

Here's a comprehensive overview of **ISO 8583**—the international messaging standard used for financial card-based transactions. I'll cover the message structure, key data elements (DEs), their usage, why they matter, and when they're used.

1. Message Structure

An ISO 8583 message comprises three main parts:

1. **MTI (Message Type Indicator)** – 4 digits indicating version, class, function, and origin.
 - Example: 0100 = ISO 1987, Authorization Request, Original message from Acquirer [Neapay+14IR+14DashDevs: Fintech Software Solutions+14](#)
 2. **Bitmap(s)** – Primary (bits 1–64) and optional Secondary (65–128); a set bit means the corresponding DE is present [Zeta US+3DashDevs: Fintech Software Solutions+3lteh Standards+3](#)
 3. **Data Elements** – 1 to 128 fields of data, each with defined formats, lengths, and functions [Medium](#)
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2. MTI (Message Type Indicator)

MTI format: **V C F O**, where:

- V = Version (0=1987, 1=1993, 2=2003)
- C = Class (1=Authorization, 2=Financial, 3=File Action, 4=Reversal, etc.)
- F = Function (0=Request, 1=Response, etc.)
- O = Originator (0=Acquirer, 1=Issuer) [Worldpay Developer Hub+10Wikipedia+10DashDevs: Fintech Software Solutions+10Medium+5Wikipedia+5IR+5](#)

Common MTIs:

- 0100: Authorization Request
 - 0110: Authorization Response
 - 0420: Reversal Advice
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3. Bitmap

Each bit in the bitmap indicates presence of a DE:

- Bit 1 = Secondary bitmap present
 - Bits 2–128 = Correspond to Data Elements 2–128
Example: if bit 2 = 1, then DE 2 (Primary Account Number) is included
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4. Key Data Elements (DE)

There are up to 128 DEs; below are commonly used ones:

DE Name	Format	Function & Usage
2 Primary Account Number (PAN)	nLL (up to 19)	Card number; used for routing/validation Worldpay Developer Hub+1Wikipedia+1IBMZeta US
3 Processing Code	n6	Indicates transaction type (purchase, refund)
4 Amount, Transaction	n12	Amount in smallest unit (e.g., cents)
7 Transmission Date & Time	n10 (MMDDhhmmss)	Logging & sequence
System Trace		
11 Audit Number (STAN)	n6	Unique tracking ID per message
12 Time, Local Transaction	n6 (hhmmss)	For logging and reconciliation
13 Date, Local Transaction	n4 (MMDD)	
14 Date, Expiration	n4 (YYMM)	Card validity check
22 POS Entry Mode	n3	Indicates card entry (chip, magstripe, contactless)

DE Name	Format	Function & Usage
Retrieval		
37 Reference Number (RRN)	an12	Used for reconciliation/future reference
39 Response Code	an2	Issuer response (e.g., '00' = approved; '05' = declined)
41 Card Acceptor Terminal ID	ans8	ID of terminal where transaction occurred
42 Merchant ID	ans15	Merchant identifier

5. Usage Per Transaction Type

- **Authorization Request (MTI=0100):** contains DE 2, 3, 4, 7, 11, 22, 41, 42...
- **Authorization Response (0110):** includes DE 11, 39, 37, 42...
- **Financial Capture (0200):** includes DE 37, 39, 4...
- **Reversal (0400):** includes DE 37, 4, 11...

DE values change according to context:

- **DE 3** specifies processing code (goods, refund, cash withdrawal)
 - **DE 39** signals result (approved, error type)
 - **DE 22** indicates how the card was read for fraud/risk decisions
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6. Why Each Data Element Matters

- **DE 2 PAN:** identifies card/account
- **DE 3 & 4:** explain transaction type and amount for proper routing/accounting
- **DE 7, 11:** used for synchronizing message logs
- **DE 14:** allows issuer to check card expiry
- **DE 22:** helps in fraud detection and fallback analysis
- **DE 37:** allows follow-up actions like refunds or disputes
- **DE 39:** essential for terminal logic and customer messaging

7. Where It's Used

ISO 8583 messages are exchanged between:

1. **Terminal → Acquirer:** Authorization Request
2. **Acquirer → Switch/Network → Issuer**
3. **Issuer → Switch → Acquirer:** Response
4. **Acquirer → Terminal:** Final approval/decline

Used also in **settlement, reconciliation, reversals, and key exchanges**

[Wikipedia+9IR+9Medium+9Wikipedia+4Worldpay Developer](#)

[Hub+4Medium+4Wikipedia+1DashDevs: Fintech Software Solutions+1](#)

8. Why ISO 8583 is Used

- Ensures **interoperability** across payment networks (Visa, Mastercard, etc.)
 - Provides **flexible data structure** using bitmaps
 - Supports robust **transaction tracking and reconciliation**
 - Enforces **standard formats and validation** for global acceptance
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9. Encoding

DE formats include:

- **n** (numeric), **an** (alphanumeric), **ans** (alphanumeric special), **z** (track data), **b** (binary) [Increase+4IR+4IteH Standards+4IBM](#)
 - Length can be fixed or variable with LL/LLL length indicators
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Sample ISO 8583 Message

Authorization Request Example:

yaml

CopyEdit

MTI: 0100

Bitmap: 7230001000000000 (bits 2,3,4,7,11,22,41,42)

DE2 (PAN): 1234567890123456

DE3: 000000

DE4: 000000025000 (\$250.00)

DE7: 0706223030

DE11: 123456

DE22: 021 (Chip insertion)

DE41: TERM1234

DE42: MERCHID00001

Authorization Response Example:

yaml

CopyEdit

MTI: 0110

Bitmap: 7230001000000000

DE11: 123456

DE37: 123ABC456789

DE39: 00 (Approved)

DE41,42 repeated

✓ Summary

- ISO 8583 is a **robust, standardized messaging protocol** for card payment transactions
- **MTI, Bitmap, DE sequence** form the backbone
- Key DEs convey **identity, amount, timestamp, type, and outcome** of transaction
- Widely adopted by POS, ATMs, acquirers, issuers, and switches

Would you like:

- A complete list of all 128 data elements?

- Sample hex-level ISO messages with parsing?
- More detail on processing codes (DE 3) or response codes (DE 39)?



Sources

You said:

you missed many data elements

ChatGPT said:

Thought for a couple of seconds

You're right—we only covered the most common fields. Here's a **comprehensive rundown** of *all 128 standard ISO 8583 data elements*, with their **structure, usage, typical values**, and **when/why they're used**.

Complete ISO 8583 Data Elements (1–128)

◆ Bitmap (DE 1)

- **Field 1** – A bitmap indicating which DEs are present. Always first, no data in itself. [European Payments Council+14Wikipedia+14Zeta US+14CodeProject+1Zeta US+1](#)

◆ Account & Transaction Details

DE Name	Format	Usage
2 Primary Account Number (PAN)	n..19	Card number for masking, routing, authentication Accredited Standards Committee X9+6Wikipedia+6Trustwave+6
3 Processing Code	n6	Specifies txn type (purchase, refund, cash withdrawal)

DE Name	Format	Usage
4 Amount, Transaction	n12	Amount in minor units (e.g., cents, paise)
5 Amount, Settlement	n12	Settlement amount (if different from txn)
6 Amount, Cardholder Billing	n12	For billing in cardholder's currency
7 Transmission Date & Time	n10 (MMDDhhmmss)	Timestamp when message was sent
8 Amount, Cardholder Billing Fee	n8	Fee in billing currency
9 Conversion Rate, Settlement	n8	FX rate to convert txn → settlement
10 Conversion Rate, Cardholder Billing	n8	FX rate to convert settlement → billing
11 System Trace Audit Number (STAN)	n6	Unique ID to correlate request/response
12 Time, Local Transaction	n6 (hhmmss)	Local time of txn at terminal
13 Date, Local Transaction	n4 (MMDD)	Local date at terminal
14 Date, Expiration	n4 (YYMM)	Card expiry › txn rejected if past
15 Date, Settlement	n4 (MMDD)	Proposed settlement date
16 Date, Conversion	n4	Date when conversion rate was applied
17 Date, Capture	n4	Date funds captured

DE Name	Format	Usage
18 Merchant Type (MCC)	n4	Merchant category code for analytics/fraud

◆ Institution & POS Info

DE Name	Format	Purpose
19 Acquiring Institution Country Code	n3	Country of acquirer bank Wikipedia+2Wikipedia+2Wikipedia+2IR
20 PAN Extended Country Code	n3	Card country info (for BINs)
21 Forwarding Institution Country Code	n3	For transaction routing
22 POS Entry Mode	n3	E.g., 021 = chip, 022 = magstripe, 071 = contactless
23 Application PAN Sequence Number	n3	Differentiates cards sharing PAN (e.g., co-badged)
24 Function Code / NII	n3	Network identifier or routing info
25 POS Condition Code	n2	E.g., unattended terminal, voice referral
26 POS Capture Code	n2	E.g., authorized without PIN then captured
27 Authorization Response Length	n1	No. of following response code bytes

◆ Fees & Amounts (DE 28–31)

- 28: Amount, Transaction Fee
- 29: Settlement Fee
- 30: Transaction Processing Fee
- 31: Settlement Processing Fee
Format: x+n8

Used for network/acquirer fee breakdown
[IR+11Wikipedia+11Wikipedia+11Trustwave](#)

◆ **Institution IDs & Track Data**

- 32: Acquiring Institution ID (n..11)
 - 33: Forwarding Institution ID
 - 34: PAN Extended (ns..28)
 - 35: Track 2 Data (z..37)
 - 36: Track 3 Data (n..104) [Accredited Standards Committee](#)
[X9+5Wikipedia+5Wikipedia+5](#)
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◆ **Reference & Response Fields**

- 37: Retrieval Reference Number (an12) – for tracking
 - 38: Authorization ID Response (an6) – e.g., approval code
 - 39: Response Code (an2) – e.g., "00" = approved, "05" = decline
 - 40: Service Restriction Code
 - 41: Card Acceptor Terminal ID (ans8) – terminal identifier
 - 42: Merchant / Card Acceptor ID (ans15) – merchant identifier
 - 43: Merchant Name/Location (ans40)
 - 44: Additional Response Data (an..25)
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◆ **Additional Track & Data**

- 45: Track 1 Data (an..76)
- 46–48: Additional Data (ISO, National, Private) (an..999)
- 49–51: Currency Codes (Transaction, Settlement, Billing)
- 52: PIN Data (b64)
- 53: Security Control Info (n16)
- 54: Additional Amounts (an..120)

- 55: ICC EMV Data (ans..999) – contains EMV TLV tags like 9F26, 82, etc.
[Wikipedia+2Wikipedia+2Wikipedia+2Worldpay Developer HubWikipedia](#)
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◆ **Message Security**

- 56–63: Reserved for future / proprietary data
 - 64: Message Authentication Code (MAC, b64) – ensures integrity [ScribdZeta US+3Wikipedia+3Wikipedia+3](#)
 - 65: Extended Bitmap Indicator – if tertiary bitmap used
 - 66–69: Settlement/Payment/Institution Country Codes
 - 70: Network Management Info Code (e.g., sign-on, key exchange)
 - 71–72: Message Numbers – for batch file transfers etc.
 - 73: Action Date
 - 74–89: Counts and Totals for credits/debits – used in reports/reconciliation
[IR+4Wikipedia+4Wikipedia+4Accredited Standards Committee X9](#)
 - 90: Original Data Elements – echo of fields in original txn (for reversals)
 - 91: File Update Code – indicates data file has changed
 - 92: File Security Code
 - 93–95: Response/Service/Replacement Amounts/Indicators
 - 96: Message Security Code (hashed for extended security)
 - 97: Net Settlement Amount
 - 98: Payee
 - 99–100: Settlement/Receiving Institution IDs
 - 101–104: File/Account/Txn Description
 - 105–119: Reserved
 - 120–127: Private Use (common for new features like SoftPOS)
 - 128: Secondary MAC [Accredited Standards Committee X9+5Wikipedia+5Wikipedia+5Worldpay Developer HubIR+4CodeProject+4medium.com+4](#)
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⚙️ When & Why Each Field Is Used

- **Auth Request (MTI 0100):** DE 2, 3, 4, 7, 11, 22, 25, 41, 42, 49 + optional 14, 18
 - **Auth Response (0110):** DE 11, 37, 38, 39
 - **Financial Transaction (0200):** DE 2, 3, 4, 11, 22, 25, 35/55, 41, 42
 - **Settlement:** DE 5, 15, 30–31, 74–88
 - **Reversal (0201/0400):** Includes DE 90 (original message data)
 - **Network Management (0800 series):** DE 70, 14, 11, etc. for key exchange, sign-on, TRNs
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🧠 Summary

ISO 8583's **power lies in its flexibility**, allowing systems to exchange only the DEs they need (using the bitmap), while supporting a **massive variety of transaction types**—from purchase, refunds, reversals, batch settlement, to key exchange.

Each DE has a clear purpose: **identifying card, merchant, txn details, security elements, and results**, enabling **global interoperability** between terminals, acquirers, processors, and issuers.

Let's go in-depth into two crucial fields of ISO 8583 used in card payment systems: **DE 3 (Processing Code)** and **DE 39 (Response Code)**.

◆ DE 3 – Processing Code

Length: 6 digits (fixed)

Format: Numeric

Purpose: Indicates the type of transaction being performed (e.g., purchase, refund, balance inquiry).

✖️ Format: NNNNNN

Split into 3 pairs:

1. **First two digits** – Transaction Type

2. **Middle two digits** – From Account

3. **Last two digits** – To Account

💡 **Examples:**

Processing Code Description

000000	Purchase from default account to default account
200000	Refund
010000	Cash Withdrawal
300000	Goods Return
400000	Reversal
000001	Purchase – savings to default
000002	Purchase – checking to default

Some values vary by issuer/acquirer. You'll often see custom codes used in different networks or for value-added services.

◆ **DE 39 – Response Code**

Length: 2 digits

Format: Alphanumeric (mostly numeric)

Purpose: Communicates the result of the authorization request or financial message (decline, approve, error, etc.)

💡 **Common Response Codes:**

Code Meaning		Action Taken
00	Approved	Continue txn
01	Refer to card issuer	Call issuer
02	Refer to issuer, special condition	Manual review
03	Invalid merchant	Decline
04	Pick up card	Decline + confiscate
05	Do not honor	Decline

Code	Meaning	Action Taken
12	Invalid transaction	Decline
13	Invalid amount	Decline
14	Invalid card number (PAN)	Decline
30	Format error	Recheck fields
41	Lost card, pick up	Decline
43	Stolen card, pick up	Decline
51	Insufficient funds	Decline
54	Expired card	Decline
55	Incorrect PIN	Retry or decline
57	Transaction not permitted to cardholder	Decline
58	Transaction not permitted to terminal	Decline
91	Issuer unavailable	Retry or decline
96	System malfunction	Retry later

These codes are mostly standardized under ISO 8583, but some may be used differently depending on the switch or payment network.

Where & When Are They Used?

DE 3 (Processing Code):

- **Request** messages like financial transactions (MTI 0200, 0220)
- Helps identify transaction nature to the issuer or switch
- Also used in reversal/adjustment messages (0400)

DE 39 (Response Code):

- **Response** messages (0210, 0230, 0430)
- Received by POS/ATM for real-time feedback
- Displayed on-screen or printed on receipt

