2.4 Acceptance Criteria

6.2.4.1 General

Products designed and manufactured in accordance with this specification shall meet the requirements of the appropriate annexes of this specification. Records shall be maintained for a minimum of five years for all accepted finished products. All products covered in this standard shall be manufactured from new material supplied by the steel mill or distributor. Cast bars shall not be used as raw material for manufacturing components. When specified, non-destructive examinations shall be performed and accepted according to the manufacturer's documented specifications which shall include acceptance criteria.

Material Test Report (MTR) shall be considered as evidence of compliance with material requirements as listed in Annex F.

Dimensional inspection shall be performed by a qualified person to assure proper function and conformance with design criteria, specifications and final component dimensions.

6.2.4.2 Frequency and Acceptance of Inspection

6.2.4.2.1 Batch Lot Processing

Unless otherwise stated in this specification, frequency and acceptance of inspection of manufacturing lots shall be in accordance with the acceptance criteria for the single sampling plan for normal inspection, general inspection level I, acceptable quality level of 4.0 %, as specified in ANSI/ASQ Z1.4. More stringent inspection plans are acceptable. Acceptance criteria shall be based on either continuous monitoring or statistical process control such as described in ANSI/ASQ Z1.4.

The frequency of dimensional inspections for components shall be accomplished according to the random single sampling plan in Table 1. This is based on acceptance of inspection per ANSI/ASQ Z1.4, General Inspection Level I, Acceptance Quality Level = 4.0 %.

6.2.4.2.2 Continuous Processing

In continuous processing, a minimum of 10.0 % of the produced parts shall be inspected. Processing of non-conforming items shall conform to 6.2.5. Parts manufactured prior to the non-conforming items shall be inspected back to the last acceptable part and the non-conforming parts shall be dispositioned according to the manufacturer's documented procedures. Acceptance criteria shall be based on either continuous monitoring or statistical process control such as described in ANSI/ASQ Z1.4.

Table 1—Sampling Procedures (See Note)

(1)	(2)	(3)	(4)
Lot Size	Sample Size	No. of Parts, Accept Lot	Out of Spec., Reject Lot ^a
2 to 8	2	0	1
9 to 15	2	0	1
16 to 25	3	0	1
26 to 50	5	0	1
51 to 90	5	0	1
91 to 150	8	1	2
151 to 280	13	1	2
281 to 500	20	2	3
501 to 1200	32	3	4
1201 to 3200	50	5	6
3201 to 10,000	80	7	8
10,001 to 35,000	125	10	11
NOTE Excerpt from ANSI/ASQ Z1.4, 2008 <i>Single Sampling Plan for Normal Inspection</i> , General Inspection Level I, Acceptable Quality Level = 4.0 %.			
^a 100 % inspection (sort) of rejected parts is acceptable practice.			

6.2.4.3 Component Parts

Component parts shall be dimensionally inspected for conformance to manufacturer's drawings and written specifications. Manufacturer's drawings and written specifications shall meet all the requirements of this standard as a minimum.

6.2.4.4 Threads

All threaded connections shall conform to the dimensions and tolerances of Annex G.

6.2.4.5 Surface Finish

Surface finishes shall be 250 Ra maximum unless otherwise noted.

Machined sealing surfaces shall be 125 Ra maximum unless otherwise noted.

Any specified surface finish shall be maximum, unless otherwise noted.

6.2.5 Manufacturing Non-conformances

The manufacturer shall establish and maintain documented procedures to ensure that a product which does not conform to specified requirements is prevented from unintended use or installation. This control shall provide for identification, evaluation, segregation, and disposition of non-conforming assemblies or components.

The responsibility for review and authority for the disposition of non-conforming product shall be defined by the manufacturer. Non-conforming product shall be:

- a) reworked to meet the specified requirements or the specified requirements of another product;

- b) accepted without repair by concession of a manufacturer's qualified and authorized person, provided the concession is within the design acceptance criteria and at no time is this product allowed to violate the requirements of this specification; or
- c) rejected and scrapped.

Records of the nature of nonconformities and any subsequent actions taken, including concessions obtained, shall be maintained in accordance with manufacturer's documented procedures. These records shall be retained for a minimum of five years.

6.2.6 Coatings

6.2.6.1 Product Coatings

Coatings applied to products (e.g. chrome plating, nickel carbide, etc.) shall be controlled by documented processing instructions, which have been approved by a qualified person. These instructions shall include acceptance criteria.

6.2.6.2 Coatings for Product Storage and Handling

Coatings that will provide protection from atmospheric corrosion and mechanical damage of products during storage and handling shall be applied in accordance with documented procedures.

6.2.7 Heat Treating Furnace Instrumentation

Automatic controlling and recording instruments shall be used. Thermocouples shall be located in the furnace working zone(s). The controlling and recording instruments used for the heat treatment processes shall possess an accuracy to within $\pm 1\%$ of their full-scale range. Temperature controlling and recording instruments shall be calibrated at least once every six months until a documented calibration history can be established. Calibration intervals shall then be established based on repeatability, degree of usage and documented calibration history. Equipment used to calibrate the furnace equipment shall possess an accuracy to within $\pm 0.25\%$ of full-scale range.

6.2.8 Ultrasonic or Magnetic Particle Methods of Non-destructive Examination (NDE)

If NDE is utilized as a manufacturer's option, instructions shall be detailed in the manufacturer's documented procedures and conform to the requirements of this specification. All NDE instructions shall be approved by a Level III examiner qualified in accordance with an international or national standard such as ASNT Recommended Practice SNT-TC-1A.

In case discontinuities are detected by non-visual NDE methods, the evaluation shall be supplemented by visual examination and measurement to determine the size of the discontinuity in accordance with the manufacturer's specification.

Personnel performing NDE shall be qualified to at least Level II for evaluation and interpretation in accordance with an international or national standard such as ASNT Recommended Practice SNT-TC-1A. Any unacceptable indications shall be removed, repaired, and re-examined using the original NDE method.

6.3 Product Identification

All products manufactured under this specification shall be marked in accordance with the requirements detailed in the Annex E and the manufacturer's documented procedures.

6.4 Documentation

The manufacturer shall establish and maintain documented procedures to control documents and data required by this specification. These documents and data shall be clear, legible, reproducible and retrievable.

These documents and data shall be retained in facilities that provide an environment which prevents damage, deterioration, or loss. Documents and data may be in the form of any type of media, such as hard copy or electronic media, and shall be retained for a minimum of five years from the date of manufacture.

Annex A (informative)

Use of API Monogram by Licensees

A.1 Scope

The API Monogram® is a registered certification mark owned by the American Petroleum Institute (API) and authorized for licensing by the API Board of Directors. Through the [API Monogram Program](#), API licenses product manufacturers to apply the API Monogram to new products which comply with product specifications and have been manufactured under a quality management system that meets the requirements of API Q1. API maintains a complete, searchable list of all Monogram licensees on the [API Composite List](#) website (www.api.org/compositelist).

The application of the API Monogram and license number on products constitutes a representation and warranty by the licensee to API and to purchasers of the products that, as of the date indicated, the products were manufactured under a quality management system conforming to the requirements of API Q1 and that the product conforms in every detail with the applicable standard(s) or product specification(s). API Monogram program licenses are issued only after an on-site audit has verified that an organization has implemented and continually maintained a quality management system that meets the requirements of API Q1 and that the resulting products satisfy the requirements of the applicable API product specification(s) and/or standard(s). Although any manufacturer may claim that its products meet API product requirements without monogramming them, only manufacturers with a license from API can apply the API Monogram to their products.

Together with the requirements of the API Monogram license agreement, this annex establishes the requirements for those organizations who wish to voluntarily obtain an API license to provide API monogrammed products that satisfy the requirements of the applicable API product specification(s) and/or standard(s) and API Monogram Program requirements.

For information on becoming an API Monogram Licensee, please contact API, Certification Programs, 1220 L Street, N. W., Washington, DC 20005 or call 202-682-8145 or by email at certification@api.org.

A.2 Normative References

API Specification Q1, *Specification for Quality Management System Requirements for Product Manufacturing for the Petroleum and Natural Gas Industry*

A.3 Terms and Definitions

For purposes of this annex, the following terms and definitions apply:

A.3.1

API monogramable product

Product that has been newly manufactured by an API licensee utilizing a fully implemented API Q1 compliant quality management system and that meets all the API specified requirements of the applicable API product specification(s) and/or standard(s)

A.3.2

API specified requirements

Requirements, including performance and licensee-specified requirements, set forth in API Q1 and the applicable API product specification(s) and or standard(s).

NOTE Licensee-specified requirements include those activities necessary to satisfy API specified requirements.

A.3.3**API product specification**

Prescribed set of rules, conditions, or requirements attributed to a specified product which address the definition of terms; classification of components; delineation of procedures; specified dimensions; manufacturing criteria; material requirements, performance testing, design of activities; and the measurement of quality and quantity with respect to materials; products, processes, services, and/or practices

A.3.4**licensee**

Organization that has successfully completed the application and audit process and has been issued a license by API

A.3.5**design package**

Records and documents required to provide evidence that the applicable product has been designed in accordance with API Q1 and the requirements of the applicable product specification(s) and/or standard(s)

A.4 Quality Management System Requirements

An organization applying the API Monogram to products shall develop, maintain, and operate at all times a quality management system conforming to API Q1.

A.5 Control of the Application and Removal of the API Monogram

Each licensee shall control the application and removal of the API Monogram in accordance with the following:

- a) Products that do not conform to API specified requirements shall not bear the API Monogram.
- b) Each licensee shall develop and maintain an API Monogram marking procedure that documents the marking/monogramming requirements specified by this annex and any applicable API product specification(s) and/or standard(s). The marking procedure shall:
 - 1) define the authority responsible for application and removal of the API Monogram;
 - 2) define the method(s) used to apply the Monogram;
 - 3) identify the location on the product where the API Monogram is to be applied;
 - 4) require the application of the licensee's license number and date of manufacture of the product in conjunction with the use of the API Monogram;
 - 5) require that the date of manufacture, at a minimum, be two digits representing the month and two digits representing the year (e.g. 05-12 for May 2012) unless otherwise stipulated in the applicable API product specification(s) or standard(s); and
 - 6) require application of the additional API product specification(s) and/or standard(s) marking requirements.
- c) Only an API licensee may apply the API Monogram and its designated license number to API monogramable products.
- d) The API Monogram license, when issued, is site-specific and subsequently the API Monogram shall only be applied at that site specific licensed facility location.

- e) The API Monogram may be applied at any time appropriate during the production process but shall be removed in accordance with the licensee's API Monogram marking procedure if the product is subsequently found to be out of conformance with any of the requirements of the applicable API product specification(s) and/or standard(s) and API Monogram Program.

For certain manufacturing processes or types of products, alternative API Monogram marking procedures may be acceptable. Requirements for alternative API Monogram marking are detailed in the API Policy, *API Monogram Program Alternative Marking of Products License Agreement*, available on the API Monogram Program website at <http://www.api.org/alternative-marking>.

A.6 Design Package Requirements

Each licensee and/or applicant for licensing must maintain a current design package for all of the applicable products that fall under the scope of each Monogram license. The design package information must provide objective evidence that the product design meets the requirements of the applicable and most current API product specification(s). The design package(s) must be made available during API audits of the facility.

In specific instances, the exclusion of design activities is allowed under the Monogram Program, as detailed in *Advisory # 6*, available on API Monogram Program website at <http://www.api.org/advisories>.

A.7 Manufacturing Capability

The API Monogram Program is designed to identify facilities that have demonstrated the ability to manufacture equipment that conforms to API specifications and/or standards. API may refuse initial licensing or suspend current licensing based on a facility's level of manufacturing capability. If API determines that additional review is warranted, API may perform additional audits (at the organization's expense) of any subcontractors to ensure their compliance with the requirements of the applicable API product specification(s) and/or standard(s).

A.8 API Monogram Program: Nonconformance Reporting

API solicits information on products that are found to be nonconforming with API specified requirements, as well as field failures (or malfunctions), which are judged to be caused by either specification deficiencies or nonconformities with API specified requirements. Customers are requested to report to API all problems with API monogrammed products. A nonconformance may be reported using the API Nonconformance Reporting System available at <http://compositelist.api.org/ncr.asp>.

Annex B (normative)

Pump Assemblies

B.1 Pump Designation

B.1.1 General

Pump assemblies shall be manufactured and supplied according to the requirements and specifications provided in this specification.

The basic types of pumps and letter designation covered by this specification are shown in Table B.1.

Table B.1—Pump Designations ^a

(1)	(2)	(3)	(4)	(5)
Type of Pump	Letter Designation			
	Metal Plunger Pumps		Soft-packed Plunger Pumps	
	Heavy-wall Barrel	Thin-wall Barrel	Heavy-wall Barrel	Thin-wall Barrel
Rod Pumps				
Stationary Barrel, Top Anchor	RHA	RWA	—	RSA
Stationary Barrel, Bottom Anchor	RHB	RWB	—	RSB
Stationary Barrel, Bottom Anchor	RXB	—	—	—
Traveling Barrel, Bottom Anchor	RHT	RWT	—	RST
Tubing Pumps	TH	—	TP	—
^a See Figure B.1 for definition of symbols.				

Complete pump designations, as shown in Figure B.1, include the following:

- nominal tubing size;
- basic bore diameter;
- type of pump, including type of barrel and location and type of seating assembly;
- barrel length;
- plunger length;
- length of each extension when used.

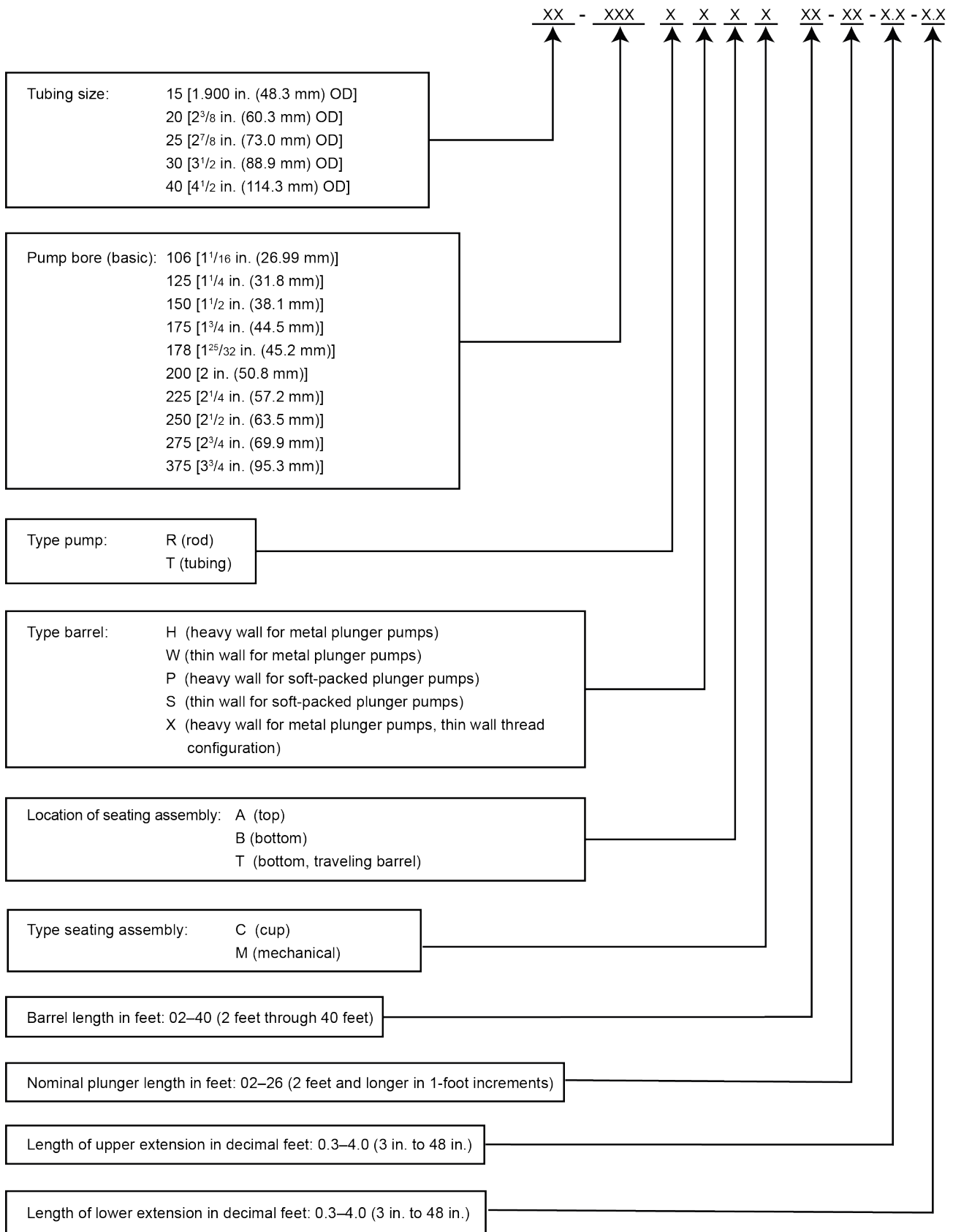


Figure B.1—Pump Designations

EXAMPLE A 1¹/₄ in. (31.8 mm) bore rod type pump with a 10 ft (3048 mm) heavy wall barrel and 24 in. (609.6 mm) upper extension, 24-in. (609.6 mm) lower extension, a 4 ft (1219.2 mm) plunger, and a bottom cup type seating assembly for operation in 2 ³/₈ in. (60.3 mm) tubing, would be designated as follows:

20-125 RHBC 10-04-2.0-2.0

In addition to the pump designation above, the purchaser must provide the following additional information:

- a) barrel material;
- b) plunger material;
- c) plunger clearance;
- d) valve material;
- e) fittings materials.

B.1.2 Pump Assemblies

Sucker rod pump assemblies shall be constructed from components defined in Annex C. Any functional combination of these components may be used to create a pump assembly. Tables B.2 through B.9 are a few examples of pump assemblies and are not limited to these designs.

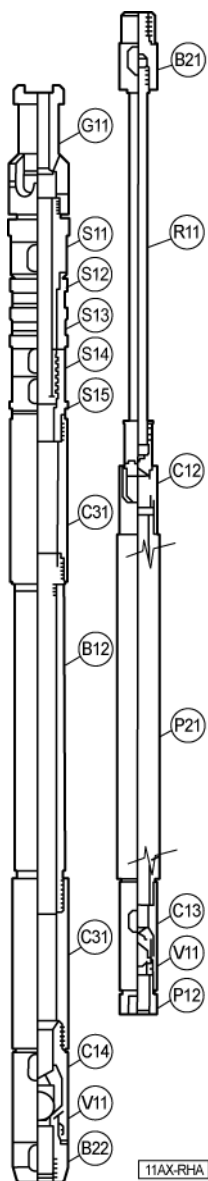
Metal plunger pumps are equipped with the following basic components from Annex C:

- a) valve rod or pull tube (insert pump only);
- b) one piece or assembled metal plungers of basic diameter, less clearance;
- c) valves;
- d) heavy-wall or thin-wall barrels;
- e) seating assemblies:
 - i) Cup type assemblies. These assemblies are furnished with compressible sealing elements. The letter "C" is to be used in the pump designation, as described in Figure B.1.
 - ii) Mechanical seating assemblies may be furnished when so specified, in which case the letter "M" is used in the pump designation in lieu of the letter "C". See part numbers S21 and S22 for details of the mechanical seating assemblies.

The design and construction of packing for soft-packed plungers has not been standardized. Specify size, type, and number of packing elements, according to the manufacturer's catalog.

Pump assemblies as described in this section shall be assembled and functionally tested per Annex D.

Marking of pump assemblies and components shall be per Annex E. Additionally, when API monogrammed assemblies and components are specified, marking shall include the marking requirements of Annex A.

**Table B.2—RHA—Rod, Stationary Heavy Wall Barrel, Top Anchor Pump (See Note)**

(1)	(2)	(3)	(4)	(5)	(6)
			Standard Pump Size		
		$2\frac{3}{8} \times 1\frac{1}{4}$ (60.3 x 31.8)	$2\frac{7}{8} \times 1\frac{1}{2}$ (73.0 x 38.1)	$2\frac{7}{8} \times 1\frac{3}{4}$ (73.0 x 44.5)	$3\frac{1}{2} \times 2\frac{1}{4}$ (88.9 x 57.2)
			Complete Pump Designation		
		20-125 RHAC^{a b c}	25-150 RHAC^{a b c}	25-175 RHAC^{a b c}	30-225 RHAC^{a b c}
Symbol ^f	Description	Part Number ^f			
B12	Barrel, Heavy Wall	B12-125 ^a	B12-150 ^a	B12-175 ^a	B12-225 ^a
B21	Bushing, Valve Rod	B21-20	B21-25	B21-25	B21-30
B22	Bushing, Barrel Cage	B22-20	B22-25	B22-25	B22-30
C12	Cage, Top Plunger	C12-125	C12-150-25	C12-175	C12-225
C13	Cage, Closed Plunger	C13-125	C13-150	C13-175	C13-225
C14	Cage, Closed Barrel	C14-20	C14-25	C14-25	C14-30
C31	Coupling, Extension	C31-125 ^c	C31-150 ^c	C31-175 ^c	C31-225 ^c
G11	Guide, Valve Rod	G11-20	G11-25	G11-25	G11-30
P12	Plug, Seat	P12-125	P12-150	P12-175	P12-225
P21	Plunger, One Piece ^d	P21-125 ^b	P21-150 ^b	P21-175 ^b	P21-225 ^b
R11	Rod, Valve	R11-20 ^e	R11-25 ^e	R11-25 ^e	R11-30 ^e
S11	Seating Mandrel, Cup (Type HR)	S11-20	S11-25	S11-25	S11-30
S12	Seating Cup (Type HR)	S12-20	S12-25	S12-25	S12-30
S13	Seating Cup Ring (Type HR)	S13-20	S13-25	S13-25	S13-30
S14	Seating Cup Nut (Type HR)	S14-20	S14-25	S14-25	S14-30
S15	Seating Cup Bushing	S15-20	S15-25	S15-25	S15-30
V11	Valve, Ball and Seat				
	Traveling	V11-125	V11-150	V11-175	V11-225
	Standing	V11-175	V11-225	V11-225	V11-250
NOTE All dimensions in inches (followed by equivalent in millimeters).					
^a Specify barrel length (L_{PL}). Standard lengths are: 2.00 ft (609.6 mm) through 40.00 ft (12192.0 mm) in 1.00 ft (304.8 mm) increments.					
^b Specify nominal plunger length in feet (millimeters) and clearance (fit) in thousandths of an inch (hundredths of a millimeter).					
^c Specify length of extension couplings in whole feet (thousandths of meters). Standard lengths are in increments of $\frac{1}{2}$ ft (0.152 m).					
^d A seat must be used between C12 and P21 if an optional F1A pin thread is present on P21 plunger, see component P21.					
^e See part number R11 for valve rod length.					
^f See Annex C for definitions of symbols used for pump components.					

Table B.3—RHB—Rod, Stationary Heavy Wall Barrel, Bottom Anchor Pump (See Note)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Standard Pump Size					
		1.900 x 1¹/₁₆ (48.3 x 27.0)	2³/₈ x 1¹/₁₆ (60.3 x 27.0)	2³/₈ x 1¹/₄ (60.3 x 31.8)	2⁷/₈ x 1¹/₂ (73.0 x 38.1)	2⁷/₈ x 1³/₄ (73.0 x 44.5)	3¹/₂ x 2¹/₄ (88.9 x 57.2)
		Complete Pump Designation					
		15-106 RHBC^{a b c}	20-106 RHBC^{a b c}	20-125 RHBC^{a b c}	25-150 RHBC^{a b c}	25-175 RHBC^{a b c}	30-225 RHBC^{a b c}
Symbol ^f	Description	Part Number ^f					
B12	Barrel, Heavy Wall	B12-106 ^a	B12-106 ^a	B12-125 ^a	B12-150 ^a	B12-175 ^a	B12-225 ^a
B21	Bushing, Valve Rod	B21-15	B21-20	B21-20	B21-25	B21-25	B21-30
C12	Cage, Top Plunger	C12-106	C12-100	C12-125	C12-150-25	C12-175	C12-225
C13	Cage, Closed Plunger	C13-106	C13-106	C13-125	C13-150	C13-175	C13-225
C14	Cage, Closed Barrel	C14-15	C14-20	C14-20	C14-25	C14-25	C14-30
C21	Connector, Upper Barrel	C21-15	C21-20	C21-20	C21-25	C21-25	C21-30
C31	Coupling, Extension	C31-106-15 ^c	C31-106 ^c	C31-125 ^c	C31-150 ^c	C31-175 ^c	C31-225 ^c
G11	Guide, Valve Rod	G11-15	G11-20	G11-20	G11-25	G11-25	G11-30
P12	Plug, Seat	P12-106	P12-106	P12-125	P12-150	P12-175	P12-225
P21	Plunger, One Piece ^d	P21-106 ^b	P21-106 ^b	P21-125 ^b	P21-150 ^b	P21-175 ^b	P21-225 ^b
R11	Rod, Valve	R11-20 ^e	R11-20 ^e	R11-20 ^e	R11-25 ^e	R11-25 ^e	R11-30 ^e
S11	Seating Mandrel, Cup (Type HR)	—	S11-20	S11-20	S11-25	S11-25	S11-30
S12	Seating Cup (Type HR)	—	S12-20	S12-20	S12-25	S12-25	S12-30
S13	Seating Cup Ring (Type HR)	—	S13-20	S13-20	S13-25	S13-25	S13-30
S14	Seating Cup Nut (Type HR)	—	S14-20	S14-20	S14-25	S14-25	S14-30
S16	Seating Cup Coupling	S16-15	S16-20	S16-20	S16-25	S16-25	S16-30
S31	Seating Mandrel, Cup (Type O)	S31-15	—	—	—	—	—
S32	Seating Cup (Type O)	S32-15	—	—	—	—	—
S33	Seating Cup Ring (Type O)	S33-15	—	—	—	—	—
S34	Seating Cup Nut (Type O)	S34-15	—	—	—	—	—
V11	Valve, Ball and Seat						
	Traveling	V11-106	V11-106	V11-125	V11-150	V11-175	V11-225
	Standing	V11-150	V11-175	V11-175	V11-225	V11-225	V11-250

NOTE All dimensions in inches (followed by equivalent in millimeters).

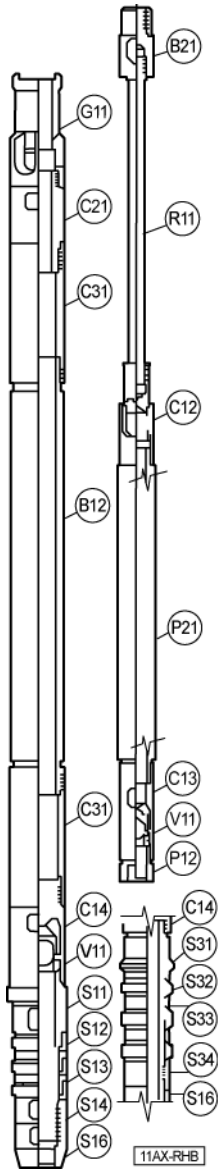
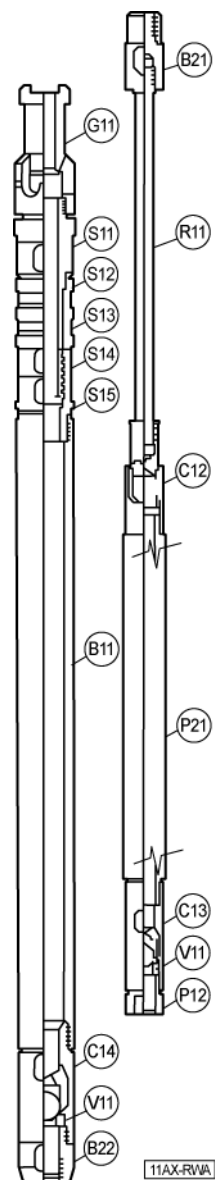
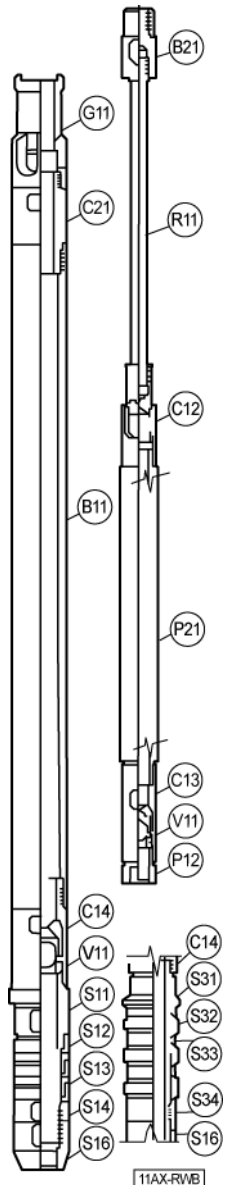
^a Specify barrel length (L_{PL}). Standard lengths are: 2.00 ft (609.6 mm) through 40.00 ft (12192.0 mm) in 1.00 ft (304.8 mm) increments.^b Specify nominal plunger length in feet (millimeters) and clearance (fit) in thousandths of an inch (hundredths of a millimeter).^c Specify length of extension couplings in whole feet (thousandths of meters). Standard lengths are in increments of 1/2 ft (0.152 m).^d A seat must be used between C12 and P21 if an optional F1A pin thread is present on P21 plunger, see component P21.^e See part number R11 for valve rod length.^f See Annex C for definitions of symbols used for pump components.

Table B.4—RWA—Rod, Stationary Thin Wall Barrel, Top Anchor Pump (See Note)



(1)	(2)	(3)	(4)	(5)	(6)
		Standard Pump Size			
		$2\frac{3}{8} \times 1\frac{1}{4}$ (60.3 x 31.8)	$2\frac{3}{8} \times 1\frac{1}{2}$ (60.3 x 38.1)	$2\frac{7}{8} \times 2$ (73.0 x 50.8)	$3\frac{1}{2} \times 2\frac{1}{2}$ (88.9 x 63.5)
		Complete Pump Designation			
		20-125 RWAC^{a c}	20-150 RWAC^{a c}	25-200 RWAC^{a c}	30-250 RWAC^{a c}
Symbol ^e	Description	Part Number ^e			
B11	Barrel, Thin Wall	B11-125 ^a	B11-150 ^a	B11-200 ^a	B11-250 ^a
B21	Bushing, Valve Rod	B21-20	B21-20	B21-25	B21-30
B22	Bushing, Barrel Cage	B22-20	B22-20	B22-25	B22-30
C12	Cage, Top Plunger	C12-125	C12-150-20	C12-200	C12-250
C13	Cage, Closed Plunger	C13-125	C13-150	C13-200	C13-250
C14	Cage, Closed Barrel	C14-20-125	C14-20	C14-25	C14-30
G11	Guide, Valve Rod	G11-20	G11-20	G11-25	G11-30
P12	Plug, Seat	P12-125	P12-150	P12-200	P12-250
P21	Plunger, One Piece ^b	P21-125 ^c	P21-150 ^c	P21-200 ^c	P21-250 ^c
R11	Rod, Valve	R11-20 ^d	R11-20 ^d	R11-25 ^d	R11-30 ^d
S11	Seating Mandrel, Cup (Type HR)	S11-20	S11-20	S11-25	S11-30
S12	Seating Cup (Type HR)	S12-20	S12-20	S12-25	S12-30
S13	Seating Cup Ring (Type HR)	S13-20	S13-20	S13-25	S13-30
S14	Seating Cup Nut (Type HR)	S14-20	S14-20	S14-25	S14-30
S15	Seating Cup Bushing	S15-20-125	S15-20	S15-25	S15-30
V11	Valve, Ball and Seat				
	Traveling	V11-125	V11-150	V11-200	V11-250
	Standing	V11-175	V11-175	V11-225	V11-250
NOTE All dimensions in inches (followed by equivalent in millimeters).					
^a Specify barrel length (L_{PL}). Standard lengths are: 2.00 ft (609.6 mm) through 40.00 ft (12192.0 mm) in 1.00 ft (304.8 mm) increments.					
^b A seat must be used between C12 and P21 if an optional F1A pin thread is present on P21 plunger, see component P21.					
^c Specify nominal plunger length in feet (millimeters) and clearance (fit) in thousandths of an inch (hundredths of a millimeter).					
^d See part number R11 for valve rod length.					
^e See Annex C for definitions of symbols used for pump components.					

Table B.5—RWB—Rod, Stationary Thin Wall Barrel, Bottom Anchor Pump (See Note)



(1)	(2)	(3)	(4)	(5)	(6)	(7)
Standard Pump Size						
		1.900 x 1¹/₄ (48.3 x 31.8)	2³/₈ x 1¹/₄ (60.3 x 31.8)	2³/₈ x 1¹/₂ (60.3 x 38.1)	2⁷/₈ x 2 (73.0 x 50.8)	3¹/₂ x 2¹/₂ (88.9 x 63.5)
Complete Pump Designation						
		15-125 RWBC^{a c}	20-125 RWBC^{a c}	20-150 RWBC^{a c}	25-200 RWBC^{a c}	30-250 RWBC^{a c}
Symbol^e	Description	Part Number^e				
B11	Barrel, Thin Wall	B11-125 ^a	B11-125 ^a	B11-150 ^a	B11-200 ^a	B11-250 ^a
B21	Bushing, Valve Rod	B21-15	B21-20	B21-20	B21-25	B21-30
C12	Cage, Top Plunger	C12-125	C12-125	C12-150-20	C12-200	C12-250
C13	Cage, Closed Plunger	C13-125	C13-125	C13-150	C13-200	C13-250
C14	Cage, Closed Barrel	C14-15	C14-20-125	C14-20	C14-25	C14-30
C21	Connector, Upper Barrel	C21-15	C21-20-125	C21-20	C21-25	C21-30
G11	Guide, Valve Rod	G11-15	G11-20	G11-20	G11-25	G11-30
P12	Plug, Seat	P12-125	P12-125	P12-150	P12-200	P12-250
P21	Plunger, One Piece ^b	P21-125 ^c	P21-125 ^c	P21-150 ^c	P21-200 ^c	P21-250 ^c
R11	Rod, Valve	R11-20 ^d	R11-20 ^d	R11-20 ^d	R11-25 ^d	R11-30 ^d
S11	Seating Mandrel, Cup (Type HR)	—	S11-20	S11-20	S11-25	S11-30
S12	Seating Cup (Type HR)	—	S12-20	S12-20	S12-25	S12-30
S13	Seating Cup Ring (Type HR)	—	S13-20	S13-20	S13-25	S13-30
S14	Seating Cup Nut (Type HR)	—	S14-20	S14-20	S14-25	S14-30
S16	Seating Cup Coupling	S16-15	S16-20	S16-20	S16-25	S16-30
S31	Seating Mandrel, Cup (Type O)	S31-15	—	—	—	—
S32	Seating Cup (Type O)	S32-15	—	—	—	—
S33	Seating Cup Ring (Type O)	S33-15	—	—	—	—
S34	Seating Cup Nut (Type O)	S34-15	—	—	—	—
V11	Valve, Ball and Seat					
	Traveling	V11-125	V11-125	V11-150	V11-200	V11-250
	Standing	V11-150	V11-175	V11-175	V11-225	V11-250

NOTE All dimensions in inches (followed by equivalent in millimeters).

^a Specify barrel length (L_{PL}). Standard lengths are: 2.00 ft (609.6 mm) through 40.00 ft (12192.0 mm) in 1.00 ft (304.8 mm) increments.

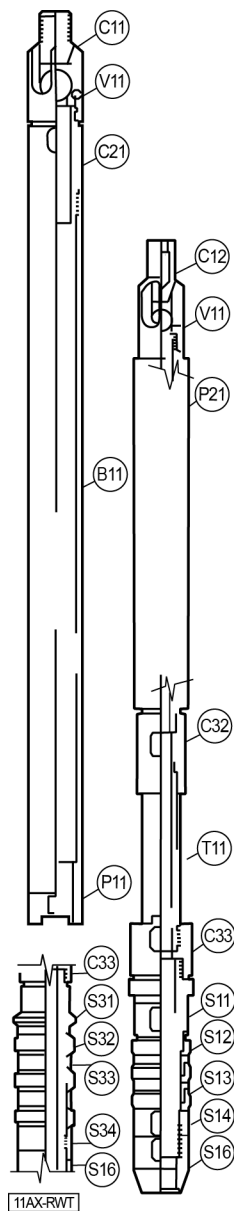
^b A seat must be used between C12 and P21 if an optional F1A pin thread is present on P21 plunger, see component P21.

^c Specify nominal plunger length in feet (millimeters) and clearance (fit) in thousandths of an inch (hundredths of a millimeter).

^d See part number R11 for valve rod length.

^e See Annex C for definitions of symbols used for pump components.

Table B.6—RWT—Rod, Traveling Thin Wall Barrel, Bottom Anchor Pump (See Note)



(1)	(2)	(3)	(4)	(5)	(6)	(7)
		Standard Pump Size				
		1.900 x 1 ¹ / ₄ (48.3 x 31.8)	2 ³ / ₈ x 1 ¹ / ₄ (60.3 x 31.8)	2 ³ / ₈ x 1 ¹ / ₂ (60.3 x 38.1)	2 ⁷ / ₈ x 2 (73.0 x 50.8)	3 ¹ / ₂ x 2 ¹ / ₂ (88.9 x 63.5)
		Complete Pump Designation				
		15-125 RWT ^{a c}	20-125 RWT ^{a c}	20-150 RWT ^{a c}	25-200 RWT ^{a c}	30-250 RWT ^{a c}
Symbol ^d	Description	Part Number ^d				
B11	Barrel, Thin Wall	B11-125 ^a	B11-125 ^a	B11-150 ^a	B11-200 ^a	B11-250 ^a
C11	Cage, Top Open	C11-15	C11-20	C11-20	C11-25	C11-30
C12	Cage, Top Plunger	C12-125	C12-125	C12-150-20	C12-200	C12-250
C21	Connector, Upper Barrel	C21-15	C21-20-125	C21-20	C21-25	C21-30
C32	Coupling, Pull Tube, Upper	C32-125	C32-125	C32-150	C32-200	C32-250
C33	Coupling, Pull Tube, Lower	C33-125-15	C33-125	C33-150-20	C33-200	C33-225
P11	Plug, Pull	P11-125-15	P11-125-15	P11-150-20	P11-200	P11-225
P21	Plunger, One Piece	P21-125 ^b	P21-125 ^b	P21-150 ^b	P21-200 ^b	P21-250 ^b
S11	Seating Mandrel, Cup (Type HR)	—	S11-20	S11-20	S11-25	S11-30
S12	Seating Cup (Type HR)	—	S12-20	S12-20	S12-25	S12-30
S13	Seating Cup Ring (Type HR)	—	S13-20	S13-20	S13-25	S13-30
S14	Seating Cup Nut (Type HR)	—	S14-20	S14-20	S14-25	S14-30
S16	Seating Cup Coupling	S16-15	S16-20	S16-20	S16-25	S16-30
S31	Seating Mandrel, Cup (Type O)	S31-15	—	—	—	—
S32	Seating Cup (Type O)	S32-15	—	—	—	—
S33	Seating Cup Ring (Type O)	S33-15	—	—	—	—
S34	Seating Cup Nut (Type O)	S34-15	—	—	—	—
T11	Tube, Pull	T11-125 ^c	T11-125 ^c	T11-150 ^c	T11-200 ^c	T11-225 ^c
V11	Valve, Ball and Seat					
	Traveling	V11-150	V11-175	V11-175	V11-225	V11-250
	Standing	V11-125	V11-125	V11-150	V11-200	V11-250

NOTE All dimensions in inches (followed by equivalent in millimeters).

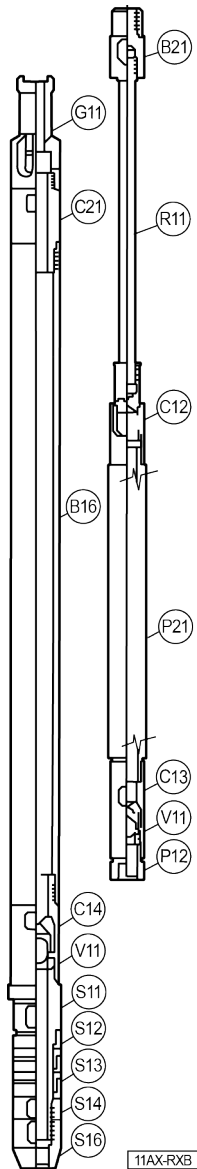
^a Specify barrel length (L_{PL}). Standard lengths are: 2.00 ft (609.6 mm) through 40.00 ft (12192.0 mm) in 1.00 ft (304.8 mm) increments.

^b Specify nominal plunger length in feet (millimeters) and clearance (fit) in thousandths of an inch (hundredths of a millimeter).

^c See part number T11 for pull tube length.

^d See Annex C for definitions of symbols used for pump components.

Table B.7—RXB—Rod, Stationary Heavy Wall Barrel, Bottom Anchor Pump (See Note)



(1)	(2)	(3)	(4)	(5)
			Standard Pump Size	
		$2\frac{3}{8} \times 1\frac{1}{4}$ (60.3 x 31.8)	$2\frac{3}{8} \times 1\frac{1}{2}$ (60.3 x 38.1)	$2\frac{7}{8} \times 2$ (73.0 x 50.8)
			Complete Pump Designation	
		20-125 RXBC^{a c}	20-150 RXBC^{a c}	25-200 RXBC^{a c}
Symbol ^e	Description	Part Number ^e		
B16	Barrel, Heavy Wall	B16-125 ^a	B16-150 ^a	B16-200 ^a
B21	Bushing, Valve Rod	B21-20	B21-20	B21-25
C12	Cage, Top Plunger	C12-125	C12-150-20	C12-200
C13	Cage, Closed Plunger	C13-125	C13-150	C13-200
C14	Cage, Closed Barrel	C14-20-125	C14-20	C14-25
C21	Connector, Upper Barrel	C21-20-125	C21-20	C21-25
G11	Guide, Valve Rod	G11-20	G11-20	G11-25
P12	Plug, Seat	P12-125	P12-150	P12-200
P21	Plunger, One Piece ^b	P21-125 ^c	P21-150 ^c	P21-200 ^c
R11	Rod, Valve	R11-20 ^d	R11-20 ^d	R11-25 ^d
S11	Seating Mandrel, Cup (Type HR)	S11-20	S11-20	S11-25
S12	Seating Cup (Type HR)	S12-20	S12-20	S12-25
S13	Seating Cup Ring (Type HR)	S13-20	S13-20	S13-25
S14	Seating Cup Nut (Type HR)	S14-20	S14-20	S14-25
S16	Seating Cup Coupling	S16-20	S16-20	S16-25
V11	Valve, Ball and Seat			
	Traveling	V11-125	V11-150	V11-200
	Standing	V11-175	V11-175	V11-225

NOTE All dimensions in inches (followed by equivalent in millimeters).

^a Specify barrel length (L_{PL}). Standard lengths are: 2.00 ft (609.6 mm) through 40.00 ft (12192.0 mm) in 1.00 ft (304.8 mm) increments.

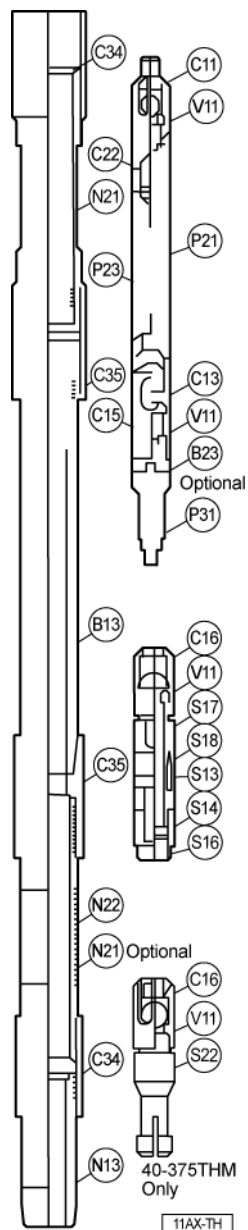
^b A seat must be used between C12 and P21 if an optional F1A pin thread is present on P21 plunger, see component P21.

^c Specify nominal plunger length in feet (millimeters) and clearance (fit) in thousandths of an inch (hundredths of a millimeter).

^d See part number R11 for valve rod length.

^e See Annex C for definitions of symbols used for pump components.

Table B.8—TH—Tubing, Heavy Wall Barrel Pump (See Note)



(1)	(2)	(3)	(4)	(5)	(6)
Standard Pump Size					
		$2\frac{3}{8} \times 1\frac{3}{4}$ (60.3 x 44.5)	$2\frac{7}{8} \times 2\frac{1}{4}$ (73.0 x 57.2)	$3\frac{1}{2} \times 2\frac{3}{4}$ (88.9 x 69.9)	$4\frac{1}{2} \times 3\frac{3}{4}$ (114.3 x 95.3)
Complete Pump Designation					
		20-175 THC ^{a b c}	25-225 THC ^{a b c}	30-275 THC ^{a b c}	40-375 THM ^{a b c e}
Symbol ^f	Description	Part Number ^f			
B23	Bushing, Optional ^d	—	—	—	B23-40
B13	Barrel, Heavy Wall	B13-175 ^a	B13-225 ^a	B13-275 ^a	B13-375 ^a
C11	Cage, Top Open	C11-20	C11-25	C11-30	C11-40
C13	Cage, Closed Plunger	C13-175	C13-225	C13-275	C13-375
C16	Cage, Standing Valve	C16-175	C16-225	C16-275	C16-375
C34	Coupling, Tubing	C34-20	C34-25	C34-30	C34-40
C35	Coupling, Barrel	C35-20	C35-25	C35-30	C35-40
N12	Nipple, Seating, Mech.	—	—	—	N12-40
N13	Nipple, Seating	N13-20	N13-25	N13-30	—
N21	Nipple, Extension, Upper	N21-20 ^c	N21-25 ^c	N21-30 ^c	N21-40 ^c
N22	Nipple, Extension, Lower	N22-20 ^c	N22-25 ^c	N22-30 ^c	N22-40 ^c
P21	Plunger, One Piece	P21-175 ^b	P21-225 ^b	P21-275 ^b	P21-375 ^b
P31	Puller, Standing Valve	P31-175	P31-225	P31-275	P31-375 ^e
S13	Seating Cup Ring (Type HR)	S13-20	S13-25	S13-30	—
S14	Seating Cup Nut (Type HR)	S14-20	S14-25	S14-30	—
S16	Seating Cup Coupling	S16-20	S16-25	S16-30	—
S17	Seating Mandrel, Cup (Type HR)	S17-20	S17-25	S17-30	—
S18	Seating Cup (Type HR)	S18-20	S18-25	S18-30	—
V11	Valve, Ball and Seat				
	Traveling	V11-175	V11-225	V11-250	V11-375
	Standing	V11-175	V11-225	V11-250	V11-375
S22		—	—	—	S22-40
	Optional Plunger Assembly				
C15	Cage, Closed, Box Plunger	C15-175	C15-225	C15-275	C15-375
C22	Connector, Box Plunger	C22-175	C22-225	C22-275	C22-375
P23	Plunger, Box End	P23-175 ^b	P23-225 ^b	P23-275 ^b	P23-375 ^b

NOTE All dimensions in inches (followed by equivalent in millimeters).

^a Specify barrel length (L_{PL}). Standard lengths are: 2.00 ft (609.6 mm) through 40.00 ft (12192.0 mm) in 1.00 ft (304.8 mm) increments.

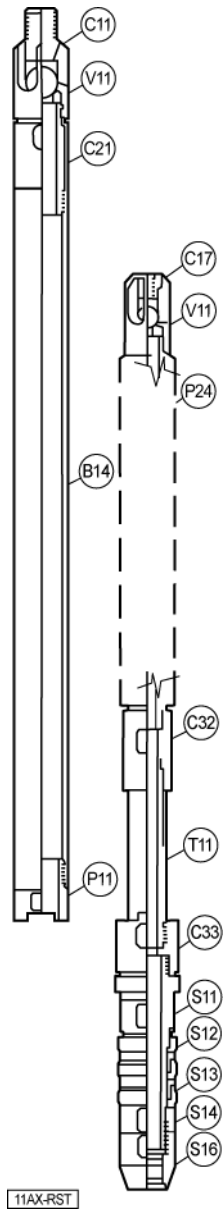
^b Specify nominal plunger length in feet (millimeters) and clearance (fit) in thousandths of an inch (hundredths of a millimeter).

^c Specify length of extensions (extension nipples) in decimal feet. Standard lengths are 24 in. and 36 in. (2.0 ft and 3.0 ft).

^d For $4\frac{1}{2} \times 3\frac{3}{4}$ only use P31-275 Puller in place of P31-375 Puller.

^e P31-275 optional with use of B23-40 Bushing.

^f See Annex C for definitions of symbols used for pump components.

Table B.9—RST—Rod, Traveling Thin Wall Barrel, Bottom Anchor, Soft-Packed Plunger Pump (See Note)

(1)	(2)	(3)	(4)	(5)	(6)
Standard Pump Size					
		$2\frac{3}{8} \times 1\frac{1}{4}$ (60.3 x 31.8)	$2\frac{3}{8} \times 1\frac{1}{2}$ (60.3 x 38.1)	$2\frac{7}{8} \times 2$ (73.0 x 50.8)	$3\frac{1}{2} \times 2\frac{1}{2}$ (88.9 x 63.5)
Complete Pump Designation					
		20-125 RSTC^{a b}	20-150 RSTC^{a b}	25-200 RSTC^{a b}	30-250 RSTC^{a b}
Symbol ^d	Description	Part Number ^d			
B14	Barrel, Soft-Packed Rod Pump	B14-125 ^a	B14-150 ^a	B14-200 ^a	B14-250 ^a
C11	Cage, Top Open	C11-20	C11-20	C11-25	C11-30
C17	Cage, Top Plunger	C17-125	C17-150	C17-200	B17-250
C21	Connector, Upper Barrel	C21-20-125	C21-20	C21-25	C21-30
C32	Coupling, Pull Tube, Upper	C32-125	C32-150	C32-200	C32-250
C33	Coupling, Pull Tube, Lower	C33-125	C33-150-20	C33-200	C33-225
P11	Plug, Pull	P11-125-15	P11-150-20	P11-200	P11-225
P24	Plunger, Soft-Packed	P24-125 ^b	P24-150 ^b	P24-200 ^b	P24-250 ^b
S11	Seating Mandrel, Cup (Type HR)	S11-20	S11-20	S11-25	S11-30
S12	Seating Cup (Type HR)	S12-20	S12-20	S12-25	S12-30
S13	Seating Cup Ring (Type HR)	S13-20	S13-20	S13-25	S13-30
S14	Seating Cup Nut (Type HR)	S14-20	S14-20	S14-25	S14-30
S16	Seating Cup Coupling	S16-20	S16-20	S16-25	S16-30
T11	Tube, Pull	T11-125 ^c	T11-150 ^c	T11-200 ^c	T11-225 ^c
V11	Valve, Ball and Seat				
	Traveling	V11-175	V11-175	V11-225	V11-250
	Standing	V11-125	V11-150	V11-200	V11-250

NOTE All dimensions in inches (followed by equivalent in millimeters).

^aSpecify barrel length (L_{PL}). Standard lengths are: 2.00 ft (609.6 mm) through 40.00 ft (12192.0 mm) in 1.00 ft (304.8 mm) increments.

^bSpecify nominal plunger length in nearest whole or half feet (thousandths of meters), and packing requirements. P24 cups or rings or combination, customer option.

^cSee part number T11 for pull tube length.

^dSee Annex C for definitions of symbols used for pump components.

Annex C (normative)

Pump Components

Sucker rod pump component parts shall conform to the dimensions in this section.

Sucker rod pump component parts shall be constructed of materials in accordance with Annex F.

The Master Part Numbering System is designed to provide a systematic method to easily identify parts and for ordering parts for interchangeability.

In order to provide freedom of design, only those dimensional requirements affecting interchangeability are specified for component parts. Flow bores, flow ports, or slots as shown in drawings are illustrative and are not meant to limit the design of the component. Wrench flats are optional, but when parts are provided with flats, the dimensions shall conform to the requirements of Table G.9, Annex G.

All dimensions are given in inches (followed by millimeter values in parentheses) unless otherwise noted.

Where tolerances are not noted, Table C.1 applies.

Table C.1—Default Tolerances

(1)	(2)	(3)
Dimensions in inches	X	± 0.250 in. (6.35 mm)
	X.X	± 0.100 in. (2.54 mm)
	X.XX	± 0.020 in. (0.51 mm)
	X.XXX	± 0.005 in. (0.13 mm)
Dimensions in feet	X	± 1.5 in. (38.1 mm)
	X.X	± 1.5 in. (38.1 mm)

Table C.2—Master Part Numbering System (five pages)

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Designation	Pump Bore Size, in. (mm)										Tubing Size, in. (mm)				
	1 ¹ / ₁₆ (26.7)	1 ¹ / ₄ (31.8)	1 ¹ / ₂ (38.1)	1 ³ / ₄ (44.5)	1 ²⁵ / ₃₂ (45.2)	2 (50.8)	2 ¹ / ₄ (57.2)	2 ¹ / ₂ (63.5)	2 ³ / ₄ (69.9)	3 ³ / ₄ (95.3)	1.900 (48.3)	2 ³ / ₈ (60.3)	2 ⁷ / ₈ (73.0)	3 ¹ / ₂ (88.9)	4 ¹ / ₂ (114.3)
	106	125	150	175	178	200	225	250	275	375	15	20	25	30	40
B															
1. Barrel	-														
1. Thin Wall		B11-125 ^a	B11-150 ^a	—	—	B11-200 ^a	—	B11-250 ^a	—	—	—	—	—	—	—
2. Heavy Wall, Rod	B12-106 ^a	B12-125 ^a	B12-150 ^a	B12-175 ^a	—	—	B12-225 ^a	—	—	—	—	—	—	—	—
3. Heavy Wall, Tubing	—	—	—	B13-175 ^a	—	—	B13-225 ^a	—	B13-275	B13-375	—	—	—	—	—
4. Thin Wall, S.P. ^e	-	B14-125 ^a	B14-150 ^a	—	—	B14-200 ^a	—	B14-250 ^a	—	—	—	—	—	—	—
5. Heavy Wall, S.P. ^e	—	—	—	—	B15-178	—	B15-225	—	B15-275	—	—	—	—	—	—
6. Heavy Wall, Rod	-	B16-125	B16-150	—	—	B16-200	—	—	—	—	—	—	—	—	—
2. Bushing															
1. Valve Rod	—	—	—	—	—	—	—	—	—	—	B21-15	B21-20	B21-25	B21-30	—
											B21M15	B21M20	B21M25	B21M30	—
2. Barrel Cage	—	—	—	—	—	—	—	—	—	—	B22-15	B22-20	B22-25	B22-30	—
3. Plunger	—	—	—	—	—	—	—	—	—	—	—	—	—	—	B23-40
C															
1. Cage															
1. Top Open	—	—	—	—	—	—	—	—	—	—	C11-15	C11-20	C11-25	C11-30	C11-40
2. Top Plunger	C12-106	C12-125	C12-150-20	C12-175	—	C12-200	C12-225	C12-250	—	—	—	—	—	—	—
	—	—	C12-150-25	—	—	—	—	—	—	—	—	—	—	—	—
	C12M106	C12M125	C12M150-20	C12M175	—	C12M200	C12M225	C12M250	—	—					
	—	—	C12M150-25	—	—	—	—	—	—	—					
3. Closed Plunger Pin	C13-106	C13-125	C13-150	C13-175	—	C13-200	C13-225	C13-250	C13-275	C13-375	—	—	—	—	—
4. Closed Barrel	—	—	—	—	—	—	—	—	—	—	C14-15	C14-20	C14-25	C14-30	—
	—	—	—	—	—	—	—	—	—	—	—	C14-20-125	—	—	—
5. Closed Plunger Box	—	—	—	C15-175	—	—	C15-225	—	C15-275	—	—	—	—	—	—

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Designation	Pump Bore Size, in. (mm)										Tubing Size, in. (mm)				
	1 ¹ / ₁₆ (26.7)	1 ¹ / ₄ (31.8)	1 ¹ / ₂ (38.1)	1 ³ / ₄ (44.5)	1 ²⁵ / ₃₂ (45.2)	2 (50.8)	2 ¹ / ₄ (57.2)	2 ¹ / ₂ (63.5)	2 ³ / ₄ (69.9)	3 ³ / ₄ (95.3)	1.900 (48.3)	2 ³ / ₈ (60.3)	2 ⁷ / ₈ (73.0)	3 ¹ / ₂ (88.9)	4 ¹ / ₂ (114.3)
	106	125	150	175	178	200	225	250	275	375	15	20	25	30	40
6. Standing Valve	—	—	—	C16-175	—	—	C16-225	—	C16-275	C16-375	—	—	—	—	—
7. Top Plunger, S.P. [®]	-	C17-125	C17-150	—	—	C17-200	—	C17-250	—	—	—	—	—	—	—
2. Connector															
1. Upper Barrel	—	—	—	—	—	—	—	—	—	—	C-21-15	C21-20	C21-25	C21-30	—
	—	—	—	—	—	—	—	—	—	—	—	C21-20-125	—	—	—
2. Plunger, Box	—	—	—	C22-175	—	—	C22-225	—	C22-275	C22-375	—	—	—	—	—
3. Coupling															
1. Extension	C31-106-15 [°]	C31-125 [°]	C31-150 [°]	C31-175 [°]	—	—	C31-225 [°]	—	—	—	—	—	—	—	—
	C31-106 [°]	—	—	—	—	—	—	—	—	—	—	—	—	—	—
2. Pull Tube, Up.	-	C32-125	C32-150	C32-175	—	C32-200	C32-225	C32-250	—	—	—	—	—	—	—
3. Pull Tube, Lr.	-	C33-125	C33-150-20	C33-175	—	C33-200	C33-225	—	—	—	—	—	—	—	—
	-	C33-125-15	C33-150-25	—	—	—	—	—	—	—	—	—	—	—	—
4. Tubing	—	—	—	—	—	—	—	—	—	—	C34-15	C34-20	C34-25	C34-30	C34-40
5. Barrel	—	—	—	—	—	—	—	—	—	—	—	C35-20	C35-25	C35-30	C35-40
6. Barrel Lower, S.P. [®]	—	—	—	—	—	—	—	—	—	—	—	C36-20	C36-25	C36-30	—
7. Barrel, S.P. [®]	—	—	—	—	—	—	—	—	—	—	—	C37-20	C37-25	C37-30	—
G															
1. Guide															
1. Valve Rod	—	—	—	—	—	—	—	—	—	—	G11-15	G11-20	G11-25	G11-30	—
N															
1. Nipple Seating															
1. Cup Type, Rod	—	—	—	—	—	—	—	—	—	—	N11-15	N11-20	N11-25	N11-30	—
2. Mech. Bottom	—	—	—	—	—	—	—	—	—	—	N12-15	N12-20	N12-25	N12-30	N12-40
3. Cup Type, Tubing	—	—	—	—	—	—	—	—	—	—	—	N13-20	N13-25	N13-30	—
4. Mech. Top	—	—	—	—	—	—	—	—	—	—	—	N14-20	N14-25	N14-30	—