HYDROXPAND · USER MANUAL

HXD-V1

Modular hydrogen dryer

User Manual



Document no. HX-MAN-HXDV1-EN-001
Version ver0.2 · Issued 2026-11-06

Latest version
hydroxpand.com/en/handbook/hxd-v1

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DOCUMENT CONTROL

Document control

Document information

Document no.	HX-MAN-HXDV1-EN-001
Version	ver0.2
Issued	2026-11-06
Product	HXD-V1 · Modular hydrogen dryer
Language	English

About this manual

This manual is the formal print edition of the HydroXpand web handbook. Its content is the same as the web handbook.

The web handbook is updated first. Where this print and the web differ, the web handbook is current. Each chapter shows its own update date at the top.

Read the safety chapter first. The meaning of the signal words (danger, warning, caution, notice) is in its first section.

Revision history

Rev.	Date	Description
0.1	2026-10-29	First version (built from the web handbook)
0.2	2026-11-06	Control app and operation chapters added; factory test, commissioning acceptance and records added; symptoms A to D added; alarms and states checked against the control app

CONTENTS

Contents

01	Safety	4
02	Receiving and storage	8
03	Installation and connection to the HXB-V1	12
04	First start	17
05	How the dryer works	20
06	Control app	24
07	Operation and shutdown	29
08	Routine checks and service	33
09	Use with HXB-V1	35
10	Decommissioning and storage	37
11	Specifications and reference	38
	Troubleshooting	40

01 Safety

HXD-V1 · updated 2026-11-06

The HXD-V1 takes wet hydrogen under pressure from HXB-V1 units, removes the water, and heats its adsorber towers with mains power to regenerate them. Pressure, hydrogen, electricity and heat are all present in one rack unit.

This chapter covers the hazards and the immediate safety actions. Read it before you install or operate the unit.

HAZARDS **Hydrogen · pressure · mains power · heat** WHEN TO READ **All of it, once, before installing**

HOW TO READ THIS CHAPTER

First time

There is no section to skip. Read it through once before installing.

Done this before

Re-read the signal words and the emergency response, and check them against your own site safety rules.

Signal words

This handbook uses the same signal words as the HXB-V1 handbook. They differ in severity, so read them as such.

SIGNAL WORD	MEANING
DANGER	A situation that will cause serious injury or death if not avoided
WARNING	A situation that could cause serious injury or death if not avoided
CAUTION	A situation that may cause minor or moderate injury if not avoided
NOTICE	Information that is not about personal injury but prevents equipment damage or loss of performance

The hazards

DANGER

Hydrogen is flammable and leaves the unit through the vents.

- The PURGE and DEPR. ports release hydrogen during normal operation. Route both to a safe place outdoors, away from air intakes and ignition sources.
- Never block, cap or throttle PURGE or DEPR. A blocked vent stops regeneration and can pressurise parts that are not meant to hold pressure.
- The DRAIN port releases condensate together with some hydrogen. Do not route it to an open floor drain.

WARNING

The gas side is under pressure. Loosening a joint under pressure can whip the tube or release hydrogen and injure you.

- Standard operation is at 10 barg. Units built for higher pressure carry their rating on the label.
- Do not loosen any fitting while the unit is pressurised. Stop the hydrogen supply and depressurise first.
- A relief valve protects the gas side. Its discharge leaves through the vent ports, which is another reason they must stay open.

WARNING

Mains voltage is inside the unit, and it reaches parts in contact with the gas. An electric shock can cause serious injury or death.

- The heaters run on 200-240 V and sit inside the adsorber towers. Connect the unit only to an earthed outlet. Protective earth is mandatory.
- Switch off at ON/OFF and remove the power cord before you open any cover.

CAUTION

Internal parts get hot. Touching them with bare hands can burn you.

- During regeneration the adsorber wall reaches about 150 °C. The towers are insulated, but the heater ends and fittings near them can be hot.
- After switching off, let the unit cool for several hours before working inside.
- Condensate from DRAIN may carry traces of alkaline electrolyte from the electrolyser. Wear gloves and eye protection when you handle it.

PPE

NOTICE

Where your site rules are stricter than this document, follow your site rules.

Routine operation and checks	Safety glasses, closed-toe shoes and suitable work clothing

Working on fittings and tubing	Safety glasses and work gloves. Stop the hydrogen supply and confirm the unit is depressurised first
Handling condensate from DRAIN	Safety glasses or goggles and alkali-resistant gloves. The condensate may carry alkaline electrolyte
Opening a cover	Safety glasses and work gloves. Remove the power cord and let the unit cool for several hours first

Built-in protection

FUNCTION	WHAT IT DOES
Relief valve	Opens if the gas-side pressure rises above its set pressure and discharges to the vents
Overheat trip	Thermostats on each tower cut heater power directly if the wall gets too hot, independent of the software
Liquid leak sensor	Detects liquid collecting inside the enclosure and triggers an emergency stop
Overpressure stop	The software triggers an emergency stop if system pressure exceeds 15 barg
Adsorber overtemperature stop	The software triggers an emergency stop if a tower runs 30 °C or more above the regeneration temperature (250 °C at most)
Fan monitoring	Warns if any of the three ventilation fans stops
Fused power inlet	IEC C14 inlet with 2-pole switch and fuses

These functions protect the unit. They do not replace the hydrogen detection, ventilation and emergency stop that your site design requires. The leak sensor detects liquid; it is not a hydrogen detector.

Emergency response

The Emergency STOP button at the top right of the control app stops the dryer at once. Once the cause is found and fixed, clear it with the Release button in the same place. If the app is not available, or there is smoke or fire, cut the power at ON/OFF or at the supply circuit.

SITUATION	WHAT TO DO
Hydrogen smell, hiss or gas alarm	Stop hydrogen production at the HXB-V1 units from a safe distance. Ventilate. Keep ignition sources away. Do not re-pressurise until the leak is found and fixed.

SITUATION	WHAT TO DO
Smoke, burning smell, overheating	Switch off the HXD-V1 at ON/OFF or at the supply circuit. Stop the HXB-V1 units. Do not open the unit while hot.
Liquid on or under the unit	Stop the system, switch off, and treat the liquid as alkaline. Check the DRAIN line and the separator before restarting.
Fire	Isolate power and the hydrogen supply if this can be done safely. Let a hydrogen fire burn out once the supply is stopped. Follow the site fire plan.

02 Receiving and storage

HXD-V1 · updated 2026-11-06

How the unit arrives, what to check before you sign for it, and how to keep it until installation. The adsorbent inside is dry when it leaves the factory, so keeping moisture out matters from the first day.

FORMAT **19-inch rack unit · 6U** SIZE **482 × 650 × 266 mm**

HOW TO READ THIS CHAPTER

First time

Check the delivery against the list below and keep the port caps on.

Done this before

Go to storage conditions.

What arrives and what you prepare

Included



The HXD-V1 itself, with its ports capped



The user manual, sent electronically



The factory acceptance test document

Prepare separately unless ordered



The Ethernet cable and the AC power cord

Your site provides



A control PC or laptop



1/4-inch stainless steel tube and fittings rated for hydrogen

Photos show the type of item only. Tubing photo by Best Tech Nick 25 (Wikimedia Commons, CC BY-SA 4.0, background removed and edited). The edited version is released under CC BY-SA 4.0.

- Vent lines that take PURGE and DEPR. to a safe place outdoors
- A liquid trap for DRAIN
- Rack rails or a shelf to support the body
- A dew-point or purity analyser, if you want to read the dew point and did not order the dew point sensor

When HydroXpand supplies the complete rack, the tube, fittings and rack rails are part of the rack integration scope.

Factory test before shipping

Every HXD-V1 passes the tests below at our factory before it ships. The results go in the factory acceptance test document that comes with the unit, and the first start is compared against them.

AREA	WHAT IS CHECKED	CRITERIA
Build	Enclosure, wiring, gas fittings	No damage, missing or loose parts
Electrical safety	Protective earth bonding, insulation resistance (500 V DC)	0.1 Ω or less, 1 MΩ or more
Sensors	Temperature and pressure sensors against reference instruments	Within ± 2 °C and ± 0.2 barg
Communication	Control app link, CSV log	Updates every second; every channel logged
Functions	Tower switching valves, fans, heaters and contactor, leak-sensor emergency stop	Each responds as commanded; the two heaters are never on together
Pressure	N_2 leak test and pressure hold at 10 barg, relief valve set-pressure certificate	No leaks; relief valve set at 15 barg
Hydrogen run	24 h on hydrogen from an HXB-V1 at 10 barg, each tower regenerated once	Regeneration temperature reached, switch at 40 °C or below, outlet dew point -65 °C or below, no drain warnings, no hydrogen leaks

AREA	WHAT IS CHECKED	CRITERIA
As shipped	Regeneration setting, ports	Factory setting (150 °C, 12 h cycle, 6 h heating); all six ports capped

> NOTICE
>
> **The factory test flow is below the rated flow.**
>
> - The test runs on the hydrogen from one HXB-V1, which is less than the 2.5 Nm^3/h maximum. The test flow is written in the document.

Unpacking and inspection

Before you start

Have the delivery documents, the order details, a camera, and a lifting aid or a second person ready.

Work sequence

> CAUTION
>
> **Do not lift it alone. Dropping it can injure your feet and damage the ports.**
>
> - Lift with two people or a lifting aid. Never lift it by the ports or fittings on the front panel.

1 **Look at the outer packaging first.**

- Check for dents, impact and water damage.
- Note any damage on the delivery documents and photograph it. You will need that for a carrier claim.

2 **Open the box carefully.**

- Keep the blade shallow so it does not damage the port caps or fittings.

3 **Move the unit onto a stable, level surface.**

4 **Inspect it by eye.**

- Check the enclosure and handles for dents, cracks and deformation.
- Check that all six gas ports are capped and that the power inlet and Ethernet port are undamaged.

- Compare the model and serial number on the label with the delivery documents.

Inspection completion criteria

The model and serial number match your order, the enclosure, ports and fittings are undamaged, and every port cap is in place.

If a check fails

Do not install the unit. Send us the photos and the serial number. For transport damage, we also need the note on the delivery documents and the photos.

> NOTICE
>
> **Keep the port caps on until the tubing is connected.**
>
> - The adsorbent takes up moisture from room air through open ports. An adsorbent loaded with moisture before start-up needs extra regeneration cycles before it reaches its dew point.

Storage

- Store indoors, dry and frost-free, in the original packaging.
- Keep the unit level. Do not stack other loads on it.
- Lift with two people, by the front handles and the base together. The handles alone are not meant to carry the full unit.

03 Installation and connection to the HXB-V1

HXD-V1 · updated 2026-11-06

The HXD-V1 is a modular dryer that takes the water out of the hydrogen leaving an HXB-V1. It has the same 19-inch rack format as the HXB-V1, so the two can sit in the same rack.

This chapter covers where the HXD-V1 goes, the line from the HXB-V1, the vents and drain, and power and network. Putting several units in one rack is in the Use with HXB-V1 chapter, and the HXB-V1 side is in the HXB-V1 upstream and downstream chapter.

WORKS WITH **HXB-V1, 10 barg version, up to five units** WHEN TO READ **Before you order, and before you choose the site**

HOW TO READ THIS CHAPTER

First time

Check what to decide before installing against your HXB-V1 order, and draw the pipework from the port table.

Done this before

Re-check just the vents and drain section. That is what usually catches you when the pipework changes.

What to decide before installing

- The HXB-V1 pressure version. The HXD-V1 is designed to take pressurised hydrogen and needs at least 10 barg at its inlet. It pairs with the 10 barg HXB-V1 and cannot be fed from a 0 barg unit. HXB-V1 pressure is fixed at order, so settle it when you order the HXB-V1.
- How many HXB-V1 units it serves. One HXD-V1 takes up to five HXB-V1 units. The pipework for several units is settled with us at order.
- The pressure at the point of use. The HXD-V1 runs at 10 barg as standard. If your application needs more, you need a compressor; if it is sensitive to pressure swings, you need a separate regulator. Higher pressure, up to 35 barg, is by agreement.
- Where the vents discharge. The HXD-V1 vents gas containing hydrogen as it runs. Decide first how the lines reach a safe outdoor discharge point.
- Power and network. You need one 200-240 V AC single-phase supply and one Ethernet connection for control.

Where it goes

- Indoors, in a ventilated area classified as non-hazardous. The HXD-V1 is not certified for use in hazardous areas (ATEX or IECEx zones).

- It takes 6U of a 19-inch rack. It is 613 mm deep from the front panel to the rear, with 30.7 mm of fittings and 36.5 mm of handles at the front, 650 mm at most in all. Leave extra room at the back so tubing and cables are not bent sharply.
- Fans at the rear ventilate the enclosure. Keep the front and rear of the rack free.
- Put it in the same room and under the same ventilation as the HXB-V1. It handles hydrogen, so the HXB-V1 site requirements apply as they are.

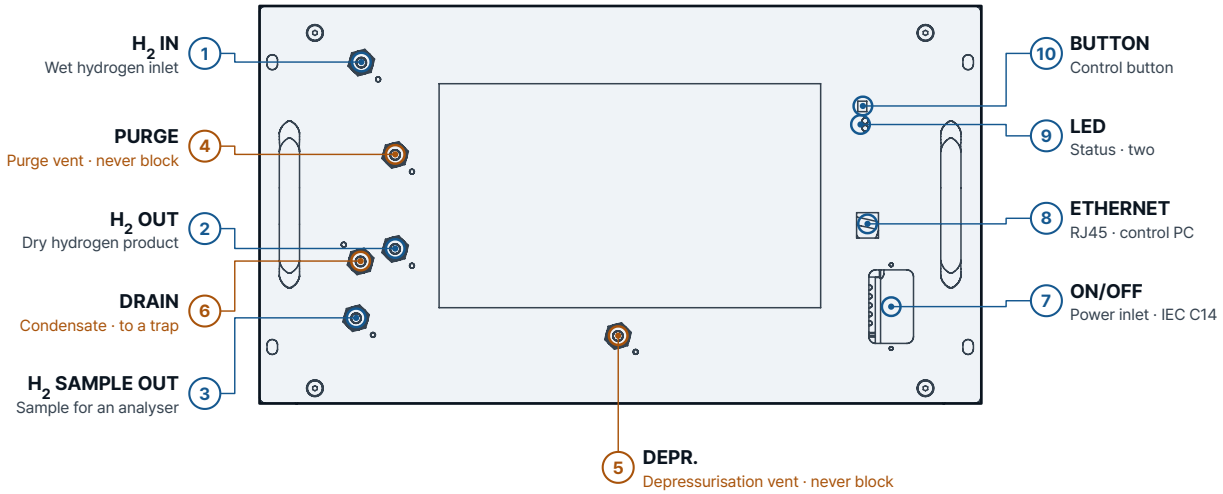
Rack mounting

Fix the front panel with four screws through the rack slots (465 mm centres). Support the body on rack rails or a shelf. The front screws alone are not designed to carry the unit.

In the standard HydroXpand rack (42U), the HXD-V1 sits at the bottom with five HXB-V1 units above it. See the Use with HXB-V1 chapter.

Ports and connections

All ports and connectors are on the front panel. There are six fluid ports, all 1/4-inch tube bulkheads. The numbers match the outline drawing.



Fluid ports 1–6 are all 1/4-inch tube bulkheads. Positions from outline drawing HX-DRW-HXDV1 Rev 00.

Figure 3-1 Front-panel port layout · numbers match the table below

NO.	PORT	WHAT IT DOES	CONNECT TO
1	H2 IN	Wet hydrogen inlet	The HXB-V1 H2 OUT
2	H2 OUT	Dry hydrogen product outlet	Your point of use, or compression and storage

NO.	PORT	WHAT IT DOES	CONNECT TO
3	H2 SAMPLE OUT	Sample outlet for an analyser	A dew-point or purity analyser; cap it if unused
4	PURGE	Regeneration purge vent	A safe outdoor discharge point. Never block it
5	DEPR.	Depressurisation vent	A safe outdoor discharge point. Never block it
6	DRAIN	Condensate drain	Through a liquid trap into a hydrogen vent route
7	ON/OFF	Power inlet, main switch and fuses	200-240 V AC single phase, IEC C14
8	Ethernet	Control and status communication	The control PC's network, RJ45
9	LED	One status indicator. For the colours, see the control app chapter	None
10	Button	Control button	None

> NOTICE
>
> **Get the latest outline drawing before you fabricate any pipework.**
>
> - The outline drawing is the master for port positions and depth. Confirm with us that the revision in this handbook's downloads is current before cutting tube.

Connecting to the HXB-V1

1 **Work with both the HXB-V1 and the HXD-V1 powered off. If the HXB-V1 still holds pressure, depressurise it first following the HXB-V1 handbook.**

2 **Run stainless steel tube and fittings rated for hydrogen and for the full operating pressure from the HXB-V1 H2 OUT to the HXD-V1 H2 IN.**

- Put no pressure regulator or relief valve in this run. The pressure-control valve at the HXD-V1 outlet sets the pressure for the whole line from the HXB-V1 through the HXD-V1. A second regulator upstream makes the HXD-V1 run below its set pressure, which raises the water load and cuts drying performance.
- If you fit a manual isolation valve, it must be open whenever the system runs. Starting with it closed puts backpressure on the HXB-V1 outlet.

3

Lay the tube level or falling from the HXB-V1 towards the HXD-V1. Do not create a low point where water can pool; if one is unavoidable, fit a drain there.

- Hydrogen from the HXB-V1 is saturated with water and can carry electrolyte droplets. The HXD-V1 separates that water at its inlet and sends it out through DRAIN.

4

Connect the HXD-V1 H2 OUT to your point of use. If you have an analyser, connect it to H2 SAMPLE OUT with a needle valve to set the sample flow; if not, cap that port.

5

Once every joint is made up, the leak test is done with us at first start. See the First start chapter.

> ⚠ WARNING
>
> **Never connect the HXD-V1 to the HXB-V1 O2 OUT or H2 VENT.**
> **Mixing oxygen and hydrogen can cause a fire or explosion.**
>
> - The only HXB-V1 port the HXD-V1 takes is H2 OUT.

After the outlet

What to keep to when you send the dry hydrogen from H2 OUT to your point of use, a compressor or storage.

- Hydrogen flows only while the pressure after H2 OUT is below the operating pressure (10 barg standard). Filling a vessel directly, the flow falls as the vessel approaches the operating pressure. To store at a higher pressure, put a compressor after H2 OUT.
- When you choose a compressor, check that its minimum suction pressure is below what H2 OUT can deliver.
- Do not run with a valve after H2 OUT closed. System pressure rises, and above 15 barg the unit makes an emergency stop (ES_05). Check the path is open before you start.
- Give the downstream and storage equipment overpressure protection that meets your codes and design. The dryer's own protection does not protect the equipment after it.

PRACTICAL NOTES

The dew point at the point of use is usually higher than at the dryer outlet.

- Water held on the pipe walls comes off downstream. The longer the pipework, or the longer it stood idle, the bigger the gap. Where a quality specification applies, measure the dew point at the point of use as well and record it with the outlet dew point (H2 SAMPLE OUT or the dew point sensor).

Vents and drain

The HXD-V1 alternates between two adsorption columns. While one takes up water, the other is heated to release what it caught, and a little dry hydrogen sweeps it out through PURGE. When the columns swap, the remaining pressure is let down through DEPR. Both vents carry gas that contains hydrogen.

> ⚠ DANGER
>
> **Never block PURGE, DEPR. or DRAIN or fit a valve to them. Pressure with nowhere to go can damage the unit and release hydrogen where it can cause a fire or explosion.**

- Run PURGE and DEPR. as separate lines, or into a vent header sized so that neither can build backpressure.
- End the vents at a safe outdoor discharge point, above roof level or where your site risk assessment approves, away from ignition sources, air intakes and walkways, with a rain cap.
- DRAIN releases hydrogen along with the condensate. Do not send it to a floor drain or open gutter: pass it through a liquid trap that catches the water and sends the gas into a hydrogen vent route.
- Never join an HXD-V1 vent to the HXB-V1 O2 OUT. If you want to share a line with the HXB-V1 H2 VENT, ask us first: backpressure from one can reach the other unit.
- The vent gas is wet. Slope the lines and put a drain at the low points. Where they can freeze, insulate them or add heat tracing.

PRACTICAL NOTES

Keep vent lines short, straight and falling

- Vent gas is wet, so water condenses in the line. Long or winding runs and low points let water collect and build backpressure, and in winter it freezes and blocks the vent. This is the first thing to look at when you lay out the pipework.

Power and network

- Power is 200-240 V AC single phase, 50/60 Hz, through the IEC C14 inlet. The inlet includes a 2-pole main switch and fuses. Consumption is at most about 300 W, during regeneration heating.
- Plug it into an earthed outlet on a circuit with overcurrent protection. The regeneration heaters run directly on the AC supply.
- Connect Ethernet (RJ45) to the same network as the HXB-V1 control PC. The unit supports Modbus TCP and MQTT with JSON payloads. For PLC integration, see the control app chapter. Firmware is updated over Wi-Fi.

First start

Once the pipework and power are done, the first start is done with us. What to prepare and what happens are in the First start chapter.

04 First start

HXD-V1 · updated 2026-11-06

Taking a newly installed HXD-V1 to its first dry hydrogen. The first start, and any start after the pipework has been opened, needs a separate procedure to purge air from the lines and check for leaks. We run that procedure with you.

BEFORE **Installation and connection** WHO **Your site team with a HydroXpand engineer**

HOW TO READ THIS CHAPTER

First time

Work through the checklist, and contact us to schedule the start once every line is met.

Done this before

After the pipework has been opened, use the checklist again and contact us.

Before you start

CHECK	OK WHEN
Vents	PURGE and DEPR. run to a safe place outdoors with no valve or cap
Drain	DRAIN runs through a liquid trap to the vent system
Gas lines	H2 IN and H2 OUT connected. Sample outlet connected or capped
Power	Earthed outlet, 200-240 V AC. ON/OFF switch off
Network	Ethernet connected to the network that the control PC uses
Electrolysers	HXB-V1 units installed and ready to start as described in their handbook

What happens at first start

- Air is purged from the lines and every joint is leak-checked at operating pressure.
- The regeneration cycle set in the software is checked. The factory setting (12 h cycle, 6 h heating) is kept unless we advise otherwise.
- The outlet dew point is watched on the dew point sensor, if fitted, or on an analyser at H2 SAMPLE OUT. Until it reaches the dew point you need, the product goes to vent, not to your process.
- The start date, the operating pressure and the first dew point readings are recorded.

> **WARNING**
>
> **Do not flow hydrogen before the air has been purged. Hydrogen mixing with air inside the lines can cause a fire or explosion.**

> **NOTICE**
>
> **The first cycles can take longer to reach the dew point.**
>
> - If the adsorbent has taken up moisture in storage or during installation, it needs one or more full regeneration cycles before the outlet is fully dry.

Acceptance

Check the following after the start. If all four hold, treat the commissioning as accepted. Regeneration and switching can only be confirmed once the first cycle (12 h at the factory setting) has finished.

Hydrogen leaks	At operating pressure, leak-detection fluid or a hydrogen detector at the H2 IN and H2 OUT fittings and downstream joints shows no bubbles or response. You provide the fluid and the detector.
Pressure	The inlet pressure stays at 9.5 barg or above and the unit does not drop to STANDBY.
Regeneration and switching	During heating the tower reaches the regeneration temperature (150 °C) and switches after cooling to 40 °C or below. No fault stop (FS) or emergency stop (ES) alarm.
Dew point	The outlet dew point is -65 °C or below, read on the dew point sensor (option) or an analyser at H2 SAMPLE OUT.

> **WARNING**
>
> **Do not send product to your process until the criteria are met.**
>
> - Keep the product going to vent, open the alarms and events, and work through the troubleshooting chapter.
> - If only the dew point falls short, run a few more cycles and check again. The first cycles can take longer.

What to write down

What you record now becomes the baseline for judging whether performance has changed. Without a baseline you cannot tell, months later, whether regeneration has slowed.

- The date and who ran it
- Inlet and outlet pressure and the product flow
- In the first cycle, the time to reach the regeneration temperature and the highest temperature

- The outlet dew point and how long it took to get there
- How those compare with the factory acceptance test figures
- Any alarm that appeared during commissioning

05 How the dryer works

HXD-V1 · updated 2026-11-06

What happens inside the unit while it runs. Knowing this helps you read the measured values and understand why the vents must stay open.

METHOD **Twin-tower · heater purge** H2 USED FOR REGENERATION **approx. 90 NL/h**

HOW TO READ THIS CHAPTER

First time

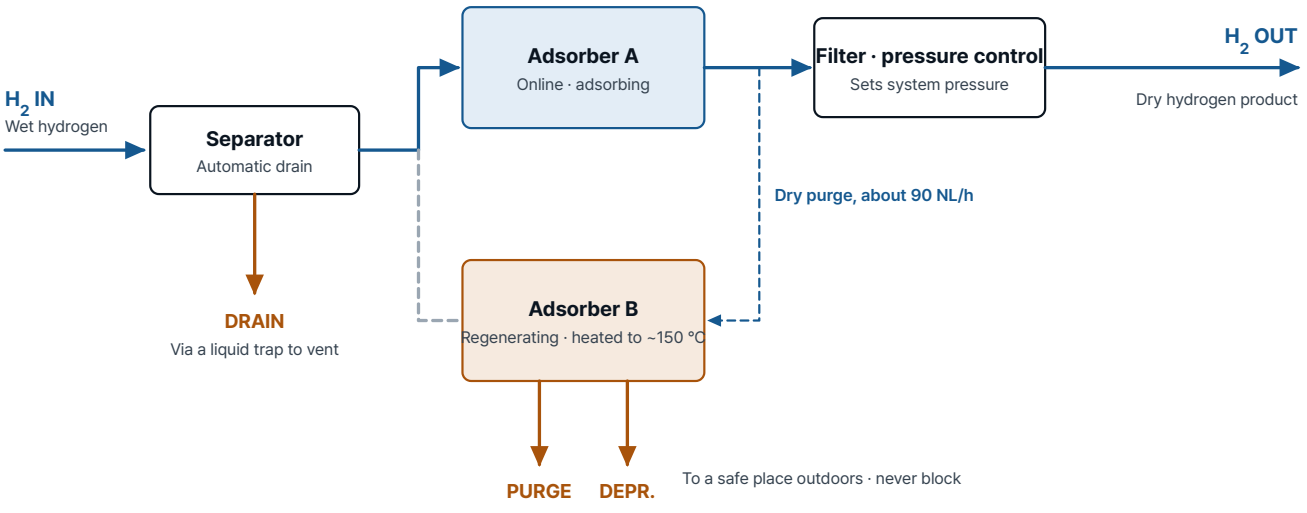
Read the process overview and the cycle.

Done this before

Go to the measured values.

Process overview

Wet hydrogen enters at H2 IN and passes through the separator, the online one of the two adsorber towers, and the filter and outlet pressure regulator before it leaves at H2 OUT.



Schematic. The two towers swap roles every regeneration cycle. Valves and instruments are not shown.

Figure 5-1 Process flow · schematic, valves and instruments not shown

STAGE	WHAT IT DOES
Separator	Collects water droplets carried with the hydrogen. An automatic valve empties it to DRAIN

STAGE	WHAT IT DOES
Adsorbers A and B	Two towers filled with molecular sieve. One removes water while the other is regenerated
Filter and pressure regulator	Hold back dust from the adsorbent and keep the operating pressure of the system

The regeneration cycle

The two towers take turns. While one tower dries the hydrogen, the other is regenerated through the steps below. The step names match the status shown in the control app.

STEP	WHAT HAPPENS
Heating (HEATING)	The tower, depressurised through DEPR., is heated by its internal heater to the regeneration temperature (150 °C by default) to drive the water out of the adsorbent
Cooling (COOLING)	A small flow of dry product hydrogen, approx. 90 NL/h, flows back through the tower, cools it and carries the water out through PURGE
Switching delay (IDLE)	Switching waits until the regenerated tower has cooled to 40 °C or below
Switching (SWITCHING)	The regenerated tower is brought up to operating pressure and the towers swap. Product gas keeps flowing during the switch

PRACTICAL NOTES

Why regeneration uses product hydrogen

- Water driven off the adsorbent by heating stays in the tower and would be taken up again. A small flow of already-dry hydrogen is needed to carry it out before the tower is properly dry. That is why hydrogen always leaves through PURGE during regeneration, and why regeneration never finishes if that vent is blocked.

The defaults and ranges for cycle time, heating time and regeneration temperature are under regeneration settings in the Operation chapter.

> NOTICE
>
> ### The purge flow does not depend on the number of HXB-V1 units.
>
> - Regeneration uses approx. 90 NL/h whether one or five HXB-V1 units are connected. With fewer units running, this is a larger share of the production.

Operating states

The Status field at the top of the control app shows the unit's current state.

APP SHOWS	MEANING
STOPPED	The regeneration cycle is stopped. After a stop the system is depressurised
STANDBY	Inlet pressure has fallen below 8.5 barg and the unit is waiting. It carries on automatically once the pressure is back at 9.5 barg or above
HEATING	The tower being regenerated is heating
COOLING	The tower being regenerated is cooling with purge hydrogen
IDLE	Switching is held until the regenerated tower has cooled
SWITCHING	The towers are swapping
EMERGENCY	Emergency stop is active. Find the cause, then clear it with Release in the app
OFFLINE	The control app is not receiving data from the unit. Check power and Ethernet

Measured values

PRACTICAL NOTES

Read a dew point together with the pressure it was measured at.

- The same water content reads as a higher dew point at higher pressure. About 5 ppm of water reads about -65 °C at atmospheric pressure and about -47 °C inside a 10 barg line. Dew points in this handbook are at atmospheric pressure. If you use your own analyser, check which pressure its reading refers to.

MEASUREMENT	USED FOR
Inlet pressure	Checking the pressure arriving from the HXB-V1 units
Gas temperature at the adsorber inlet	Tracking the water load on the online tower
Outlet pressure	Operating pressure of the system
Tower temperatures	Heating and cooling progress
Separator level	Starting the automatic drain
Liquid leak sensor	Stopping the unit if liquid collects inside
Outlet dew point (option)	Product quality

The dew point sensor is an option. If your unit has it, read the outlet dew point on the control PC; if not, use an analyser at H2 SAMPLE OUT. With the sensor fitted, the unit warns when the dew point rises above -70 °C and stops if it stays above -65 °C for ten minutes.

06 Control app

HXD-V1 · updated 2026-11-06

The HXD-V1 is monitored and operated from the same desktop control app as the HXB-V1. The dryer screens are included from app version 2.1.0. This chapter covers registering the dryer in the app, the screens, reading the alarm tables and exporting records. The daily start and stop order and what to watch while it runs are in [the Operation chapter](/handbook/hxd-v1/operation/).

APP **Same control app as the HXB-V1, 2.1.0 or later** SCREENS **Home · Dashboard · P&ID · Alarms & Events**

HOW TO READ THIS CHAPTER

First time

Follow the device and project sections, then look over the screens.

Done this before

Go to reading the alarm and event tables.

Installation and connection

Installing the app and setting up the control PC's network are the same as for the HXB-V1. Connect the HXD-V1 Ethernet to the same network as the control PC. Versions below 2.1.0 have no dryer screens, so get the latest version.

Registering the unit and creating a project

1 **The app opens on Project Manager. Click Devices.**

2 **Choose HXD as the Device Type, enter the Device ID exactly as on the unit's label, and click Add.**

3 **Click New Project, enter a project name, choose the registered HXD-V1 under Devices, and click Create.**

4 **Click Start on the project in the list and confirm with Start Project.**

- **Check** MQTT ONLINE and the unit status (Status) appear at the top of the app. If it shows OFFLINE, check power and Ethernet.

PRACTICAL NOTES

Operating records are kept per project.

- Making a separate project for each test or installation makes it easier to find and compare records later. Starting a new project stops the one that was running.

The screens

Header	MQTT connection, unit status (Status), logging (Logging) and the Emergency STOP button
Home	Today's and the current session's operating summary, and a safety snapshot of active alarms
Dashboard	Adsorber A and B temperature and H2 IN and H2 OUT pressure charts, with minimum, maximum and average for the period
P&ID	Readings and valve states on the process diagram, and the regeneration step of each tower. Below it: Temperature Control, Cycle time control and Adsorber Switching
Alarms & Events	The alarm list (code, reading, limit and status), the history of commands sent, and operating events

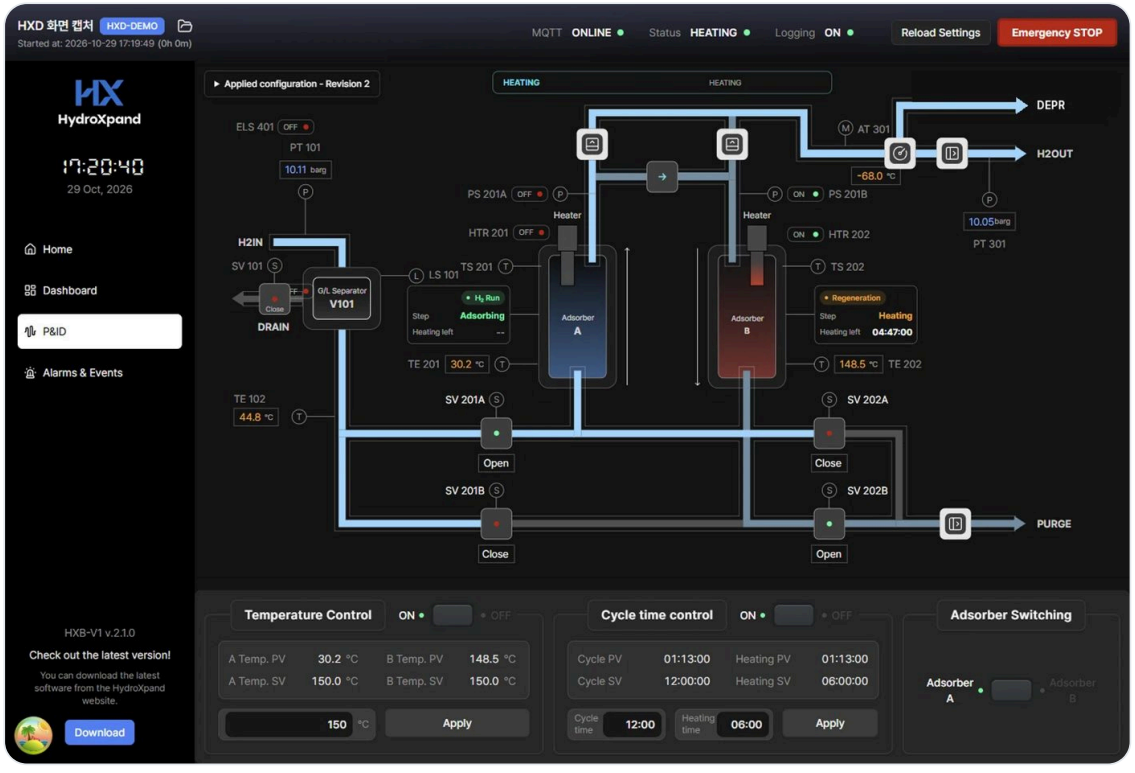


Figure 6-1 P&ID screen · example values

Reading the alarm and event tables

The top of the Alarms & Events screen is the alarm table and the bottom is the event table. Alarms are abnormal conditions that need attention; events are the history of commands sent and of what happened during operation. The refresh icon updates the tables.

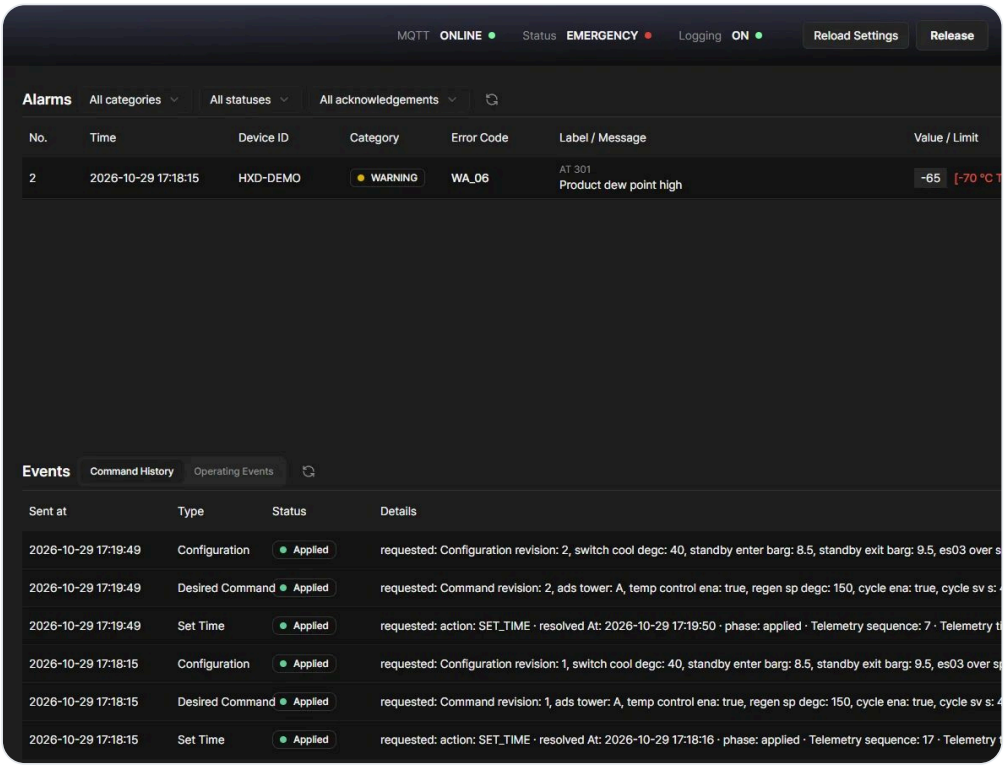


Figure 6-2 Alarms & Events screen · example values

ALARM COLUMN	MEANING
No.	Alarm number
Time	When the alarm was raised
Device ID	The dryer that raised it, when the project has more than one unit
Category	Level: EMERGENCY STOP, FAULT STOP or WARNING
Error Code	The ES, FS or WA code. Find the same code in the alarm tables
Label / Message	The small text is the tag of the sensor or part that raised it (as on the P&ID screen); below it is what is abnormal
Value / Limit	The actual value against the alarm limit
Status	Whether it is still Active or has been Resolved

ALARM COLUMN	MEANING
Ack	The acknowledge button. Pressing it records when the alarm was acknowledged

The three lists above the table filter by level, status and acknowledgement.

> NOTICE
>
> **Ack records that someone has seen the alarm. It does not remove the cause.**
>
> - If the cause is still there after you acknowledge it, the Status stays Active. Clear an emergency stop with Release at the top right of the app once the cause is fixed.

EVENT TAB	WHAT IT HOLDS
Command History	Settings and commands the app sent: Sent at, Type, Status and Details. The status is Sent, Applied, Rejected or Timeout
Operating Events	What happened during operation: automatic switch delayed or completed, manual switch executed or refused, STANDBY entered or recovered, and so on

PRACTICAL NOTES

Command History tells you whether a setting took effect.

- If you changed a setting and the value seems unchanged, check that the command's status is Applied. Rejected or Timeout means the unit did not take it.

Exporting records

While Logging at the top of the app is ON, operating data is recorded to the project continuously. Export the records as csv.

1. **Open Project Manager.**
2. **In the options menu (⋯) of the project, choose Telemetry Only (.csv).**
3. **Choose HXD as the Device type and a Sampling interval from 1 second to 30 minutes.**
4. **Pick where to save it. The file is named project-name-hxd-telemetry-interval-s.csv.**

The csv holds, with timestamps, the regeneration step and online tower, the regeneration settings, tower temperatures, inlet and outlet pressure, dew point, valve, heater and fan states, the emergency-stop cause, alarms and the firmware version.

PRACTICAL NOTES

When you contact us, send the csv as it is.

- Do not trim or average it; we need the period before and after the event to find the cause. A 1-second interval gives us the most detail.

07 Operation and shutdown

HXD-V1 · updated 2026-11-06

How to run a commissioned dryer day to day: what the front-panel LED means, the start-up and shutdown order, the regeneration settings, what to watch while it runs, and PLC integration. The app screens and exporting records are in the Control app chapter.

START ORDER **Dryer first, then HXB-V1** REGENERATION DEFAULTS **12 h cycle · 150 °C**

HOW TO READ THIS CHAPTER

First time

Read just two sections first: the front-panel LED and daily start-up. Those two are enough to run the dryer every day; the rest is reference for when you need it.

Done this before

Go straight to the monitoring table.

Front-panel LED

A single LED on the front panel shows the unit's state by colour. The colours mean the same as on the HXB-V1. For the detailed state, check the Status field at the top of the control app.

STATE	COLOUR	MEANING
Running	Green	The regeneration cycle is running and the unit is drying hydrogen
Standby	Yellow	Power is on but the unit is not running
Emergency stop	Red	An emergency stop is active. Find the cause, then clear it with Release in the app

Daily start-up

Switch the dryer on first and start the HXB-V1 units after it. The first start is done with us, as in the First start chapter.

Before you start

- There is no active emergency stop (ES) or fault stop (FS) alarm in Alarms & Events.
- The PURGE, DEPR. and DRAIN vents run to safe discharge points and are unobstructed. There are no valves in the vent lines.
- The line after H2 OUT is open, so the product hydrogen has somewhere to go.

- The air openings at the rear of the unit are clear.

Sequence

1. **Switch the HXD-V1 on at ON/OFF.**

2. **Start the dryer project in the app and check MQTT ONLINE.**

3. **On the P&ID screen, turn Temperature Control ON. Check the regeneration temperature.**

4. **Turn Cycle time control ON.**
   - The cycle cannot start while Temperature Control is off.

5. **Start the HXB-V1 units. Once inlet pressure rises, the dryer moves from STANDBY into operation.**

> NOTICE
>
> **After a long stop, the dew point takes time to come back.**
>
> - Expect one or more full regeneration cycles before the outlet reaches its dew point. Send the product to vent until then.

Regeneration settings

The three settings below are the ones you can change on the dryer. Change them under Temperature Control and Cycle time control on the control app's P&ID screen.

SETTING	DEFAULT	RANGE
Cycle time	12 h	1–48 h
Heating time	6 h	At least 30 minutes, and at least 40 minutes shorter than the cycle
Regeneration temperature	150 °C	50–200 °C

- Keep the defaults unless HydroXpand advises otherwise.
- A longer cycle leaves the online tower taking up water for longer. If the outlet dew point rises, first check that this setting has not been changed.

- If a tower runs 30 °C or more above the regeneration temperature, the unit makes an emergency stop (ES_03).

> NOTICE
>
> **Adsorber Switching can also be done by hand.**
>
> - If the regenerated tower has not cooled yet, or the conditions are not met, the request is refused and warning WA_05 appears. Try again after the switching delay (IDLE).

Monitoring during operation

During operation, watch the values below on the P&ID and Dashboard screens. Outside the normal range the unit warns or stops, with the alarm code shown in the right-hand column.

WATCH	NORMAL	OUTSIDE THE RANGE
Status	Cycles through HEATING, COOLING, IDLE and SWITCHING	For STANDBY or EMERGENCY, see the operating states table
Inlet pressure	9.5 barg or above (10 barg standard)	Below 8.5 barg: STANDBY. Above 15 barg: emergency stop (ES_05)
Tower temperatures	Rises to the regeneration temperature (150 °C by default) while heating and falls to 40 °C or below before the switch	Not reached within the heating time: FS_09. 30 °C or more above the regeneration temperature: emergency stop (ES_03)
Adsorber inlet gas temperature	80 °C or below	Above it: warning (WA_08)
Outlet dew point (option)	-70 °C or below	Above it: warning (WA_06). Above -65 °C for ten minutes: stop (FS_08)
Alarms	No active alarm	Look the code up in the alarm tables

Trends matter more than a single reading. Follow them with the temperature and pressure charts on the Dashboard and the daily and monthly items in the check lists.

Normal shutdown

To stop, reverse the start order and stop the HXB-V1 units first. To take the unit out of service for storage or return, follow the shutdown steps in the Decommissioning chapter.

1 **Stop hydrogen production at the HXB-V1 units.**

2 **Turn Cycle time control OFF, then Temperature Control OFF.**

- Temperature Control cannot be turned off while the cycle is running.

3 **For a long stop, switch off at ON/OFF. Do not open a tower that was heating until it has cooled.**

> ⚠ WARNING
>
> **In an emergency, press Emergency STOP at the top right of the app.**
>
> - Clear it with Release in the same place once the cause is found and fixed. If the app is not available, cut the power at ON/OFF or at the supply circuit.

PLC and SCADA integration (Modbus TCP)

The dryer supports Modbus TCP over Ethernet. Instead of the control app, your site PLC or SCADA system can take the operating state and readings and integrate the unit into your plant.

Ask us through a technical enquiry and we will send the latest register map. Agree the scope of integration with us when you order.

08 Routine checks and service

HXD-V1 · updated 2026-11-06

What to check and how often, and what HydroXpand does for you. The adsorbent is sealed and needs no replacement.

ADSORBENT **Sealed · no replacement** DAILY **Leaks · vents · readings**

HOW TO READ THIS CHAPTER

First time

Copy the check lists into your own check sheet.

Done this before

Go to service by HydroXpand.

Before any work

> NOTICE
>
> **These lists are a starting point.**
>
> - Adjust the lists to your running hours and site conditions.

> WARNING
>
> **Before any work on the unit, stop it properly. Remaining pressure or power can injure you or give you a shock.**
>
> - Stop the HXB-V1 units, let the dryer depressurise, switch off at ON/OFF and remove the power cord.
> - Let the unit cool before you open it. Parts near the adsorber towers can stay hot for several hours.

Check lists

Daily, or each shift

- No leaks at the front panel fittings and the tubing.
- Vent and drain lines intact and not blocked.
- Outlet dew point and operating pressure in the normal range. No active alarms.

PRACTICAL NOTES

The dew point trend matters more than a single reading.

- When the adsorbent tires or more water comes from upstream, the dew point creeps up over weeks. Recording readings taken under the same conditions in the maintenance log lets you see the change before warning WA_06 appears.

Monthly

- Rear fans running and air openings free of dust.
- Dew point trend. A slow rise over weeks is a reason to contact HydroXpand.
- Drain events. A clear increase points to more water coming from upstream.

Yearly

- Leak check of all connections at operating pressure.
- Check the dew point sensor or analyser against a reference, as its maker recommends.
- Check the power cord, the earth connection and the network cable.

Service by HydroXpand

Internal parts such as filters, valves and sensors are serviced by HydroXpand or a partner we authorise. Do not open the pressure parts or replace internal components yourself.

When you contact us, please send the serial number, the firmware version, the operating hours and an export of recent events.

09 Use with HXB-V1

HXD-V1 · updated 2026-11-06

One HXD-V1 dries the hydrogen of up to five HXB-V1 units. This chapter covers how they are combined in one rack and connected.

UNITS **1 to 5 × HXB-V1** MAX. FLOW **2.5 Nm³/h** RACK **42U**

HOW TO READ THIS CHAPTER

First time

Look at the rack layout and the sizing.

Done this before

Go to the checklist.

Standard rack layout

In the standard HydroXpand rack, five HXB-V1 units (6U each) sit above one HXD-V1 (6U) in a 42U rack. The dryer is at the bottom.

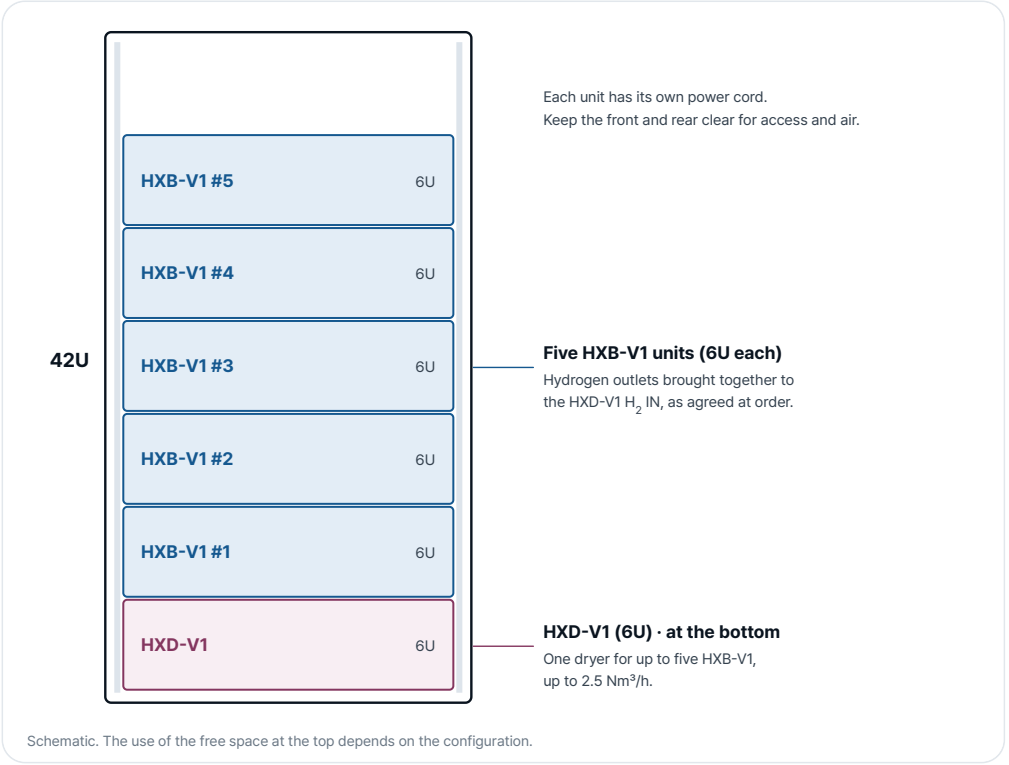


Figure 9-1 Standard 42U rack layout · schematic

- The hydrogen outlets of the HXB-V1 units are brought together to H2 IN of the dryer. The arrangement of that manifold is settled with us at order.
- Oxygen and vent lines of the HXB-V1 units are separate from the dryer lines. Do not join them.

- Each unit has its own power cord. Plan one supply circuit per unit, as given in the HXB-V1 handbook and in this handbook.
- Keep the front and rear of the rack free for access and air flow.

Sizing

HXB-V1 UNITS	NOTE
1 to 5	One HXD-V1 covers the full range up to 2.5 Nm^3/h
More than 5	Use one HXD-V1 per group of up to five HXB-V1 units

Checklist

- Each HXB-V1 hydrogen outlet is connected to the manifold, and the manifold to H2 IN.
- All vents, from the HXB-V1 units and the dryer, run to a safe place outdoors without valves.
- The dryer is switched on before the HXB-V1 units start, and the HXB-V1 units are stopped before the dryer is switched off.

10 Decommissioning and storage

HXD-V1 · updated 2026-11-06

How to take the unit out of service for a short stop, for storage or for return to HydroXpand.

ORDER **HXB-V1 first, then dryer**

HOW TO READ THIS CHAPTER

First time

Follow the steps in order.

Done this before

Go to storage after use.

Shutting down

1 **Stop hydrogen production at the HXB-V1 units.**

2 **Let the dryer depressurise through its vents. Confirm on the control PC that the outlet pressure reads zero.**

3 **Switch off at ON/OFF and remove the power cord.**

4 **Disconnect the tubing and cap every gas port straight away.**

Storage after use

- Store as described in the Receiving and storage chapter: indoors, dry, frost-free and with all ports capped.
- Before restarting after a long stop, expect one or more full regeneration cycles before the outlet reaches its dew point.

Return and disposal

Contact HydroXpand before returning a unit. The adsorbent and the electronics are disposed of separately; we take the unit back for this.

11 Specifications and reference

HXD-V1 · updated 2026-11-06

The specifications from data sheet HX-DS-HXDV1 Rev 21 and the outline dimensions from drawing HX-DRW-HXDV1 Rev 00.

DATA SHEET **Rev 21 · 2026-10-29** DRAWING **Rev 00 · 2026-10-04**

HOW TO READ THIS CHAPTER

First time

Use the table for site planning.

Done this before

Check the revision of the data sheet and the drawing you hold.

Specifications

Performance

Purity after drying	99.999%
Dew point	≤ -65 °C (atmospheric)
Maximum flow	2.5 Nm^3/h (5 × HXB-V1)
Operating pressure	10 barg standard · up to 35 barg on request
Regeneration H2 loss	approx. 90 NL/h, regardless of unit count

Physical

Form factor	19-inch rack mount · 6U
Size W × D × H	482 × 650 × 266 mm

Utility and safety

Adsorbent	Sealed · no replacement required
Regeneration method	Twin-tower alternating · heater purge

Power supply	200-240 V AC · single phase · 50/60 Hz
Power connection	IEC C14 inlet
Power consumption	approx. 300 W max
Regeneration cycle	Factory 12 h · heating 6 h · 1–48 h adjustable
Regeneration temperature	150 °C default · 50–200 °C adjustable
Safety functions	Relief valve · overheat trip · liquid leak sensor · software emergency stop

Interfaces

H2 inlet / outlet	1/4-inch tube bulkhead
Required inlet pressure	min. 10 barg
Communication	Modbus TCP · MQTT/JSON
Firmware update	Wi-Fi OTA
Dew point sensor	Option

- Dew point is at atmospheric pressure, equivalent to about 5 ppm water. Power consumption is the maximum during regeneration heating.

Outline dimensions

- Front 482 × 266 mm (6U). Rack slots at 465 mm centres.
- Depth 650 mm max. (613 mm front panel to rear, fittings 30.7 mm, handles 36.5 mm).

Troubleshooting

HXD-V1 · updated 2026-11-06

Common symptoms and what to check first, and the control app's alarm list. If the cause is not clear, stop the system and contact HydroXpand.

Where to start

1. **Look at Status and MQTT at the top of the app. If it shows OFFLINE, check power and Ethernet first.**

2. **Read the code of any active alarm on the Alarms & Events screen, find the same code in the Alarms section below and follow the action.**

3. **If there is no alarm, read the inlet and outlet pressures, tower temperatures and dew point on the P&ID screen and compare them with the Find by symptom table.**

4. **If the cause is not clear, stop the system, gather the items under What to send us and contact HydroXpand.**

Find by symptom

Find the symptom in the table below. Dew point, pressure, regeneration temperature and drains are covered cause by cause in symptoms A to D after the table.

SYMPTOM	POSSIBLE CAUSE	WHAT TO DO
Outlet dew point too high after start	The adsorbent took up moisture before start-up	Send the product to vent and let the unit complete one or more full cycles
Outlet dew point rises during operation	Hydrogen at H2 IN warmer or wetter than usual. Regeneration cycle set too long	Check the upstream units and the room temperature. Check the cycle setting
Pressure does not reach 10 barg, or the status shows STANDBY	A leak, or the HXB-V1 units are not producing enough hydrogen. The unit waits when inlet pressure falls below 8.5 barg	Leak-check the connections. Check the HXB-V1 units. The unit carries on automatically once inlet pressure is back at 9.5 barg or above

SYMPTOM	POSSIBLE CAUSE	WHAT TO DO
Frequent drain events	More water carried from upstream than usual	Check the HXB-V1 units and the inlet line for water collecting at low points
No flow at PURGE during regeneration	Vent line blocked or closed	Stop the system. Clear the vent line. Never fit a valve in it
Unit stops with a liquid leak alarm	Liquid has collected inside the unit	Keep it stopped and switched off. Contact HydroXpand
Heater does not heat	Overheat trip open, or no power to the heater	Let the unit cool. If it repeats, contact HydroXpand
No connection over Ethernet	Cable, network settings	Check the cable and the IP settings on the control PC

Symptom A. The outlet dew point is too high

Just after start-up

The adsorbent took up moisture while the unit was stored or stopped. Send the product to vent and let the unit complete one or more full cycles. If it is still high after that, work through the items below.

The incoming hydrogen is warmer or wetter than usual

Warning WA_08 appears when the adsorber inlet gas temperature exceeds 80 °C. Check the operating temperature of the HXB-V1 units, the room temperature, and whether water is collecting anywhere in the inlet line.

The regeneration settings have changed

A longer cycle or a lower regeneration temperature sends the tower back on line less dry. Compare the settings with the defaults under regeneration settings.

Regeneration is not finishing

Hydrogen should always leave through PURGE during regeneration. If the PURGE vent is blocked, the water driven off the tower cannot be carried out. Stop the system and clear the vent line. If the tower is not heating, see symptom C.

Only your own analyser reads high

The same water content reads as a higher dew point at higher pressure. About 5 ppm of water reads about -65 °C at atmospheric pressure and about -47 °C at 10 barg. First check which pressure your analyser's reading refers to.

Symptom B. Inlet pressure is low or the unit keeps going to STANDBY

Not enough hydrogen from the HXB-V1 units

Below 8.5 barg at the inlet the dryer waits in STANDBY, and it carries on by itself once the pressure is back at 9.5 barg or above. First check that no HXB-V1 is switched off or stopped on an alarm.

A connection is leaking

Warning WA_07 appears when the online tower's pressure is low. Leak-check the connections from the HXB-V1 units to H2 IN, and after H2 OUT, with leak detection fluid.

The pressure reading looks wrong

If the reading jumps or sticks at one value, suspect the sensor. A reading outside -1 to 30 barg stops the unit with FS_06. Keep it stopped and contact HydroXpand.

The pressure is too high instead

Above 15 barg the unit makes an emergency stop (ES_05). Check that the line after H2 OUT and the vents are not blocked and that no valve in them is closed.

Symptom C. The tower does not heat, or switching is late

The regeneration temperature is not reached within the heating time

If the regeneration temperature is not reached by the end of the heating time, the unit stops with FS_09. If the heater gets no power during heating, it is FS_01. Keep the unit stopped and contact HydroXpand.

The overheat trip has opened

The overheat trip cuts heater power directly, independently of the controls. Let the unit cool and check again; if it repeats, contact HydroXpand. Warning WA_04 appears if the heater signal drops out 10 times or more in an hour.

The switching delay (IDLE) lasts a long time

The towers swap only once the regenerated tower has cooled to 40 °C or below. The tower is cooled by the hydrogen flowing out through PURGE, so a blocked PURGE vent slows cooling. Check the vent line.

Manual switching is refused

If the regenerated tower has not cooled yet, or the conditions are not met, the request is refused with warning WA_05. Check the current step and try again after the switching delay.

Symptom D. Frequent drains or a water-related alarm

More water is arriving from upstream

The separator collects water carried with the hydrogen and empties it to DRAIN. If the drain runs more often than usual, check the HXB-V1 units and the low points of the inlet line for collecting water.

The level stays high

Warning WA_03 appears when the separator level stays high for ten minutes; WA_02 means the drain valve did not move as commanded. Check the DRAIN line and the liquid trap for blockages.

Liquid has been detected inside the unit

This is the emergency stop for a liquid leak (ES_01). Switch off and treat the liquid as alkaline. Do not restart before the cause is found; contact HydroXpand.

Alarms

Alarms appear on the control app's Alarms & Events screen and in the safety snapshot on the home screen, with the code, the app message, the measured value and the limit. Emergency stops (ES) and fault stops (FS) stop the unit; warnings (WA) keep it running and tell you. Limits in the tables are the default settings.

Emergency stop (ES)

APP MESSAGE	LABEL	MEANING	WHAT TO DO
Water leak detected in enclosure	**ES_01** **ELS401**	Liquid was detected inside the enclosure	Switch off and treat the liquid as alkaline. Do not restart until the cause is found
Heater contactor welded (main contact stuck closed)	**ES_02** **MC401**	The heater contactor is stuck closed and cannot cut heater power	Open the panel breaker and contact HydroXpand
Adsorber bed temperature critical high	**ES_03** **TE201/202**	A tower is 30 °C or more above the regeneration temperature (250 °C at most)	Let the unit cool and contact HydroXpand. Do not open it while hot
System pressure critical high	**ES_05** **PT101** **PT301**	System pressure is above 15 barg	Stop the HXB-V1 units and check that H2 OUT and the vent lines are not blocked

Fault stop (FS)

APP MESSAGE	LABEL	MEANING	WHAT TO DO
Heater not energized - feedback lost	**FS_01** **HTR201** **HTR202**	The heater is not powered during heating	Keep the unit stopped and contact HydroXpand
Heater contactor not energized	**FS_02** **MC401**	The heater contactor does not close	Keep the unit stopped and contact HydroXpand
Heater contactor auxiliary contact mismatch	**FS_03** **MC401**	The heater contactor's auxiliary contact does not match	Keep the unit stopped and contact HydroXpand
Switching valve feedback mismatch	**FS_04** **SV201A–202B**	A switching valve did not move as commanded	Keep the unit stopped and contact HydroXpand
Temperature sensor fault	**FS_05** **TE102** **TE201** **TE202**	A temperature reading is outside -50–400 °C	Keep the unit stopped and contact HydroXpand
Pressure sensor fault	**FS_06** **PT101** **PT301**	A pressure reading is outside -1–30 barg	Keep the unit stopped and contact HydroXpand
Dew point sensor fault	**FS_07** **AT301**	The dew point reading is outside -100–50 °C	Keep the unit stopped and contact HydroXpand
Product dew point out of specification (stop)	**FS_08** **AT301**	The outlet dew point has stayed above -65 °C for ten minutes	Send the product to vent. Check the upstream units and the regeneration settings, and contact HydroXpand if it repeats
Regeneration failed - target temperature not reached	**FS_09** **TE201/202**	The tower did not reach the regeneration temperature within the heating time	Keep the unit stopped and contact HydroXpand

Warning (WA)

APP MESSAGE	LABEL	MEANING	WHAT TO DO
Ventilation fan not running	**WA_01** **FAN401–403**	A ventilation fan is not running	Check that the rear air openings are clear. Contact HydroXpand if it persists
Drain valve feedback mismatch	**WA_02** **SV101**	The drain valve did not move as commanded	Check that the DRAIN line and the liquid trap are not blocked
Separator liquid level high persists	**WA_03** **LS101**	The separator level has stayed high for ten minutes	Check the DRAIN line, the liquid trap and how much water comes from upstream
Heater feedback dropping frequently	**WA_04** **HTR201** **HTR202**	The heater feedback dropped out 10 times or more within an hour	Contact HydroXpand
Manual adsorber switch rejected	**WA_05**	A manual tower switch was refused because the conditions were not met	Check the current step and try again after the switching delay
Product dew point high	**WA_06** **AT301**	The outlet dew point is above -70 °C (early warning)	Watch the dew point trend. If it stays above -65 °C the unit stops with FS_08
Adsorbing tower pressure low	**WA_07** **PS201A** **PS201B**	Pressure in the online tower is low	Check the inlet pressure and leak-check the connections
Adsorber inlet temperature high	**WA_08** **TE102**	The gas entering the adsorbers is above 80 °C	Check the upstream units, the room temperature and the inlet line
Telemetry not received	**WA_09**	The control app is not receiving data from the unit	Check the Ethernet cable and the unit's power
Heartbeat not received by device	**WA_11**	The unit is not receiving the control app's heartbeat	Check that the app is running on the control PC and the network is connected

What to send us

- Serial number and firmware version

- When the symptom first appeared, with the operating pressure and dew point at the time
- An export of recent events
- How many HXB-V1 units are connected, and photos of the pipework