

EUROPEAN PATENT OFFICE
U.S. PATENT AND TRADEMARK OFFICE

CPC NOTICE OF CHANGES 1212

DATE: JANUARY 1, 2022

PROJECT RP0762

The following classification changes will be effected by this Notice of Changes:

<u>Action</u>	<u>Subclass</u>	<u>Group(s)</u>
SCHEME:		
Symbols New:	G06N	10/20, 10/40, 10/60, 10/70, 10/80
Titles Changed:	G06N	Subclass
	G06N	3/00
	G06N	5/00
	G06N	7/00, 7/02
	G06N	10/00
Warnings New:	G06N	10/00, 10/20, 10/40, 10/60, 10/70, 10/80
DEFINITIONS:		
Definitions New:	G06N	10/20, 10/40, 10/60, 10/70, 10/80
Definitions Modified:	G06N	10/00

No other subclasses/groups are impacted by this Notice of Changes.

This Notice of Changes includes the following [Check the ones included]:

1. CLASSIFICATION SCHEME CHANGES

- A. New, Modified or Deleted Group(s)
- B. New, Modified or Deleted Warning(s)
- C. New, Modified or Deleted Note(s)
- D. New, Modified or Deleted Guidance Heading(s)

2. DEFINITIONS

- A. New or Modified Definitions (Full definition template)
- B. Modified or Deleted Definitions (Definitions Quick Fix)

3. REVISION CONCORDANCE LIST (RCL)

4. CHANGES TO THE CPC-TO-IPC CONCORDANCE LIST (CICL)

5. CHANGES TO THE CROSS-REFERENCE LIST (CRL)

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1. CLASSIFICATION SCHEME CHANGES

A. New, Modified or Deleted Group(s)**SUBCLASS G06N - COMPUTER SYSTEMS BASED ON SPECIFIC COMPUTATIONAL MODELS**

<u>Type*</u>	<u>Symbol</u>	<u>Indent Level Number of dots (e.g. 0, 1, 2)</u>	<u>Title</u> <u>“CPC only” text should normally be enclosed in {curly brackets}**</u>	<u>Transferred to#</u>
M	G06N	Subclass	COMPUTING ARRANGEMENTS BASED ON SPECIFIC COMPUTATIONAL MODELS	
M	G06N 3/00	0	Computing arrangements based on biological models	
M	G06N 5/00	0	Computing arrangements using knowledge-based models	
M	G06N 7/00	0	Computing arrangements based on specific mathematical models	
M	G06N 7/02	1	using fuzzy logic (computing arrangements based on biological models G06N 3/00; computing arrangements using knowledge-based models G06N 5/00)	
C	G06N 10/00	0	Quantum computing, i.e. information processing based on quantum-mechanical phenomena	G06N 10/00, G06N 10/20, G06N 10/40, G06N 10/60, G06N 10/70, G06N 10/80
N	G06N 10/20	1	Models of quantum computing, e.g. quantum circuits or universal quantum computers	
N	G06N 10/40	1	Physical realisations or architectures of quantum processors or components for manipulating qubits, e.g. qubit coupling or qubit control	
N	G06N 10/60	1	Quantum algorithms, e.g. based on quantum optimisation, quantum Fourier or Hadamard transforms	
N	G06N 10/70	1	Quantum error correction, detection or prevention, e.g. surface codes or magic state distillation	
N	G06N 10/80	1	Quantum programming, e.g. interfaces, languages or software-development kits for creating or handling programs capable of running on quantum computers; Platforms for simulating or accessing quantum computers, e.g. cloud-based quantum computing	

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*N = new entries where reclassification into entries is involved; C = entries with modified file scope where reclassification of documents from the entries is involved; Q = new entries which are firstly populated with documents via administrative transfers from deleted (D) entries. Afterwards, the transferred documents into the Q entry will either stay or be moved to more appropriate entries, as determined by intellectual reclassification; T= existing entries with enlarged file scope, which receive documents from C or D entries, e.g. when a limiting reference is removed from the entry title; M = entries with no change to the file scope (no reclassification); D = deleted entries; F = frozen entries will be deleted once reclassification of documents from the entries is completed; U = entries that are unchanged.

NOTES:

- **No {curly brackets} are used for titles in CPC only subclasses, e.g. C12Y, A23Y; 2000 series symbol titles of groups found at the end of schemes (orthogonal codes); or the Y section titles. The {curly brackets} are used for 2000 series symbol titles found interspersed throughout the main trunk schemes (breakdown codes).
- U groups: it is obligatory to display the required “anchor” symbol (U group), i.e. the entry immediately preceding a new group or an array of new groups to be created (in case new groups are not clearly subgroups of C-type groups). Always include the symbol, indent level and title of the U group in the table above.
- All entry types should be included in the scheme changes table above for better understanding of the overall scheme change picture. Symbol, indent level, and title are required for all types.
- “Transferred to” column must be completed for all C, D, F, and Q type entries. F groups will be deleted once reclassification is completed.
- When multiple symbols are included in the “Transferred to” column, avoid using ranges of symbols in order to be as precise as possible.
- For administrative transfer of documents, the following text should be used: “< administrative transfer to XX>”, “<administrative transfer to XX and YY simultaneously>”, or “<administrative transfer to XX, YY, ...and ZZ simultaneously>” when administrative transfer of the same documents is to more than one place.
- Administrative transfer to main trunk groups is assumed to be the source allocation type, unless otherwise indicated.
- Administrative transfer to 2000/Y series groups is assumed to be “additional information”.
- If needed, instructions for allocation type should be indicated within the angle brackets using the abbreviations “ADD” or “INV”: <administrative transfer to XX ADD> , <administrative transfer to XX INV>, or < administrative transfer to XX ADD, YY INV, ... and ZZ ADD simultaneously>.
- In certain situations, the “D” entries of 2000-series or Y-series groups may not require a destination (“Transferred to”) symbol, however it is required to specify “<no transfer>” in the “Transferred to” column for such cases.
- For finalisation projects, the deleted “F” symbols should have <no transfer> in the “Transferred to” column.
- For more details about the types of scheme change, see CPC Guide.

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B. New, Modified or Deleted Warning(s)

SUBCLASS G06N - COMPUTER SYSTEMS BASED ON SPECIFIC COMPUTATIONAL MODELS

<u>Type*</u>	<u>Location</u>	<u>Old Warning</u>	<u>New/Modified Warning</u>
N	G06N 10/00		Group G06N 10/00 is impacted by reclassification into groups G06N 10/20, G06N 10/40, G06N 10/60, G06N 10/70 and G06N 10/80. All groups listed in this Warning should be considered in order to perform a complete search.
N	G06N 10/20		Group G06N 10/20 is incomplete pending reclassification of documents from group G06N 10/00. Groups G06N 10/00 and G06N 10/20 should be considered in order to perform a complete search.
N	G06N 10/40		Group G06N 10/40 is incomplete pending reclassification of documents from group G06N 10/00. Groups G06N 10/00 and G06N 10/40 should be considered in order to perform a complete search.
N	G06N 10/60		Group G06N 10/60 is incomplete pending reclassification of documents from group G06N 10/00. Groups G06N 10/00 and G06N 10/60 should be considered in order to perform a complete search.
N	G06N 10/70		Group G06N 10/70 is incomplete pending reclassification of documents from group G06N 10/00. Groups G06N 10/00 and G06N 10/70 should be considered in order to perform a complete search.
N	G06N 10/80		Group G06N 10/80 is incomplete pending reclassification of documents from group G06N 10/00. Groups G06N 10/00 and G06N 10/80 should be considered in order to perform a complete search.

*N = new warning, M = modified warning, D = deleted warning

NOTE: The "Location" column only requires the symbol PRIOR to the location of the warning. No further directions such as "before" or "after" are required.

2. A. DEFINITIONS (new)

Insert: The following new Definitions.

G06N 10/20

Definition statement

This place covers:

Models or logical architectures, as opposed to the hardware architectures covered by group G06N 10/40, of quantum computing, independent of whether or not a physical realisation is also disclosed. In particular, general logical/physical models of quantum computing, e.g. related to quantum circuit, are classified in group G06N 10/20.

The physical realisations of a specific model (see examples below) are classified in both G06N 10/20 and G06N 10/40.

A “quantum circuit” is a sequence of quantum logic gates, e.g. quantum gate array, quantum register or quantum random access memory. It should be noted that these are terms of art representing quantum models and should not be confused with physical circuit versions, e.g. electrical circuitry, in general. Quantum circuits are typically obtained via “quantum circuit synthesis”, “quantum circuit decomposition” or “quantum compilers” (also not to be confused with “classical” compilers).

Typical examples of quantum gates: Clifford gates, controlled gates, e.g. cX, cY, cZ, CNOT, Hadamard gate, Pauli-X/Y/Z gates, SWAP gate, T gate, i.e. $\pi/8$, Toffoli gate, i.e. CCNOT, Deutsch gate, Ising XX/YY/ZZ coupling gates, phase shift gates.

Other typical models of quantum computing: adiabatic quantum computation [AQC], topological quantum computing, quantum simulations, e.g. universal quantum simulator, quantum state machines, quantum cellular automata, quantum Turing machines [QTM].

Models wherein the units of quantum information are based on d-level quantum systems (qudits), e.g. using qutrits (d=3).

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G06N 10/40**Definition statement***This place covers:*

Physical realisations or hardware architectures, as opposed to the logical architectures covered by group G06N 10/20 for quantum computing, independent of whether or not a model of quantum computing is also disclosed. Executing models of quantum computing on a specific physical realisation (see examples below) are classified in both G06N 10/20 and G06N 10/40.

Physical realisations typically fall in one of the following categories: superconducting quantum computers, e.g. based on charge qubits, flux qubits, phase qubits, Transmon, Xmon, trapped ion/atom quantum computers, e.g. based on Paul ion trap, optical lattices, spin-based quantum computers, e.g. based on quantum dots, NMR, NMRQC, nitrogen-vacancy centres, fullerenes, Kane or Loss-DiVincenzo quantum computers, based on quantum optics, e.g. linear optical quantum computers.

Examples of quantum components and qubit manipulations: qubit coupling, control or readout, storing quantum states, quantum processor, quantum bus, quantum memory, quantum network (for computations), quantum repeater (for computations).

References***Informative references****Attention is drawn to the following places, which may be of interest for search:*

Superconducting quantum bits per se	H01L 39/00
Nanotechnology for information processing, storage or transmission, e.g. quantum computing or single electron logic	B82Y 10/00

G06N 10/60

Definition statement

This place covers:

All quantum algorithms and not limited to, e.g. quantum optimisation (see examples below). In particular, quantum computing algorithms for specific problems, e.g. NP problem, are classified in group G06N 10/60. Algorithms based on quantum optimisation also includes so-called “hybrid quantum-classical algorithms”. The physical realisations of a specific algorithm (see example below) are classified in both G06N 10/40 and G06N 10/60.

Quantum algorithms typically fall in one of the following categories:

- based on amplitude amplification, e.g. Grover’s algorithm;
- based on Fourier or Hadamard transforms, e.g. Shor’s algorithm, Simon’s algorithm, Deutsch-Josza algorithm, quantum phase estimation algorithm [QPEA] or quantum eigenvalue estimation algorithm;
- quantum optimisation, e.g. quantum annealing, Ising machines, variational quantum eigen-solver [VQE], quantum alternating operator ansatz [QAOA], quantum approximate optimisation algorithm, including hybrid quantum-classical algorithms, e.g. quantum machine learning, machine learning based quantum algorithms;
- quantum walks.

G06N 10/70

Definition statement

This place covers:

Arrangements to achieve fault-tolerant quantum computations. Typical solutions rely on the introduction of ancillary, i.e. additional or auxiliary qubits, such as stabiliser codes, but this place also covers ancilla-free solutions, i.e. no additional qubit necessary. Other examples: bit flip codes, sign flip codes, Shor code, topological codes, e.g. surface codes, planar codes, toric codes.

Arrangements for assessing the quality of quantum computers, whether characterised by a metrics or figure of merits, e.g. quantum fidelity, quantum volume, quantum purity, error rate, or by its calculation or measurement, e.g. randomized benchmarking [RB], cross-entropy benchmarking [CEB], random circuit sampling [RCS].

G06N 10/80

Definition statement

This place covers:

All arrangements for quantum programming, such as quantum instruction sets, quantum software development kits, or quantum programming languages. Typical examples: Quil, Qiskit, or QCL.

Platforms for simulating or accessing the quantum computers, such as cloud-based quantum computing. Typical examples: IBM Q Experience, Quantum Inspire, Azure Quantum, Amazon Braket, Rigetti Quantum Cloud Services, Quantum Playground.

2. A. DEFINITIONS (modified)

G06N 10/00

References

Informative references

Insert: The following new row into the existing Informative references table.

Quantum cryptography	H04L 9/0852
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3. REVISION CONCORDANCE LIST (RCL)

<u>Type*</u>	<u>From CPC Symbol (existing)</u>	<u>To CPC Symbol(s)</u>
C	G06N 10/00	G06N 10/00, G06N 10/20, G06N 10/40, G06N 10/60, G06N 10/70, G06N 10/80

* C = entries with modified file scope where reclassification of documents from the entries is involved; Q = new entries which are firstly populated with documents via administrative transfers from deleted (D) entries. Afterwards, the transferred documents into the Q entry will either stay or be moved to more appropriate entries, as determined by intellectual reclassification; D = deleted entries; F = frozen entries will be deleted once reclassification of documents from the entries is completed.

NOTES:

- Only C, D, F, and Q type entries are included in the table above.
- When multiple symbols are included in the “To” column, do not use ranges of symbols.
- For administrative transfer of documents, the following text should be used: “< administrative transfer to XX>”, “<administrative transfer to XX and YY simultaneously>”, or “<administrative transfer to XX, YY, ...and ZZ simultaneously>” when administrative transfer of the same documents is to more than one place.
- Administrative transfer to main trunk groups is assumed to be the source allocation type, unless otherwise indicated.
- Administrative transfer to 2000/Y series groups is assumed to be “additional information”.
- If needed, instructions for allocation type should be indicated within the angle brackets using the abbreviations “ADD” or “INV”: <administrative transfer to XX ADD>, <administrative transfer to XX INV>, or < administrative transfer to XX ADD, YY INV, ... and ZZ ADD simultaneously>.
- In certain situations, the “D” entries of 2000-series or Y-series groups may not require a destination (“To”) symbol, however it is required to specify “<no transfer>” in the “To” column for such cases.
- RCL is not needed for finalisation projects.

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4. CHANGES TO THE CPC-TO-IPC CONCORDANCE LIST (CICL)

<u>CPC</u>	<u>IPC</u>	<u>Action*</u>
G06N 10/20	G06N 10/20	NEW
G06N 10/40	G06N 10/40	NEW
G06N 10/60	G06N 10/60	NEW
G06N 10/70	G06N 10/70	NEW
G06N 10/80	G06N 10/80	NEW

*Action column:

- For an (N) or (Q) entry, provide an IPC symbol and complete the Action column with “NEW.”
- For an existing CPC main trunk entry or indexing entry where the existing IPC symbol needs to be changed, provide an updated IPC symbol and complete the Action column with “UPDATED.”
- For a (D) CPC entry or indexing entry complete the Action column with “DELETE.” IPC symbol does not need to be included in the IPC column.
- For an (N) 2000 series CPC entry which is positioned within the main trunk scheme (breakdown code) provide an IPC symbol and complete the action column with “NEW”.
- For an (N) 2000 series CPC entry positioned at the end of the CPC scheme (orthogonal code), with no IPC equivalent, complete the IPC column with “CPCONLY” and complete the action column with “NEW”.

NOTES:

- F symbols are not included in the CICL table above.
- T and M symbols are not included in the CICL table above unless a change to the existing IPC is desired.