2022 GAS LIFT WORKSHOP

API Standards for Gas Lift

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ALRDC.COM

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Agenda

- Standards 101
  - Document Creation
  - Structure
  - Approval Process
  - Use & Enforcement
- Documents available for Gas Lift
- Status of Documents under Development
- Q&A

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Standards 101

- API/ISO Document Creation
- Structure
- Approval Process
- Use & Enforcement

What responses to AL tenders seem like:

Why use standards?

End users:

Be able to compare apples-to-apples for optimal equipment / vendor selection

Manufacturers:

Know their system is being compared fairly / correctly against others

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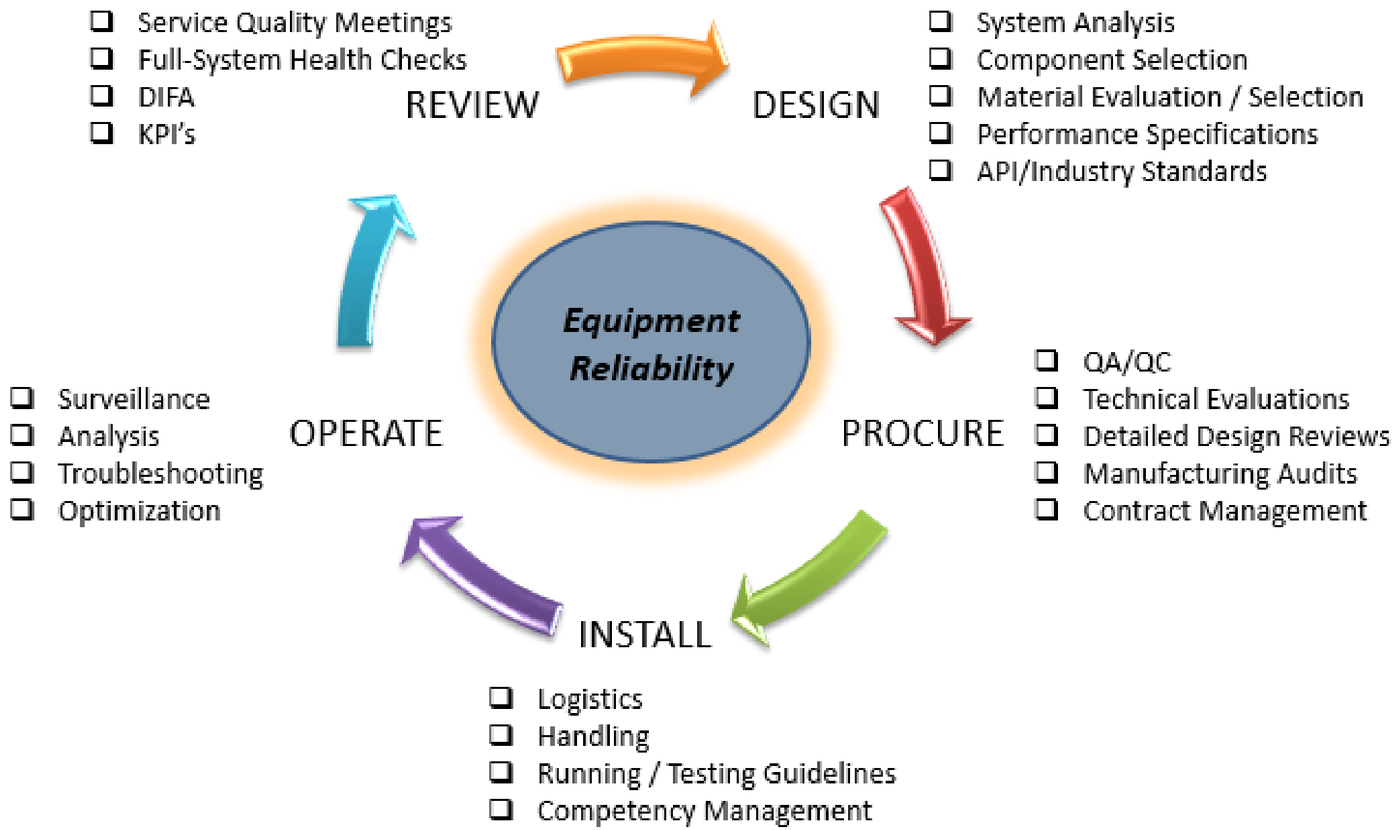
Improving Artificial Lift Reliability



Why are artificial lift standards developed?

- Help optimize operations, therefore improve bottom line.
- Lack of standardized performance ratings and function tests makes comparisons across manufacturers difficult.
- Assurance that the equipment performs as advertised and supported with sound engineering practices.
- Establish common nomenclature and definitions so that everyone is speaking the same language.

»Further Reading:

1. *http://www.api.org/publications-standards-and-statistics/standards/~/media/Files/Publications/FAQ/valueofstandards.ashx*
2. *http://www.iso.org/iso/home/standards/benefitsofstandards.htm*

What a standard is NOT

- It is not a contract with the manufacturer.
- It does not guarantee or become an issue of equipment warranty.
- For ISO standards and API standards that adopted an ISO standard, manufacturers are not required to comply unless required by an end user (i.e., the end user must invoke use of the standard in contracts).

What Makes a Good Standard?

- Clear objective based on sound technical principles
- Reasonable and practical
- Not restrictive of technology development
- Proven engineering practices – not necessarily “good” or “best” practices (terms are subjective)
- Input from all stakeholders
- Addresses those issues that make a difference
- Risk-based when necessary
- Performance-based, rather than prescriptive

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API vs ISO: Differences & Similarities

- One company, one vote
- Balance of user/purchasers and supplier/ manufacturers
- Approval process is a democratic vote by member company.
- API members are corporations, ranging from producers to service and supply companies.
- Process from new draft to published standard can take 18 months – several years.
- Documents include Standards/Specifications, Recommended Practices and Technical Reports.
- Monogram program.

- One country, one vote
- Balance of user/purchasers and supplier/ manufacturers
- Approval process is a democratic vote by member country – 2 rounds.
- ISO members are the national standards bodies of 165 countries
- Process from new draft to published standard can take 18 months – several years.
- Only publishes standards, no recommended practices or technical reports.
- No monogram program - enforcement through company purchasing requirements.

API Document Designations

- Specifications — **Mandatory 5-year Review Cycle**
- Standards (combine elements of specifications & RP's)
- Recommended Practices

- Bulletins — **"One and done"**
- Technical Reports

Co-branding

- Certain standards drafted by one organization and “adopted back” by other.
  - Example: API SPEC 19G2, First Edition = ISO 17078-2:2007
- Practice largely ended over past decade due to export compliance and IP concerns.
  - Example: API SPEC 19G2, Second Edition has no ISO equivalent

How a Standard is Structured

- Clauses 1-9: Requirements
- Normative Annexes: Additional details for requirements in Clauses
- Informative Annexes: Related Guidelines

API/ISO Document Structure

1. Scope
2. Normative References
3. Terms and Definitions
4. Symbols and Abbreviated Terms
5. Functional Specification
6. Technical Specification
7. Supplier/Manufacturer Requirements

Normative Annexes

Informative Annexes

ISO Only:

8. Repair
9. Shipping, handling and storage

Document Structure – 3 Main Components

Clause 5

Functional Specifications

- Operation conditions
  - Well
  - Fluids
  - Operational parameters
- Q/C & documentation requirements
- Other requirements

What the user needs

Clause 6

Technical Specifications

- Equipment characteristics
- Design criteria
- Validation procedures

Manufacturers response to user's request

Clause 7

Supplier Requirements

- Documentation and data control
- Product identification
- Q/C procedures
- Design verification

How we ensure this happens

Usage and Enforcement

- End-users reference in purchasing requirements & contracts.
- End-users select applicable grades for design validation, functional testing, quality assurance and environmental service.
- End-users perform audits.
- Manufacturers ***may*** participate in voluntary monogram program.
- API auditors enforce compliance with monogram program through audits.
- API can withdraw monogram license.

- End-users reference in purchasing requirements & contracts.
- End-users select applicable grades for design validation, functional testing, quality assurance and environmental service.
- End-users perform audits.
- No monogram program.

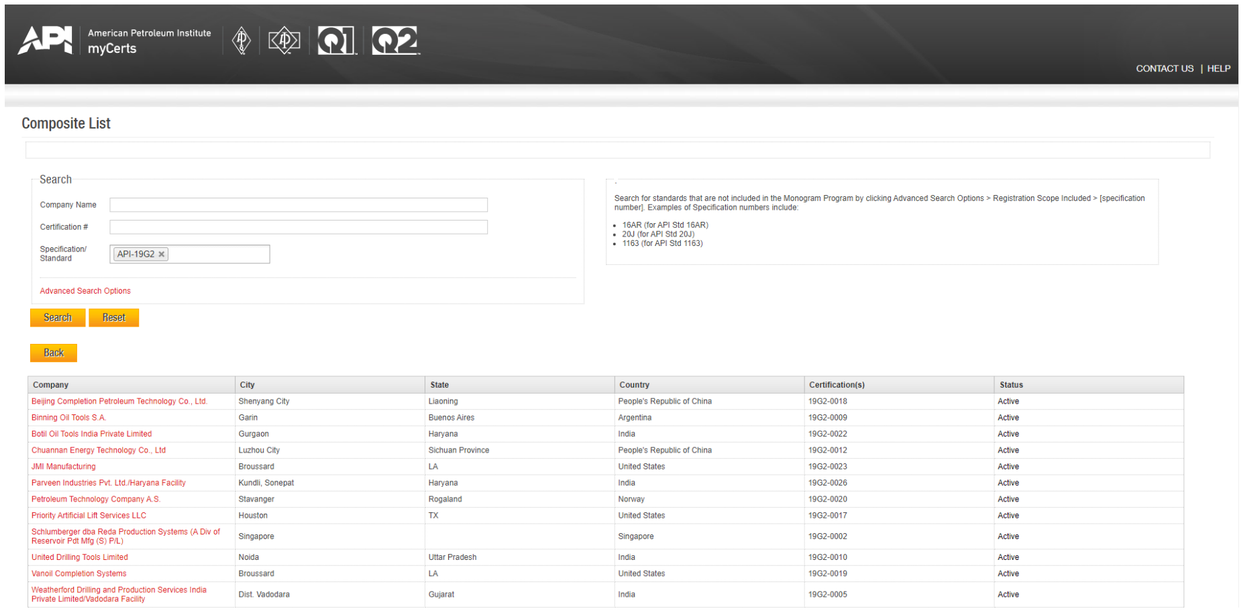
How do you purchase standards?

- API Publications Store
  https://www.apiwebstore.org/
- ANSI WEBSTORE*
  https://webstore.ansi.org/
- IHS Markit Standards Store*
  https://global.ihs.com/
  *Your company may have a subscription.

How can you tell which vendors are licensed to produce monogrammed equipment?

- Search the API Composite List:

  https://mycerts.api.org/Search/CompositeSearch



API American Petroleum Institute myCerts — CONTACT US | HELP

Composite List

Search

Company Name

Certification #

Specification/ Standard: API-19G2

Advanced Search Options

Search Reset

Back

Search for standards that are not included in the Monogram Program by clicking Advanced Search Options > Registration Scope Included > [specification number]. Examples of Specification numbers include:

- 16AR (for API Std 16AR)
- 20J (for API Std 20J)
- 1163 (for API Std 1163)

Company	City	State	Country	Certification(s)	Status
Beijing Completion Petroleum Technology Co., Ltd.	Shenyang City	Liaoning	People's Republic of China	19G2-0018	Active
Binning Oil Tools S.A.	Garin	Buenos Aires	Argentina	19G2-0009	Active
Botti Oil Tools India Private Limited	Gurgaon	Haryana	India	19G2-0022	Active
Chuannan Energy Technology Co., Ltd	Luzhou City	Sichuan Province	People's Republic of China	19G2-0012	Active
JMI Manufacturing	Broussard	LA	United States	19G2-0023	Active
Parveen Industries Pvt. Ltd./Haryana Facility	Kundli, Sonepat	Haryana	India	19G2-0026	Active
Petroleum Technology Company A.S.	Stavanger	Rogaland	Norway	19G2-0020	Active
Priority Artificial Lift Services LLC	Houston	TX	United States	19G2-0017	Active
Schlumberger dba Reda Production Systems (A Div of Reservoir Pdt Mfg (S) P/L)	Singapore		Singapore	19G2-0002	Active
United Drilling Tools Limited	Noida	Uttar Pradesh	India	19G2-0010	Active
Vanoil Completion Systems	Broussard	LA	United States	19G2-0019	Active
Weatherford Drilling and Production Services India Private Limited/Vadodara Facility	Dist. Vadodara	Gujarat	India	19G2-0005	Active

*Note: Monogram licenses are ***per facility*** and non-transferrable.

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What's available for gas lift?

- Active:
  - SPEC 19G1, 2nd Edition – **Side-pocket Mandrels (2019)**
  - SPEC 19G2, 2nd Edition – **Flow-control Devices for Side-pocket Mandrels (2020)**
  - SPEC 19G3, 1st Edition – **Kick-over Tools and Latches for Side-pocket Mandrels (Reaffirmed June 2019)**
  - RP 19G4, 1st Edition – **Practices for Side-pocket Mandrels and Related Equipment (Reaffirmed January 2019)**
  - RP 19GLHB, 1st Edition – **Gas Lift Handbook (2020)**

- Under Development:
  - SPEC 19G15, 1st Edition – **Conventional Gas Lift Equipment**
  - 19GLHB Addendum – **Gas Lift Automation**

- Under "Consideration"
  - New Standard for Surface Controlled Gas Lift Equipment
  - New Standard for Critical Well Environments
  - SPEC 19G2, 3rd Edition
  - SPEC 19G3, 2nd Edition

SPEC 19G1: Side-pocket Mandrels

Table B.1—Design Validation Grades

Criterion	Grade			
	V3	V2	V1	V1H
Documentation	B.1.2.2	B.1.3.2	B.1.4.2	B.1.5.2
Design review (burst, collapse, tolerance)	B.1.2.3	B.1.3.3	B.1.4.3	B.1.5.3
Burst and collapse validation pressure test to destruction at ambient temperature	Not required	B.1.3.4 or B.1.4.6	Not required	Not required
Pressure testing at rated temperature	B.1.2.4	B.1.3.5	B.1.4.4	B.1.5.4
Internal pressure cycles	Not required	B.1.3.6	B.1.4.5	B.1.5.5
Finite element analysis/strain gauge	Not required	Not required	B.1.4.6	B.1.5.6
Failure mode and effect analysis	Not required	Not required	Not required	B.1.5.7
Flow control—install/pull with KOT	B.1.2.5	B.1.3.7	B.1.4.7	B.1.5.8
Slick line operational test with KOT	Not required	Not required	B.1.4.8	B.1.5.9
Product validation internal drift test	C.1.3.3	C.1.3.3	C.1.3.3	C.1.3.3
Product validation external drift test	C.1.3.4	C.1.3.4	C.1.3.4	C.1.3.4

KOT = kick-over tool

Table C.1—Product Functional Testing Grades

Criterion	Grade			
	F3	F2	F1	F1H
Internal pressure test	C.1.3.2	C.1.4.2	C.1.5.2	C.1.6.2
External pressure test	Not required	C.1.4.3	C.1.5.3	C.1.6.3
ID drift test	C.1.3.3	C.1.4.4	C.1.5.4	C.1.6.4
OD drift test	C.1.3.4	C.1.4.5	C.1.5.5	C.1.6.5
Installation/removal method—KOT	Not required	C.1.4.6	C.1.5.6	C.1.6.6

ID = inside diameter; KOT = kick-over tool; OD = outside diameter

SPEC 19G2: Flow-control Devices for Side-pocket Mandrels

Table B.1—Purpose of Normative and Informative Annexes

Annex	Annex Title	Purpose of Annex [a]
A	API Monogram	Provide guidance to API Licensee on the application of the API Monogram.
B	Design validation and device functional testing requirements	List purpose of each annex List all required design validation and device functional test requirements
C	Validation and device functional testing overview	Table summarizing the design validation and device functional testing requirements
D	Interface testing requirements	Design validation testing of all interfaces between flow-control devices and other related devices such as SPMs
E	Insertion testing requirements	Design validation testing of insertion and retrieval of flow-control devices into and from SPMs
F	Probe and travel testing and load rate determination	Design validation testing of maximum travel and load rate Device functional testing of maximum travel and load rate
G	Dynamic flow testing and flow coefficient, C_v, calculation	Design validation testing of flow and flow coefficient, C_v Device functional testing of flow and flow coefficient, C_v
H	Back-check testing	Design validation testing of back-check devices Device functional testing of back-check devices
I	Opening and closing pressure testing	Design validation testing of opening and closing Device functional testing of opening and closing
J	Bellows actuation life cycle testing	Design validation testing of bellows life cycles
K	Erosion testing requirements	Design validation testing of effects of erosion
L	Shelf (bellows integrity) testing requirements for nitrogen-pressure-charged flow-control devices	Design validation shelf (bellows integrity) testing Device functional shelf (bellows integrity) testing
M	Conducting port/seat leakage rate testing	Design validation testing of port/seat leakage rates Device functional testing of port/seat leakage rates

[a] The purpose of the normative Annexes B to M is to define design validation and device functional test requirements for flow-control devices.

Table C.1—Testing Requirements

Flow-control Device Group and Type (See 6.1.2)		Design Validation Test and/or Device Functional Test	Annex	Design Validation and Device Functional Test Requirements for Each Flow-control Device Grade							
				V3 Basic Grade	V2 Intermediate Grade	V1 Highest Grade	V0 Severe Service	F3 Basic Grade	F2 Intermediate Grade	F1 Highest Grade	F0 Severe Service
I	IPO Balanced IPO IPO w/ choke	Interface	D	D.2.1	D.2.1	D.2.2	D.2.2	—	—	—	—
		Insertion	E	E.2	E.2	E.2	E.2	—	—	—	—
		Probe or travel	F	F.2	F.2	F.2	F.2	—	F.6.2	F.6.3	F.6.3
		Load rate	F	F.3	F.3	F.3	F.3	—	F.7.2	F.7.3	F.7.3
		Flow	G	—	G.2.2	G.2.3	G.2.3	—	—	—	—
		Back-check	H	H.2.2	H.2.3	H.2.4	H.2.5	H.3.1	H.3.1	H.3.2	H.3.3
		Open and close	I	I.1.2	I.1.2	I.1.2	I.1.2	I.2	I.2, I.3.1	I.2, I.3.1	I.2, I.3.1
		Actuation life cycle	J	—	—	J.2.2	J.2.2	—	—	—	—
		Erosion	K	—	K.2.3	K.2.3	K.2.4	—	—	—	—
		Shelf	L	L.2.1	L.2.1	L.2.1	L.2.1	L.3.2	L.3.2	L.3.2	L.3.2
		Port/seat leakage rate	M	M.2	M.2	M.2	M.2	M.3	M.3	M.3	M.3
II	PPO	Interface	D	D.2.1	D.2.1	D.2.2	—	—	—	—	—
		Insertion	E	E.2	E.2	E.2	—	—	—	—	—
		Probe or travel	F	F.2	F.2	F.2	—	—	F.6.2	F.6.3	—
		Load rate	F	F.3	F.3	F.3	—	—	F.5.2	F.5.3	—
		Flow	G	—	G.2.2	G.2.3	—	—	—	—	—
		Back-check	H	H.2.2	H.2.3	H.2.4	—	H.3.1	H.3.1	H.3.2	—
		Open and close	I	I.1.2	I.1.2	I.1.2	—	I.2	I.2, I.3.2	I.2, I.3.3	—
		Actuation life cycle	J	—	—	J.2.2	—	—	—	—	—
		Erosion	K	—	K.2.2	K.2.2	—	—	—	—	—
		Shelf	L	L.2.1	L.2.1	L.2.1	—	L.3.2	L.3.2	L.3.2	—
		Port/seat leakage rate	M	M.2	M.2	M.2	—	M.3	M.3	M.3	—

API Monogram™ Program

SPEC 19G3: Kick-over Tools and Latches for Side-pocket Mandrels

- Annex A (normative): **Requirements for running and pulling tools**
- Annex B (normative): **Requirements for kick-over tools**
- Annex C (normative): **Requirements for latches**
- Annex D (normative): **Side-pocket mandrel tool interface evaluations**
- Annex E (informative): **Figures**
- Annex F (informative): **API Monogram Program**

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API Monogram™ Program

COMING SOON

SPEC 19G15, 1st Edition: Conventional Gas Lift Equipment

- Annex A: Requirements for Flow Control Devices
- Annex B: Back Check Testing Requirements
- Annex C: Flow Assembly Testing Requirements (FCD & Back Check)
- Annex D: Requirements for Mandrels

- Status: *95% Complete*
- Focus of change: *The initial document is finished. We will be reviewing the document for any errors referencing from annex to document before proceeding to the next steps.*
- Discussion: *Once we have finished QC on the document to ensure reference graphs, and tables align in the document and are sure that all the necessary content is covered, we will be ready to move forward to a comment only ballot.*

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Withdrawn but available for purchase

- RP 19G5 (2019): **Operation, Maintenance, Surveillance, and Troubleshooting of Gas-lift Installations**
- RP 19G6 (1999): **Recommended Practice for Design of Continuous Flow Gas Lift Installations Using Injection Pressure Operated Valves**
- RP 11V7 (1999): **Recommended Practice for Repair, Testing, and Setting Gas Lift Valves**
- RP 11V8 (2003): **Recommended Practice for Gas Lift System Design and Performance Prediction**
- RP 19G9 (2015): **Design, Operation, and Troubleshooting of Dual Gas-lift Wells**
- RP 19G10 (2018): **Design and Operation of Intermittent Gas-lift Systems**
- RP 19G11 (2018): **Dynamic Simulation of Gas-lift Wells and Systems**
- API Vocational Book 6: **Gas Lift, Book 6 of Vocational Training Series** (2007)

* The above were superseded by RP 19GLHB, The API Gas Lift Handbook

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Question Time

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