



AMERICAN PETROLEUM INSTITUTE

---

# API Specification 16C

## Choke and Kill Equipment

SECOND EDITION | MARCH 2015 | 114 PAGES | \$150.00 | PRODUCT NO. G16C02

---

This specification establishes the minimum requirements for the design and manufacture of the following types of new equipment:

- a) articulated choke and kill lines;
- b) choke and kill manifold buffer chamber;
- c) choke and kill manifold assembly;
- d) drilling choke actuators;
- e) drilling choke controls;
- f) drilling chokes;
- g) flexible choke and kill lines;
- h) union connections used in choke and kill assemblies;
- i) rigid choke and kill lines;
- j) swivel unions used in choke and kill equipment.

These requirements were formulated to provide for safe and functionally interchangeable surface and subsea choke and kill system equipment utilized for drilling oil and gas wells.

Technical content provides the minimum requirements for performance, design, materials, welding, testing, inspection, storing, and shipping.

For ordering information:

Online: [www.api.org/pubs](http://www.api.org/pubs)

Phone: 1-800-854-7179  
(Toll-free in the U.S. and Canada)

(+1) 303-397-7056  
(Local and International)

Fax: (+1) 303-397-2740

API members receive a 30% discount where applicable.

# Contents

	Page
<b>1</b>	<b>Scope</b> . . . . . <b>1</b>
<b>2</b>	<b>Normative References</b> . . . . . <b>1</b>
<b>3</b>	<b>Terms, Definitions, and Abbreviations</b> . . . . . <b>3</b>
<b>3.1</b>	<b>Terms and Definitions</b> . . . . . <b>3</b>
<b>3.2</b>	<b>Abbreviations</b> . . . . . <b>10</b>
<b>4</b>	<b>Design Requirements</b> . . . . . <b>10</b>
<b>4.1</b>	<b>Service Conditions</b> . . . . . <b>10</b>
<b>4.2</b>	<b>Product Specification</b> . . . . . <b>11</b>
<b>4.3</b>	<b>Design Method</b> . . . . . <b>14</b>
<b>4.4</b>	<b>Performance Requirements</b> . . . . . <b>15</b>
<b>4.5</b>	<b>Design Validation</b> . . . . . <b>15</b>
<b>4.6</b>	<b>Bore Size and Rated Working Pressure</b> . . . . . <b>16</b>
<b>4.7</b>	<b>Closure Bolting</b> . . . . . <b>16</b>
<b>4.8</b>	<b>Clamps</b> . . . . . <b>16</b>
<b>4.9</b>	<b>Test, Vent, Pipe Plugs, and Gauge Connections</b> . . . . . <b>16</b>
<b>4.10</b>	<b>Design Documentation</b> . . . . . <b>16</b>
<b>5</b>	<b>Material Requirements</b> . . . . . <b>17</b>
<b>5.1</b>	<b>General</b> . . . . . <b>17</b>
<b>5.2</b>	<b>Written Specifications</b> . . . . . <b>17</b>
<b>5.3</b>	<b>Drilling Chokes</b> . . . . . <b>18</b>
<b>5.4</b>	<b>Closure Bolting</b> . . . . . <b>18</b>
<b>5.5</b>	<b>Flexible Lines</b> . . . . . <b>18</b>
<b>5.6</b>	<b>Pressure-containing Parts, Bodies, Bonnets, Stems, and End Connections</b> . . . . . <b>18</b>
<b>5.7</b>	<b>Rigid Piping</b> . . . . . <b>21</b>
<b>5.8</b>	<b>Qualification Test Coupons</b> . . . . . <b>22</b>
<b>6</b>	<b>Welding</b> . . . . . <b>25</b>
<b>6.1</b>	<b>General</b> . . . . . <b>25</b>
<b>6.2</b>	<b>Non-pressure-containing Weldments</b> . . . . . <b>25</b>
<b>6.3</b>	<b>Pressure-containing Fabrication Weldments</b> . . . . . <b>25</b>
<b>6.4</b>	<b>Pressure-containing Repair Weldments</b> . . . . . <b>29</b>
<b>6.5</b>	<b>Weld Overlay</b> . . . . . <b>30</b>
<b>7</b>	<b>Quality Control</b> . . . . . <b>32</b>
<b>7.1</b>	<b>General</b> . . . . . <b>32</b>
<b>7.2</b>	<b>Measuring and Testing Equipment</b> . . . . . <b>32</b>
<b>7.3</b>	<b>Quality Control Personnel Qualifications</b> . . . . . <b>34</b>
<b>7.4</b>	<b>Quality Control Requirements</b> . . . . . <b>34</b>
<b>7.5</b>	<b>Assembled Equipment</b> . . . . . <b>53</b>
<b>7.6</b>	<b>Quality Control Record Requirements</b> . . . . . <b>58</b>
<b>8</b>	<b>Marking</b> . . . . . <b>60</b>
<b>8.1</b>	<b>General</b> . . . . . <b>60</b>
<b>8.2</b>	<b>Low Stress Area Marking</b> . . . . . <b>60</b>
<b>8.3</b>	<b>High Stress Area Marking</b> . . . . . <b>60</b>

## Contents

	Page
8.4 Equipment-specific Marking .....	60
8.5 Hardness Marking for Bodies, Bonnets, and Flanges .....	60
9 Storing and Shipping .....	60
9.1 Storing .....	60
9.2 Shipping .....	61
10 Equipment-specific Requirements .....	62
10.1 General .....	62
10.2 End and Outlet Connections .....	62
10.3 Ring Gaskets .....	63
10.4 Studs and Nuts .....	63
10.5 Drilling Chokes .....	63
10.6 Actuators for Drilling Chokes .....	65
10.7 Rigid Choke and Kill Lines .....	67
10.8 Flexible Choke and Kill Lines .....	67
10.9 Hydraulic Control System—Drilling Chokes .....	70
10.11 Buffer Chamber .....	74
10.12 Choke and Kill Manifold Assemblies .....	74
10.13 Operating and Maintenance Manual Requirements .....	75
Annex A (informative) Use of the API Monogram by Licensees .....	77
Annex B (normative) Design Validation Procedures .....	80
Annex C (informative) Weld Preparation Designs .....	96
Annex D (informative) Heat Treating Equipment Qualification .....	101
Annex E (informative) Pipe Thermal Expansion Calculations .....	103
Annex F (informative) Purchasing Guidelines .....	105
Annex G (normative) Drilling Choke Control Console System .....	106
Annex H (informative) Example Choke and Kill System Configurations .....	109
Bibliography .....	114
<b>Figures</b>	
1 Simple Geometric Shapes .....	23
2 Complex Shaped Components .....	23
3 Keel Block Configuration .....	24
4 Welding Procedure Qualification Rockwell Hardness Test Locations .....	27
5 Welding Procedure Qualification Vickers Hardness Test Location .....	28
6 Hardness Test Locations .....	31
7 Typical Flexible Line Construction .....	67
8 Typical Bonded and Non-bonded Flexible Line Assemblies .....	68
9 Typical Flexible Line End Fitting .....	69
10 Example of an Articulated Choke or Kill Line .....	73

## Contents

	Page
11 Example Illustrating “Points of Rotation” . . . . .	73
C.1 Pipe Butt Joints . . . . .	96
C.2 U-Groove. . . . .	96
C.3 Heavy Wall V-groove . . . . .	97
C.4 Attachment Welds . . . . .	97
C.5 Hole Repair. . . . .	98
C.6 Excavation for Repair—Removal of Sample Discontinuities in Weld Metal and Base Metal. . . . .	99
C.7 Bushing/Seat Cavity . . . . .	100
D.1 Thermocouple Locations . . . . .	102
H.1 Example Choke Manifold Assembly for 2K and 3K Rated Working Pressure Service— Surface BOP Installations. . . . .	109
H.2 Example Choke Manifold Assembly for 5K Rated Working Pressure Service— Surface BOP Installations. . . . .	110
H.3 Example Choke Manifold Assembly for 10K or Greater Rated Working Pressure Service— Surface BOP Installations. . . . .	111
H.4 Example Kill Line Assembly for 2K and 3K Rated Working Pressure Service— Surface BOP Installations. . . . .	111
H.5 Example Kill Line Assembly for 5K Rated Working Pressure Service—Surface BOP Installations . . .	112
H.6 Example Kill Line Assembly for 10K and Greater Rated Working Pressure Service— Surface BOP Installations. . . . .	112
H.7 Example Choke and Kill Manifold for Subsea Systems . . . . .	113

## Tables

1 Temperature Rating for Metallic and Nonmetallic Materials and Flexible Lines . . . . .	11
2 Equipment Bore Sizes and Rated Working Pressures . . . . .	12
3 Union, Swivel Joint, and Articulated Line Sizes and Rated Working Pressures . . . . .	13
4 Flexible Line Sizes and Rated Working Pressures . . . . .	14
5 Pressure-containing Parts Material Property Requirements . . . . .	18
6 Pressure-containing Parts Material Designation . . . . .	19
7 Pressure-containing Parts Material Steel Composition Maximum Limits . . . . .	19
8 Alloying Element Maximum Tolerance Range Requirements . . . . .	19
9 Acceptance Criteria Charpy V-notch Impact Requirements . . . . .	20
10 Quality Control Requirements for Bodies, Bonnets, Choke and Kill Lines, and End and Outlet Connections . . . . .	35
11 Minimum Hardness Values . . . . .	36
12 Hot Worked Parts Acceptance Criteria . . . . .	40
13 Castings Acceptance Criteria . . . . .	40
14 Weld Inclusion Length Acceptance Criteria—Radiographic Method . . . . .	42
15 Weld Inclusion Length Acceptance Criteria—Ultrasonic Method . . . . .	42
16 Quality Control Requirements for Stems . . . . .	44
17 Quality Control Requirements for Pressure-controlling Metallic Parts. . . . .	45
18 Quality Control Requirements for Pressure-containing Parts of Actuators. . . . .	45
19 Quality Control Requirements for Non-metallic Sealing Material . . . . .	46

## Contents

	Page
20	Quality Control Requirements for Pressure-containing Parts of Flexible Lines . . . . . 48
21	Quality Control Requirements for Rigid Piping . . . . . 49
22	Acceptance Criteria for Elongated Indications . . . . . 50
23	Quality Control Requirements for Male and Female Subs . . . . . 53
24	Quality Control Requirements—Assembled Equipment . . . . . 54
25	Minimum Hydrostatic Test Pressures . . . . . 55
26	Metallic Marking Requirements . . . . . 61
27	Performance Requirements for Drilling Chokes and Actuators . . . . . 65
28	Flexible Line Sizes and Rated Working Pressures . . . . . 69
29	Flexible Choke and Kill Line Flexible Specification Level (FSL) . . . . . 70
30	Color Coding of Articulated Choke and Kill Line Components . . . . . 73
B.1	Standard Test Fluid . . . . . 85