Technical Data Sheet

Hydrochloric Acid 31% ACS Grade

ACS · 31% w/w

Alliance Code	Revised	Revision
hydrochloric-acid-31-acs-grade	2026-11-19	1.7

CAS number 7647-01-0	UN number UN1789	Hazard class · packing group 8 · PG II
 Structure · PubChem	Grade ACS · 31% w/w	Signal word **Danger**

Hazards

Corrosive | Irritant / harmful | H290 H314 H335

Proper shipping name

Hydrochloric acid

IDENTITY & COMPOSITION

PRODUCT NAME

Hydrochloric Acid 31% ACS Grade

ALLIANCE CODE

hydrochloric-acid-31-acs-grade

GRADE

ACS

CONCENTRATION

31% w/w

CAS NUMBER

7647-01-0 Adjudicated

FORMULA

ClH Adjudicated

MOLECULAR WEIGHT

36.46 Adjudicated

PRODUCT TYPE

Solution

SPECIFICATIONS

TEST	SPECIFICATION	TYPICAL	METHOD	SOURCE
Assay (HCl)	30.5 - 31.5 % w/w	—	—	Interpreted
Ammonium (NH4)	2.5 ppm max	—	—	Interpreted
Arsenic (As)	0.0084 ppm max	—	—	Interpreted
Bromide (Br)	0.0042% max	—	—	Interpreted
Extractable organic substances	4.2 ppm max	—	—	Interpreted
Free chlorine (Cl)	0.84 ppm max	—	—	Interpreted
Heavy metals (as Pb)	0.84 ppm max	—	—	Interpreted
Iron (Fe)	0.17 ppm max	—	—	Interpreted
Residue after ignition	4.5 ppm max	—	—	Interpreted
Sulfate (SO4)	1 ppm max	—	—	Interpreted
Sulfite (SO3)	0.84 ppm max	—	—	Interpreted
Color (APHA)	10 max	—	—	Interpreted
Composition	31 % hydrochloric acid in deionized water, by weight	—	By formulation; batch weights (scale ticket)	Interpreted

Values are reproduced from the current product reference. Source labels do not by themselves establish a supplier guarantee or a test result for your lot. Confirm applicable acceptance limits and request lot-specific documentation.

AVAILABLE GRADES SAME CAS, ALTERNATE GRADES AND CONCENTRATIONS

GRADE	CONCENTRATION	TYPICAL ASSAY	SKU
THIS GRADE ACS	31% w/w	—	current
ACS Reagent	37% w/w	—	hydrochloric-acid-37-acs-reagent-grade
Technical Grade	37% w/w	—	hydrochloric-acid-37-hcl-37-technical-grade
Technical Grade	31% w/w	—	hydrochloric-acid-31-technical-grade
Technical	25% w/w	—	hydrochloric-acid-25-technical-grade
ACS	20% w/w	—	hydrochloric-acid-20-acs-grade
Technical	20% w/w	—	hydrochloric-acid-20-technical-grade
ACS	15% w/w	—	hydrochloric-acid-15-acs-grade
Technical Grade	15% w/w	—	hydrochloric-acid-15-technical-grade
ACS	10% w/w	—	hydrochloric-acid-10-acs-grade
Technical	10% w/w	—	hydrochloric-acid-10-technical-grade
ACS	5% w/w	—	hydrochloric-acid-5-acs-grade
Technical Grade	5% w/w	—	hydrochloric-acid-5-technical-grade

Typical assay for each grade is the average of its recent lots. Confirm a grade meets your specification before substituting it.

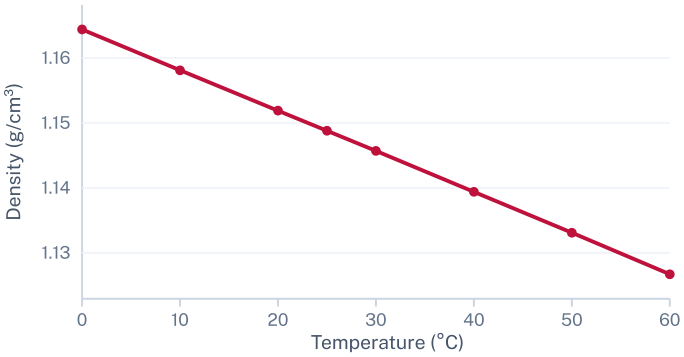
PHYSICAL & CHEMICAL PROPERTIES

PROPERTY	VALUE	SOURCE
Appearance	Clear, colorless to slightly yellow liquid	Adjudicated
Form	Liquid	Published reference
Odor	Pungent, acrid odor	Adjudicated
pH	< 1	Adjudicated
Specific Gravity	1.156 at 20/20 °C (water = 1)	Adjudicated
Density	1.1543 g/cm^3 at 20 °C	Adjudicated
Boiling Point	~85-90 °C (fumes)	Adjudicated
Melting Point	-46.9 °C (-52.5 °F), freezing point	Adjudicated
Flash Point	Not flammable	Published reference
Vapor Pressure	35–40 mmHg at 30 °C (86 °F)	Adjudicated
Vapor Density	1.27 (air = 1)	Adjudicated
Solubility (water)	Completely miscible with water	Adjudicated
Viscosity	1.55 mPa·s at 30 °C	Adjudicated

Strong acid — density and vapor-pressure values shown are at 20 °C; values shift markedly with concentration and temperature. Reference concentration-temperature curves before specifying equipment.

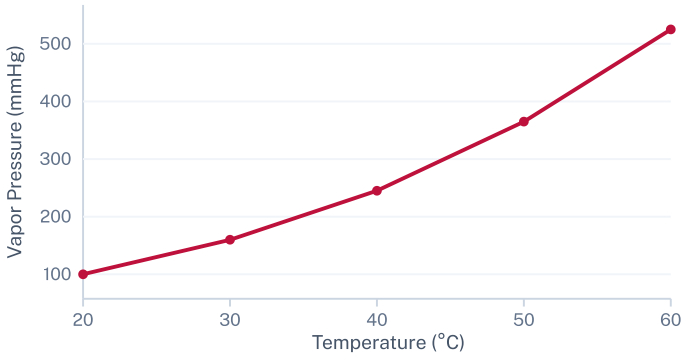
PROPERTY CURVES

Density vs. Temperature (31%)



Source: Perry's Chemical Engineers' Handbook (31% reference)

Vapor Pressure vs. Temperature (31%)



Source: Perry's Chemical Engineers' Handbook (31% reference)

Reference curves drawn from public engineering data. For engineering use, consult the cited source for the underlying tabulated values.

MATERIALS OF CONSTRUCTION

MATERIAL	RATING	CONDITIONS	SOURCE
Rubber-lined steel (rubber lining)	Compatible	20° Bé muriatic acid, 31.45 wt.% min HCl; bulk tank car and tank truck service	oxychem.com

Compatibility is drawn from published manufacturer and supplier documentation for this product; each rating is sourced. Confirm against your specific duty cycle before equipment selection.

REGULATORY & TRANSPORT

DOT / 49 CFR

UN NUMBER
UN1789 Adjudicated

HAZARD CLASS
8 Adjudicated

PACKING GROUP
II Adjudicated

PROPER SHIPPING NAME
Hydrochloric acid Adjudicated

GHS / OSHA HCS 2024

SIGNAL WORD
Danger Adjudicated

H-CODES (HAZARD STATEMENTS)
H290, H314, H335 Adjudicated

P-CODES (PRECAUTIONARY STATEMENTS)
P234, P260, P261, P264, P271, P280, P301+P330+P331, P303+P361+P353, P304+P340, P305+P351+P338, P310, P321, P363, P390, P403+P233, P405, P406, P501

Adjudicated

OCCUPATIONAL EXPOSURE LIMITS

OSHA PEL (29 CFR 1910.1000)
5 ppm ceiling OSHA 29 CFR 1910.1000

ACGIH TLV
2 ppm Ceiling Adjudicated

NIOSH REL
5 ppm ceiling NIOSH Pocket Guide

NIOSH IDLH
50 ppm NIOSH Pocket Guide

Transport descriptions reflect 49 CFR 172.101 lookup at time of publication. Sourced data: NIOSH Pocket Guide for REL/IDLH, OSHA Z-Tables for PEL. Always verify against the latest regulatory text before shipment-critical decisions.

HEALTH & FIRE HAZARD

ACUTE TOXICOLOGY

LD_{50} ORAL (RAT)
700 mg/kg Adjudicated

LC_{50} INHALATION
3124 ppm (hydrogen chloride gas, rat, 1 h)

Adjudicated

Acute toxicology values from SDS Section 11 or NIOSH RTECS.

APPLICATIONS

Pickling and metal cleaning agent in metal processing, to remove oxides and scale chemceed.com

Oil well acidizing — dissolves calcium and magnesium carbonate rock formations to increase permeability and production

chemceed.com

Beneficiation of ores and rock phosphate; stimulation of oil and gas wells in carbonate and sandstone reservoirs

itwreagents.com

Metallurgical pickling, etching and brazing itwreagents.com

Removal of calcium carbonate (scale) deposits from equipment and cleaning of boreholes and gravel-pack filters after drilling

itwreagents.com

ACS reagent purity makes it acceptable for analytical applications and research laboratories laballey.com

Batteries, reagent use, descaling agent, reducing agent laballey.com

Petroleum well operations, ore reduction, food processing, pH adjustment and general cleaning

chemceed.com

Listed product uses include acid cleaners, boiler water treatment, electroplating, galvanizing, high fructose corn syrup, pH control, rust and scale removers, sugar refining, swimming pool and toilet bowl cleaner

chemceed.com

Applications are drawn from published manufacturer and supplier documentation; each is sourced. Suitability for a specific use is the buyer's to confirm.

STORAGE & HANDLING

RECOMMENDED STORAGE

Store in a cool, well-ventilated area out of direct sunlight in closed, vented, corrosion-resistant containers (polyethylene or glass). Keep away from bleach and other oxidizers, bases and metals.

Adjudicated

HANDLING PRECAUTIONS

Use full PPE including face shield, acid-resistant gloves and apron. Add acid to water slowly with stirring; never reverse. Ventilation required.

Class-level guidance — not product-specific; the SDS controls.

INCOMPATIBILITIES

Bases, hydroxides, carbonates, amines and ammonia; oxidizers, including sodium hypochlorite (bleach) (release chlorine gas); most metals and metal oxides, including iron, copper, nickel and aluminum (release flammable hydrogen); cyanides, sulfides and sulfites (release toxic gases); formaldehyde.

Adjudicated

SHELF LIFE

Consult Technical Services for product-specific shelf life

For full hazard, PPE, and emergency response guidance, refer to the Safety Data Sheet (SDS) for this product. The SDS controls in all cases where guidance differs.

PACKAGING & LOGISTICS

SHIPPING DESCRIPTION (US DOT)

```
UN1789, Hydrochloric acid, 8, PG II
```

Sourced from 49 CFR 172.101. Confirm against shipping documents and carrier requirements before tender.

NMFC CLASS	PLACARD	PACKING GROUP
60	Corrosive	PG II

REVISION HISTORY

Last reviewed 2026-11-19 by Andre Taki, Chief Commercial Officer, DOT Hazmat–certified (49 CFR 172.704).

VERSION	DATE	CHANGE	TRIGGER
1.7	2026-10-20	Canonical data updated: 2 fields changed via the provenance/adjudication pipeline. • `density` · canonical change (coa.data_provenance / adjudication) • `specificGravity` · canonical change (coa.data_provenance / adjudication)	`canonical_change`

VERSION	DATE	CHANGE	TRIGGER
1.6	2026-10-08	Canonical data updated: 22 fields changed via the provenance/adjudication pipeline. • ghsClassification · canonical change (coa.data_provenance / adjudication) • hazard_h_codes · canonical change (coa.data_provenance / adjudication) • hazard_p_codes · canonical change (coa.data_provenance / adjudication) • meltingPoint · canonical change (coa.data_provenance / adjudication) • vaporPressure · canonical change (coa.data_provenance / adjudication) • vaporDensity · canonical change (coa.data_provenance / adjudication) • specificGravity · canonical change (coa.data_provenance / adjudication) • solubility · canonical change (coa.data_provenance / adjudication) • viscosity · canonical change (coa.data_provenance / adjudication) • evaporationRate · canonical change (coa.data_provenance / adjudication) • odor · canonical change (coa.data_provenance / adjudication) • odorThreshold · canonical change (coa.data_provenance / adjudication) • pH · canonical change (coa.data_provenance / adjudication) • oel_acgih_tlv · canonical change (coa.data_provenance / adjudication) • cercla_rq · canonical change (coa.data_provenance / adjudication) • incompatible_materials · canonical change (coa.data_provenance / adjudication) • conditions_to_avoid · canonical change (coa.data_provenance / adjudication) • hazardous_decomposition_products · canonical change (coa.data_provenance / adjudication) • storage_precautions · canonical change (coa.data_provenance / adjudication) • synonyms · canonical change (coa.data_provenance / adjudication) • restrictions_on_use · canonical change (coa.data_provenance / adjudication) • recommended_use · canonical change (coa.data_provenance / adjudication)	canonical_change
1.5	2026-10-07	Canonical data updated: 3 fields changed via the provenance/adjudication pipeline. • ghsClassification · canonical change (coa.data_provenance / adjudication) • hazard_h_codes · canonical change (coa.data_provenance / adjudication) • hazard_p_codes · canonical change (coa.data_provenance / adjudication)	canonical_change

VERSION	DATE	CHANGE	TRIGGER
1.4	2026-10-05	Canonical data updated: 1 field changed via the provenance/adjudication pipeline. • oel_osha_pel · canonical change (coa.data_provenance / adjudication)	canonical_change
1.3	2026-09-30	Canonical data updated: 2 fields changed via the provenance/adjudication pipeline. • boilingPoint · canonical change (coa.data_provenance / adjudication) • appearance · canonical change (coa.data_provenance / adjudication)	canonical_change
1.2	2026-08-27	Canonical data updated: 2 fields changed via the provenance/adjudication pipeline. • oel_niosh_rel · canonical change (coa.data_provenance / adjudication) • oel_idlh · canonical change (coa.data_provenance / adjudication)	canonical_change
1.1	2026-07-22	Canonical data updated: 1 field changed via the provenance/adjudication pipeline. • dotSubsidiaryHazardClass · canonical change (coa.data_provenance / adjudication)	canonical_change

This Technical Data Sheet is provided for technical reference. The Safety Data Sheet (SDS) controls in all cases where guidance differs. Values reflect Alliance Chemical canonical data at time of generation; subsequent revisions are recorded in the Revision History above.