ISO/IEC 9075-4:2023-06 (E)

Information technology - Database languages SQL - Part 4: Persistent stored modules (SQL/PSM)

Contents

Page

Foreword . . . viii

Introduction . . . x

1 Scope . . . 1

2 Normative references . . . 2

3 Terms and definitions . . . 3

4 Concepts . . . 4

4.1 Notations and conventions . . . 4

4.1.1 Notations . . . 4

4.1.2 Use of terms . . . 4

4.2 SQL-server modules . . . 4

4.3 Tables . . . 5

4.3.1 Base tables . . . 5

4.3.1.1 Temporary tables . . . 5

4.3.2 Unique identification of tables . . . 5

4.4 SQL-schemas . . . 5

4.5 SQL-invoked routines . . . 6

4.5.1 Overview of SQL-invoked routines . . . 6

4.5.2 Execution of conventional SQL-invoked routines . . . 6

4.5.3 Routine descriptors . . . 6

4.6 SQL-paths . . . 6

4.7 Host parameters . . . 6

4.7.1 Status parameters . . . 6

4.8 Diagnostics area . . . 6

4.9 Condition handling . . . 7

4.10 Cursors . . . 8

4.10.1 General description of cursors . . . 8

4.11 SQL-statements . . . 9

4.11.1 Classes of SQL-statements . . . 9

4.11.2 SQL-statements classified by function . . . 9

4.11.2.1 SQL-schema statements . . . 9

4.11.2.2 SQL-control statements . . . 9

4.11.2.3 SQL-control declarations . . . 9

4.11.2.4 SQL-diagnostics statements . . . 10

4.11.3 SQL-statements and transaction states . . . 10

4.11.4 SQL-statement atomicity and statement execution contexts . . . 10

4.11.5 Embeddable SQL-statements . . . 10

4.11.6 Preparable and immediately executable SQL-statements . . . 11

4.11.7 Directly executable SQL-statements . . . 11

4.11.8 Iterated SQL-statements . . . 11
4.11.9 Compound statements . . . 12
4.12 Basic security model . . . 12
4.12.1 Privileges . . . 12
4.13 SQL-sessions . . . 12
4.13.1 General description of SQL-sessions . . . 12
5 Lexical elements . . . 13
5.1 <token> and <separator> . . . 13
5.2 Names and identifiers . . . 15
6 Scalar expressions . . . 17
6.1 <value specification> and <target specification> . . . 17
6.2 <identifier chain> . . . 19
6.3 <next value expression> . . . 21
6.4 <SQL variable reference> . . . 22
7 Query expressions . . . 23
7.1 <table reference> . . . 23
7.2 <query specification> . . . 24
8 Additional common rules . . . 25
8.1 Potential sources of non-determinism . . . 25
8.2 Executing an <SQL procedure statement> . . . 26
8.3 Executing a <compound statement> . . . 27
8.4 Invoking an SQL-invoked routine . . . 29
8.5 Transformation of query specifications . . . 30
8.6 Handler execution . . . 31
9 Additional common elements . . . 34
9.1 <sqlstate value> . . . 34
10 Schema definition and manipulation . . . 36
10.1 <schema definition> . . . 36
10.2 <drop schema statement> . . . 37
10.3 <table definition> . . . 38
10.4 <column definition> . . . 39
10.5 <default clause> . . . 40
10.6 <check constraint definition> . . . 41
10.7 <drop column scope clause> . . . 42
10.8 <drop column definition> . . . 43
10.9 <drop table constraint definition> . . . 44
10.10 <drop table statement> . . . 45
10.11 <view definition> . . . 46
10.12 <drop view statement> . . . 47
10.13 <drop domain statement> . . . 48
10.14 <drop character set statement> . . . 49
10.15 <drop collation statement> . . . 50
10.16 <drop transliteration statement> . . . 51
10.17 <assertion definition> . . . 52
10.18 <drop assertion statement> . . . 53

10.19 <trigger definition>. . . . 54
10.20 <drop user-defined ordering statement>. . . . 55
10.21 <SQL-server module definition>. . . . 56
10.22 <drop module statement>. . . . 59
10.23 <drop data type statement>. . . . 60
10.24 <SQL-invoked routine>. . . . 61
10.25 <drop routine statement>. . . . 63
10.26 <drop user-defined cast statement>. . . . 64
11 Access control. . . . 65
11.1 <grant statement>. . . . 65
11.2 <privileges>. . . . 66
11.3 <revoke statement>. . . . 67
12 SQL-client modules. . . . 71
12.1 <externally-invoked procedure>. . . . 71
12.2 <SQL procedure statement>. . . . 73
13 Data manipulation. . . . 74
13.1 <declare cursor>. . . . 74
13.2 <open statement>. . . . 75
13.3 <fetch statement>. . . . 76
13.4 <close statement>. . . . 77
13.5 <select statement: single row>. . . . 78
13.6 <delete statement: positioned>. . . . 79
13.7 <update statement: positioned>. . . . 80
13.8 <temporary table declaration>. . . . 81
14 Additional data manipulation rules. . . . 82
14.1 Effect of opening a cursor. . . . 82
15 Control statements. . . . 83
15.1 <compound statement>. . . . 83
15.2 <handler declaration>. . . . 86
15.3 <condition declaration>. . . . 88
15.4 <SQL variable declaration>. . . . 89
15.5 <assignment statement>. . . . 90
15.6 <case statement>. . . . 94
15.7 <if statement>. . . . 97
15.8 <iterate statement>. . . . 99
15.9 <leave statement>. . . . 100
15.10 <loop statement>. . . . 101
15.11 <while statement>. . . . 102
15.12 <repeat statement>. . . . 104
15.13 <for statement>. . . . 105
16 Dynamic SQL. . . . 108
16.1 <prepare statement>. . . . 108
16.2 <input using clause>. . . . 110
16.3 <output using clause>. . . . 111
17 Embedded SQL. . . . 112

17.1 <embedded SQL host program> . . . 112
18 Direct invocation of SQL . . . 114
18.1 <direct SQL statement> . . . 114
19 Diagnostics management . . . 115
19.1 <get diagnostics statement> . . . 115
19.2 <signal statement> . . . 117
19.3 <resignal statement> . . . 119
20 Information Schema . . . 121
20.1 Information Schema digital artifact . . . 121
20.2 MODULE_COLUMN_USAGE view . . . 121
20.3 MODULE_PRIVILEGES view . . . 123
20.4 MODULE_TABLE_USAGE view . . . 124
20.5 MODULES view . . . 125
20.6 PARAMETERS view . . . 126
20.7 ROLE_MODULE_GRANTS view . . . 127
20.8 ROUTINES view . . . 128
20.9 Short name views . . . 129
21 Definition Schema . . . 130
21.1 Definition Schema digital artifact . . . 130
21.2 MODULE_COLUMN_USAGE base table . . . 130
21.3 MODULE_PRIVILEGES base table . . . 132
21.4 MODULE_TABLE_USAGE base table . . . 134
21.5 MODULES base table . . . 135
21.6 ROUTINES base table . . . 137
22 Status codes . . . 138
22.1 SQLSTATE . . . 138
23 Conformance . . . 139
23.1 Claims of conformance to SQL/PSM . . . 139
23.2 Additional conformance requirements for SQL/PSM . . . 139
23.3 Implied feature relationships of SQL/PSM . . . 139
Annex A (informative) **SQL conformance summary . . . 141**
Annex B (informative) **Implementation-defined elements . . . 146**
Annex C (informative) **Implementation-dependent elements . . . 148**
Annex D (informative) **SQL optional feature taxonomy . . . 150**
Annex E (informative) **Deprecated features . . . 152**
Annex F (informative) **Incompatibilities with ISO/IEC 9075:2016 . . . 153**
Annex G (informative) **Defect Reports not addressed in this edition of this document . . . 154**
Index . . . 155

Tables

Table

Page

1 Data types of <condition information item name>s. 115
2 SQL-statement codes. 116
3 SQLSTATE class and subclass codes. 138
4 Implied feature relationships of SQL/PSM. 139
A.1 Feature definitions outside of Conformance Rules. 141
D.1 Feature taxonomy for optional features. 150