

Encoding Metars

ICAO Meteorological Aerodrome Report (METAR)

METARs are issued worldwide to report aviation weather. They are the equivalent of an SA report. METARS are issued hourly in some locations, but only three or six hourly in others.

Each METAR is a series of groups arranged in a specific order. Each contains information regarding wind, visibility, runway visual range (optional), weather, cloud cover, temperature, dewpoint and surface pressure. A trend forecast may at times be included, but is optional. Supplemental data is supplied in a plain language format, if needed.

The generic format for a METAR is:

METAR CCCC YYGGggZ AUTO COR dddff(f)KT(dddVddd) VVVVSM
RDrDr/VrVrVrVrFT ww NNNhhh or VVhhh or SKC/CLR
TT/TdTd APPPP RMK

Where: METAR is the routine (scheduled) report and SPECI is the non-routine (unscheduled) report

CCCC is the ICAO identifier

YYGGggZ is the day, hour and minute of the report (UCT)

AUTO or COR is the type of station report. AUTO is a fully automated station with NO human intervention

COR indicates a correction to a previous report

dddff(f)GfffKT(dddVddd) is the wind direction, speed and gusts. (dddVddd) is used if the wind Varies by 60 degrees or more and the speed is greater than 6kts

VVVVSM is the visibility in Statute Miles

RDrDr/VrVrVrVrFT is the runway visual range in hundreds of feet

ww is present weather

NNNhhh is the cloud amount (FEW, SCT, BKN or OVC) and height of the base in hundreds of feet

The cloud type may be added manually, e.g. TCU

VVhhh would represent Vertical Visibility in hundreds of feet, or SKC/CLR is used for Clear conditions

TT is the temperature in whole degrees Celsius

Sub-zero readings are prefixed with an M

TdTd is the dewpoint temperature in whole degrees C

APPPP is the altimeter in inches of mercury

RMK Remarks that could include, Automated, Manual, Plain language, Additive and Maintenance Data

Examples:

KDFW 111753Z VRB03KT 10SM CLR 19/12 A3025 RMK A02 SLP240 T01890117
10189 20067 58002=

KCLE 111806Z 24013KT 10SM SCT024 BKN029 00/MO4 A3026 RMK A02 POOO1=

The format for decoding METARs is therefore as follows:

- A. Type of Report
- B. Station identifier
- C. Date and Time of observation
- D. Report Modifier
- E. Wind direction and speed (knots)
- F. Visibility in meters
- G. RVR in feet
- H. Present weather (from table below)
- I. Sky Condition
- J. Temperature/dewpoint group in Celsius
- K. Altimeter in inches
- L. Remarks

Expanding on these items:

A. Reports are either METAR for routine observations, or SPECI for non-routine (special) observations.

B. Station identifiers are all 4 character ICAO identifiers.

C. Time of observation is always in UTC (formerly Greenwich).

D. Report modifier will be AUTO if fully automated with no human input. COR will indicate a correction.

E. True wind direction in tens of degrees using three digits. Speed is reported in whole knots, using two or three digits. Gusts (G) are appended to the speed if required. Group ends with KT to indicate knots. MS would indicate meters/sec. If wind direction varies by 60 degrees or more, and the speed is > 6 kts, a variable wind group is reported, e.g. 180V250. Direction may be reported VRB if speed is < or equal to 6 kts, e.g. VRB05KT. Calm winds are reported 0000KT.

F. Visibility is in Statute Miles (SM) or meters (M). Group will end with SM if in statute miles. A space divides whole miles and fractions. For AUTO only; M prefixed to value < 1/4 mile, e.g. M1/4SM.

G. Runway visual range in hundreds of feet. This is reported when the prevailing visibility is less than or equal to 1 statute mile, or the RVR is < or equal to 6000ft. The group ends with FT to signify feet. For example, R06L/2000FT means RVR on runway 06 Left is 2000 feet. The RVR value may be prefixed with M or P to indicate the reading is below (M), or above (P) the reported value, e.g. R06L/P6000Ft means the RVR is about 6000FT. If the RVR is variable during the 10 minute evaluation period, the variability is reported, e.g. R06L/2000V4000FT.

H. Present weather (other than obscurations) occurring at the station are reported in the body of the METAR. Obscurations are reported if the visibility < 7 miles. Weather is reported in order of decreasing dominance. Automated stations can only report RA, SN, UP, FG, BR, FZFG, HZ, SQ without augmentation. The following table lists the codes for present weather types. A maximum of three groups will be reported.

Qualifier for Intensity:

- Light

Moderate (no sign)

+ Heavy

VC In the Vicinity (0SM to 10SM for precipitation, and 5SM to 10SM for non-precipitation)

Descriptors

MI	Shallow
PI	Partial
BC	Patches
DR	Low Drifting
BL	Blowing
SH	Shower(s)
TS	Thunderstorm
FZ	Freezing

Precipitation:

DZ	Drizzle
RA	Rain
SN	Snow
SG	Snow Grains
IC	Ice Crystals
PE	Ice Pellets
GR	Hail
GS	Small hail/Snow Pellets
UP	Unknown precipitation

Obscuration:

BR	Mist (visibility 5/8 statute miles or more)
FG	Fog (visibility 1/2 mile or less)
FU	Smoke
VA	Volcanic Ash
DU	Widespread Dust
SA	Sand
HZ	Haze
PY	Spray

Other phenomena:

PO	Well-developed Dust/Sand Whirls
SQ	Squalls
FC	Funnel Cloud, (+FC for Tornado, or Waterspout)
SS	Sandstorm
DS	Duststorm

I. Cloud group in the form NCChhh, where NNN is either FEW, SCT, BKN, or OVC to indicate cloud coverage. The term is immediately followed by the cloud height in hundreds of feet. The amount of coverage for each term in eights is listed below. CLR at automated stations means no clouds detected below 12,000 feet.

SKC or CLR 0/8

FEW >0 - 2/8

SCT 3/8 - 4/8

BKN 5/8 - <8/8

OVC 8/8

At manual stations, CB or TCU may be appended to the cloud height if observed.

Vertical Visibility (VV) is reported in hundreds of feet for an indefinite ceiling, e.g. VV002. Surface obscuration reported using amount (FEW, SCT, etc), followed by 000, e.g. SCT000.

Note for International METAR reports:

The word CAVOK can be used to replace the groups VVVVSM RDD/VVVVFT ww NNNhhh when the following conditions apply:

Visibility 10 km or more

No clouds below 1500 meters

No cumulonimbus clouds

No precipitation, thunderstorm, shallow fog or low drifting snow

J. The temperature/dewpoint group follows next with:

TT being the air temperature in degrees Celsius

TdTd being the dewpoint temperature in degrees Celsius
Sub-zero values are prefixed with an M, e.g., 03/M02.

K. The altimeter reading is prefixed with A indicating altimeter in inches of mercury. It is reported using four digits; tens, units, tenths, and hundredths of an inch of mercury, e.g., A2990.

L. Remarks (RMK) are divided into two categories.

- 1) Automated, Manual (Augmented), Plain Language (Manual only).
- 2) Additive and Automated Maintenance Data.

The following describes the order in which remarks are reported.

Automated, Manual, Plain Language Remarks

Volcanic Eruption

Tornadic Activity

Type of Automated station (A01, A02)

Peak Wind (PK WND)

Windshift (WSHFT)

Frontal passage (FROPA)

Tower Visibility (TWR VIS)

Surface Visibility (SFC VIS)

Variable Prevailing Visibility (VIS)

Sector Visibility (VIS [DIR])

Visibility at 2nd location (VIS [LOC])

Lightning location and frequency (LTG)

Begin/end of precipitation

Begin/end of thunderstorm

Thunderstorm location

Hailstone size

Virga observation

Variable ceiling height (CIG)

Obscurations

Variable Sky Conditions

Significant Cloud Types

Ceiling height at 2nd location

Pressure Rising/Falling Rapidly (PRESRR, PRESFR)

Sea Level Pressure (SLP)

Aircraft Mishap (ACFT MSHP)

No specific reports taken (NOSPECI)

Snow increasing rapidly (SNINCR inches-hr/inches on ground)

Other significant information (agency specific, e.g. LAST)

Additive and Automated Maintenance Data

Hourly precipitation amount (Prrrr)

a trace is P000

3- and 6-Hour precipitation amount (6RRRR)

24-Hour precipitation amount (7RRRR)

Snow depth on ground (4/sss)

Water equivalent of snow on ground (933RRR)

Cloud Type (8/CCC)

Duration of sunshine (98mmm)

Hourly Temperature and Dewpoint (TsnTTTsnTdTdTd)

sn=0 if T > 0.0C; sn=1 if T < 0.0C

6-Hour maximum temperature (1snTTT)

6-Hour minimum temperature (2snTTT)

24-Hour Maximum/minimum temperature (4snTTTsnTTT)

3-Hour pressure tendency (5appp)

Sensor status indicators:

RVRNO, PWINO, PNO, FZRANO, TSNO,

VISNO_LOC, CHINO_LOC

Maintenance Check Indicator: \$

Note:

If an element or phenomena does not occur, is missing, or cannot be observed, the corresponding group and space are omitted (main body or remarks), except for Sea Level Pressure (SLPppp), 3-, 6-, and 24-Hour precipitation groups. At designated stations, SLPNO shall be reported in a METAR when the SLP is not available.

Other contractions that may appear in International METARs as part of the trend forecast:

INTER meaning intermittent (same as occasional in US format)

TEMPO meaning temporary (same as brief in US format)

GRADU..a gradual change over a period greater than 1/2 hour

RAPID..a rapid change over a period less than 1/2 hour

FRONT..same as RAPID>

Other abbreviations

RE...followed by a weather type indicates its occurrence within the past hour

WX NIL..the end of thunderstorms or freezing precipitation SKC..sky is becoming clear

PROB..probability of conditions occurring (in percent)

NOSIG..no elements are expected to change in such a way as to require a change to be indicated.