
Traditional Chinese medicine — Pulse waveform format

Médecine traditionnelle chinoise — Format de la forme d'onde de pouls

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 249, *Traditional Chinese medicine*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Traditional Chinese medicine — Pulse waveform format

1 Scope

This document specifies the application, in the context of traditional Chinese medicine practice, of medical waveform format encoding rules (MFER) to pulse condition waveform as measured in physiological laboratories, hospitals, bed-wards, pharmacies, clinics, community health centres and home care check-ups using pulse condition devices.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 19614, *Traditional Chinese medicine — Pulse graph force transducer*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 19614 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

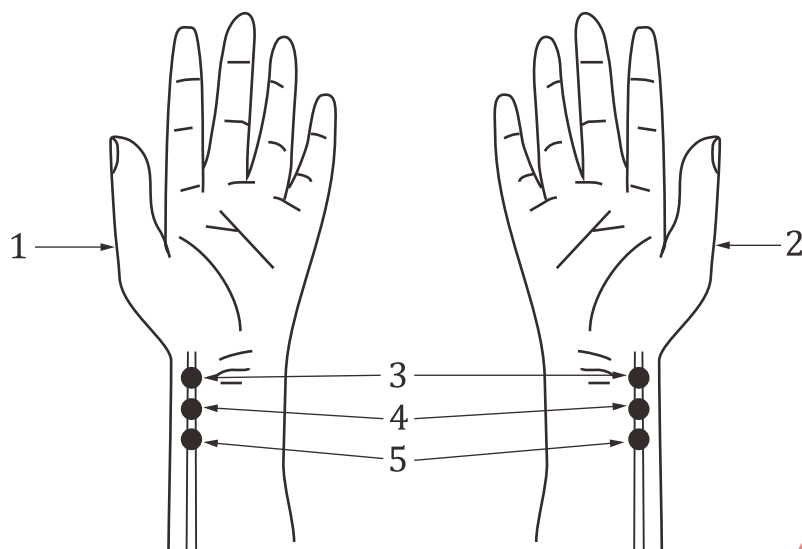
- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1

pulse-taking location

place on the radial artery where the pulse condition is measured

Note 1 to entry: According to traditional Chinese medicine theory, there are three such places (cun/inch, guan/bar and chi/cubit) all over the radial artery, see [Figure 1](#).



Key

- 1 left hand
- 2 right hand
- 3 cun/inch
- 4 guan/bar
- 5 chi/cubit

Figure 1 — Pulse-taking location

**3.2
channel**

individual waveform data group from the *pulse graph force transducer* (3.3)

**3.3
pulse graph force transducer**

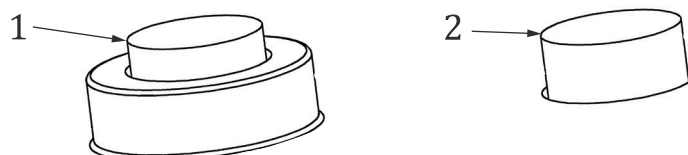
device that can detect pulsation of the radial artery and its peripheral tissues as a mechanical quantity and convert it into an electrical signal output according to a certain pattern for the purpose of traditional Chinese medicine pulse condition acquisition

Note 1 to entry: Transducers involved in this document only refer to pressure or force transducers.

[SOURCE: ISO 19614:2017, 3.1]

**3.4
one signal transducer**

pulse graph force transducer (3.3) with only one channel (see Figure 2)



Key

- 1 signal transducer with auxiliary plan
- 2 signal transducer without auxiliary plan

Figure 2 — One signal transducer

3.5

array signal transducer

pulse graph force transducer (3.3) with multi-channel (see [Figure 3](#))

Note 1 to entry: Array signal transducer can be further divided into line array transducer and cross array transducer.

Note 2 to entry: Line array transducer can be further divided into horizontal parallelism line array transducer and vertical parallelism line array transducer.



Key

- 1 array signal transducer with auxiliary plan
- 2 array signal transducer without auxiliary plan

Figure 3 — Array signal transducer

4 Encoding format

4.1 Primary description

4.1.1 General

This document provides encoding rules for pulse waveform. In addition, together with encoding of information of recognition for waveform, measurement information and interpretation information is provided, but these are all optional functions and are dependent on each implementation concept.

NOTE Interpretation code or measurement value might be described by other standards such as HL7 or XML.

All the symbols and their tags used in this document are specified in ISO 22077-1.

4.1.2 Sampling attributes

4.1.2.1 General

Sampling attributes, including sampling rate and resolution, are given in [Tables 1](#) to [4](#). An example of the encoded data and its explanation can be found in [Annex A](#), Table A.1.

4.1.2.2 MWF_IVL (0Bh): Sampling rate

This tag indicates the frequency or sampling interval for the medical waveform sampled (see [Table 1](#)).

Table 1 — Sampling rate

Symbol	Tag	Length Bytes	Value
MWF_IVL	11d/0Bh	≤ 6	Unit (1)
			Exponent (1)
			Mantissa (≤4)

The units may be frequency in hertz or time in seconds (see [Table 2](#)).

Table 2 — Sampling rate unit

Unit	Code	
Frequency	Hz	0d
Time interval	s	1d

EXAMPLE If the code is 0B 04 01 FD 00 01, that means the sampling rate is equal to 1×10^{-3} and the units are 1 ms.

4.1.2.3 MWF_SEN (0Ch): Sampling resolution

This tag indicates the resolution, minimum bits, for the medical waveform sampled (see [Table 3](#)).

Table 3 — Sampling resolution

Symbol	Tag	Length Bytes	Value
MWF_SEN	12d/0Ch	≤ 6	Unit (1)
			Exponent (1)
			Mantissa (≤4)

The units should be force in newtons, mass in kilograms, pressure in Pascals and voltage in volts (see [Table 4](#)).

Table 4 — Sampling resolution units

Unit		Code	Default
Voltage	V	0d	None
Force	N	6d	None
Pressure	Pa	2d	None
Mass	kg	16d	None

4.1.3 Frame attributes

4.1.3.1 General

A frame is composed of data blocks, channels and sequences.

4.1.3.2 MWF_BLK (04h): data block

This tag indicates the number of data sampled in a block. The number of data blocks in pulse condition waveform coding is defined as 01, namely one data block in one sequence (see [Table 5](#)).

Table 5 — Data block

Symbol	Tag	Length Bytes	Value
MWF_BLK	04d/04h	1	01

4.1.3.3 MWF_CHN (05h): quantity of channels

This tag indicates the amount of channels. This tag should be specified before each definition of the channel attribute (see [Table 6](#)).

Table 6 — Quantity of channels

Symbol	Tag	Length Bytes	Value
MWF_CHN	05d/05h	≤ 4	Based on pulse-taking location and the type of the transducer

4.1.3.4 MWF_SEQ (06h): sequences

This tag indicated the quantity of sequences (see [Table 7](#)). The sequence amount should be fixed as 01 in this document.

Table 7 — Sequences

Symbol	Tag	Length Bytes	Value
MWF_SEQ	06d/06h	1	01

4.1.4 Waveform**4.1.4.1 General**

The waveform class and type, waveform attributes and waveform data are encoded as follows.

4.1.4.2 MWF_WFM (08h): waveform class

This tag indicates the type of waveform encoding rule (see [Table 8](#)). The value should be fixed as “pulse condition waveform” in this document.

Table 8 — Pulse condition waveform

Symbol	Tag	Length Bytes	Value
MWF_WFM	08d/08h	24	Pulse condition waveform

4.1.4.3 MWF_LDN (09h): waveform attributes

This tag indicates the attributes of waveform (see [Table 9](#)).

Table 9 — Definition of waveform attributes

Symbol	Tag	Length Bytes	Value
MWF_LDN	09d/09h	4	Waveform code

The waveform code in the waveform attribute definition consists of four bytes, as shown in Figure 4. Among them, the coding and description of each byte is shown in Tables 10 to 13.

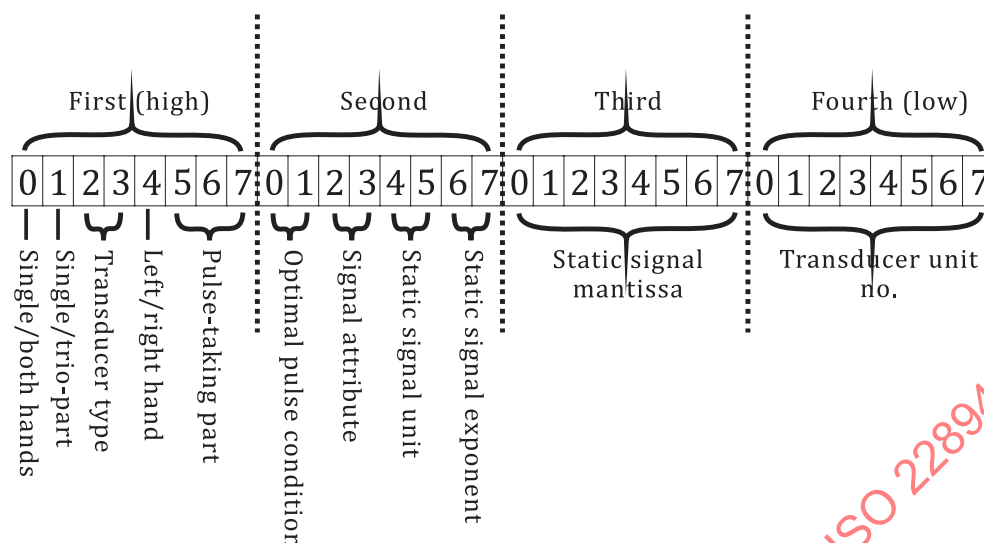


Figure 4 — Waveform code structures

Table 10 — The first byte (high)

Single/both hands ^a		Single part/trio-part ^b		Transducer type		Left/right hand		Pulse-taking location			
Code	Explanation	Code	Explanation	Code	Explanation		Code	Explanation	Code	Explanation	
0	Single	0	Cun or guan or chi	00	One signal transducer		0	Left	000	Others	
				01	Array signal transducer	Horizontal parallelism line array			001	Cun	
									010	Guan	
									011	Chi	
1	Both	1	Cun and guan and chi	10	Array signal transducer	Vertical parallelism line array	1	Right	100	Above cun	
				11					Cross array	101	Blow chi

^a Used to indicate whether the pulse-taking of a single hand or both hands.

^b Used to indicate whether the pulse-taking of a single part or trio-part.

Table 11 — The second byte

Optimal pulse condition ^a		Signal attribute		Static signal unit		Static signal exponent	
Code	Explanation	Code	Explanation	Code	Explanation	Code	Explanation
00	No	00	Others	00	V	00	10^{-2}
		01	Static signal	01	G	01	10^{-1}
01	Yes	10	Dynamic signal	10	N	10	10^0
		11	Static and dynamic signal	11	Pa	11	10^1

^a Optimal pulse condition means when the pulse waveform amplitude is maximum.

Table 12 — The third byte

Static signal mantissa
00000000 — 11111111

Table 13 — The fourth byte (low)

Transducer unit no. (0-127) ^a
00000000 — 01111111

^a The valid number range of the transducer unit specified in this document is 0-127.

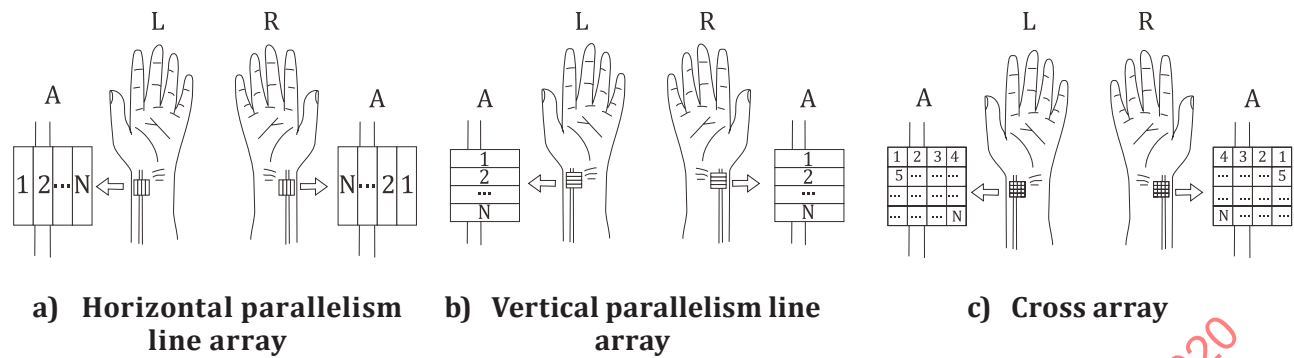
4.1.5 Channel

4.1.5.1 Numbering method for pulse graph force transducer

When using a horizontal parallelism line array transducer (array parallel to the radial artery) for pulse-taking, the channel's serial number should be defined consecutively in the direction from thumb to little finger. The numbering rule is shown in [Figure 5 a](#)).

When using a vertical parallelism line array transducer (array vertical to the radial artery) for pulse-taking, the channel's serial number should be defined consecutively in the direction from top to bottom. The numbering rule is shown in [Figure 5 b](#)).

When using a cross array transducer for pulse-taking, the channel's serial number should be defined consecutively in the direction from thumb to little finger and then top to bottom. The numbering rule is shown in [Figure 5 c](#)).



Key
A pulse vessel
L left hand
R right hand

Figure 5 — Numbering method for transducer

4.1.5.2 WMF_ATT (3Fh): channel attributes

This tag defines the attributes for each channel (see Table 14). Before this definition, the channel quantity shall be specified using the rule in Table 6.

Table 14 — Channel attributes

Symbol	Tag	Length Bytes	Value		
WMF_ATT	3Fh Channel No.	6	MWF_LDN		
			09d/09h	4	Waveform code

4.2 Auxiliary rule

4.2.1 MWF_WAV (1Eh): waveform data

The entire set of waveform data should be strictly aligned as defined in frame attributes. If the waveform data are compressed, the data alignment may depend on the compression method, but the waveform data after decompressing should be aligned according to the definition (see Table 15).

Table 15 — Waveform data

Symbol	Tag	Length Bytes	Value
MWF_WAV	1Eh/50d	—	—

4.2.2 MWF_FLT (11h): filter information

This tag indicates the filter information (see Table 16).

Table 16 — Filter information

Symbol	Tag	Length Bytes	Value
MWF_FLT	17d/11h	Str < 256	—

EXAMPLE Types of filter:

- hum-filter ON
- 30 Hz second order Butterworth low pass
- chebucheff
- elliptic

4.2.3 MWF_END (80h): end of description

This tag indicates an end of data description (see [Table 17](#)).

Table 17 — End of description

Symbol	Tag	Length Bytes	Value
MWF_END	128d/80h	—	—

4.2.4 MWF_TXC (03h): character code

4.2.4.1 As shown in [Table 18](#), this tag enables designation of the character code used for the text (e.g. ISO/IEC 2022 for Japanese text). If text is written with no character code specified, it is not certain whether users can process the text or not.

Table 18 — Character code system

Symbol	Tag	Length Bytes	Default value
MWF_TXC	03d/03h	Str ≤ 16	ASCII

For the structure and meaning of each coding system, refer to the proper specification.

5 Supplemental information

5.1 MWF_TIM (85h): measurement date/time

This tag encodes the examination/measurement date or the data acquisition data/time (see [Table 19](#)).

The data/time is an important object stored using MFER. Care should be taken to ensure it is accurate.

Table 19 — Measurement time

Symbol	Tag		Length Bytes		Remarks	Default value
MWF_TIM	133d/85h	Year	2	7	1 900 to 2 100	None
		Month	1		1 to 12	None
		Day	1		1 to 31 (1 to 30, 1 to 28, 29)	None
		Hour	1		0 to 23	None
		Minute	1		0 to 59	None
		Second	1		0 to 59	None

5.2 Information description

5.2.1 MWF_NTE (16h): comment

This tag indicates the comments information from the doctor (see [Table 20](#)).

Table 20 — Comment

Symbol	Tag	Length Bytes	Value
MWF_MAN	22d/16h	Str ≤ 256	—

5.2.2 MWF_PRE (40h): preamble

This tag indicates the preamble of encoding rule. The content shall include the information on the size of the transducer's effective plane and whether this transducer has an auxiliary plane. See [Table 21](#). The preamble should be as follows:

EXAMPLE 06^06^00^01 means the effective plane size is 6*6 mm; the transducer has an auxiliary plane.

00^00^06^00 means the effective plane size is 2*π*6 mm; the transducer does not have an auxiliary plane.

Table 21 — Preamble

Symbol	Tag	Length Bytes	Value
MWF_PRE	64d/40h	4	See Table 22

Table 22 — The value of the preamble

Length Bytes	Width Bytes	Radius Bytes	Auxiliary
0 to 63	0 to 63	0 to 63	00 or 01

5.2.3 MWF_MAN (17h): manufacturer information of medical device

This tag indicates the information on the manufacturer and model of the pulse measurement device (see [Table 23](#)).

EXAMPLE Manufacturer ^ Model.

Table 23 — Manufacture information

Symbol	Tag	Length Bytes	Value
MWF_MAN	23d/17h	Str ≤ 128	—

5.2.4 MWF_UID (87h): unique identifier

This tag indicates unique identifier (UID), shown in [Table 24](#).

Description of the UID is not be defined by the MFER. This is designated with a universal device identifier (UDI).

The global use of a UDI will facilitate traceability throughout distribution^[4].

In order to achieve traceability, it is necessary to involve all stakeholders to capture and store the UDI [device identifier (UDI-DI) + production identifier (UDI-PI)] throughout distribution and use.

The UDI-DI is a unique numeric or alphanumeric code specific to a model of medical device that is also used as the “access key” to information stored in a UDI database. Examples of the UDI-DI include GS1 GTIN (global trade item number), HIBC-LIC (labeller identification code) and ISBT 128-PPIC (processor product identification code). The production identifier (UDI-PI) is a numeric or alphanumeric code that identifies the unit of device production.

The different types of UDI-PI include serial number, lot/batch number, software as a medical device (SaMD) version and manufacturing and/or expiration date.

Table 24 — Unique identifier

Symbol	Tag	Length Bytes	Default value
MWF_UID	135d/87h	Str ≤ 64	No

The description of the UDI is specified in Reference [\[4\]](#).

5.3 Patient information

5.3.1 General

This clause refers to extensions. The extension tags are for the extended supplemented information with WFER, information which should preferably be represented with a system standard applicable to the most widespread convention in the usage of the particular implementation of MFER. Such local conventions may include, for example, HL7 or DICOM. The heading of patient demographic information should cover other local considerations, in particular privacy and security.

5.3.2 MWF_PNM (81h): patient name

The structure of the patient's name should follow the ISO/TS 22220. This tag indicates a patient name (see [Table 25](#)). It is recommended that patient names are encoded as follows:

Family name ^ first name ^ middle name

The character code of the name can be found in MWF_TXC (03h).

Table 25 — Patient names

Symbol	Tag	Length Bytes	Default value
MWF_PNM	129d/81h	Str ≤ 128	None

5.3.3 MWF_PID (82h): patient ID

This tag indicates a patient identification number (see [Table 26](#)).

It is recommended that patient identification numbers are encoded as follows:

Patient ID ^Local ID ^Temporary ID

If no separator (^) is used, patient ID data are processed as unique IDs in the system.

Table 26 — Patient ID

Symbol	Tag	Length Bytes	Default value
MWF_PID	130d/82h	Str ≤ 64	None

5.3.4 MWF_AGE (83h): patient date of birth

This tag is to encode the date of birth of the patient (see [Table 27](#)).

Table 27 — Date of birth

Symbol	Tag			Length Bytes	Default value
MWF_AGE	131d/83h	Date of birth	Year	2	None
			Month	1	
			Day	1	

5.3.5 MWF_SEX (84h): gender

This tag is to encode the sex of the patient (see [Table 28](#)), using the codes shown in [Table 29](#).

Table 28 — Gender

Symbol	Tag	Length Bytes	Default value
MWF_SEX	132d/84h	1	00

Table 29 — Gender code

Sex	Code
Unclear	00d
Male	01d
Female	02d
Undefined	03d