

MX SEMI

SUSTAINABLE SOLUTION FOR YOUR
SEMICONDUCTOR PRODUCTION

» CRYOGENIC ETCHING

» DEEP REACTIVE ION ETCHING

MIRAI XS 40

(MXS CRYO 40)

PRODUCT DATASHEET

- **ZERO GWP**

With the air cycle technology
Not a subject of F-Gas Regulation

- **THE WIDEST TEMPERATURE RANGE**

From -160 °C to +90 °C*
Accuracy $\pm 0.5^{\circ}\text{C}$ under changing load

- **QUICK SWITCHING BETWEEN COOLING AND HEATING MODES**

Within 2 minutes

- **EASY CONNECTIVITY**

Plug & Play system, configurable connections

- **COMPACT AND NARROW DESIGN**

- **FAST RETURN OF INVESTMENT**

** The temperature range varies based on the type of HTF selected and will be confirmed during the ordering process.*



FEATURES

MIRAI XS machines are ideal solution for the **semiconductor production**, applicable for **single and dual channel processes**.

In addition to safe and environmentally friendly cooling, it represents the latest solution in technology, providing highly-precise temperature and process control for dramatic changes in temperature and machine load.



AIR AS REFRIGERANT

0 GWP, 0 ODP, and 0 TFA
Environmentally friendly
Refrigerant free of charge



SUSTAINABLE SOLUTION FOR SEMICONDUCTOR PRODUCTION

Complies with all current and future international environmental standards



QUICK SWITCHING BETWEEN COOLING AND HEATING MODES

From +40°C to -100°C - within 2 min



ENERGY EFFICIENCY

High cycle efficiency
Inverter driven motor



NO VIBRATION

Turbo-compressor design
eliminates vibration



LOW OPERATING COSTS

Long equipment lifecycle
Low maintenance



TEMPERATURE ACCURACY

± 0.5°C under changing load



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LOW OPERATING COSTS

Compared to existing semiconductor solutions, Mirai Intex offers an unparalleled system from both environmental and economic perspectives.

This is achieved through:

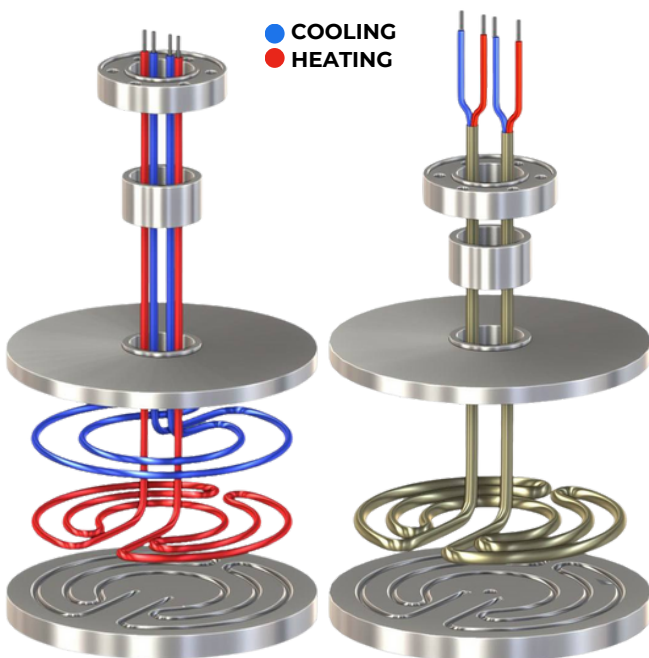
- » Free refrigerant
- » Exceptional performance at ultra-low temperatures, especially under partial load conditions
- » Zero additional costs related to safety and environmental compliance
- » Minimal service expenses.

INSTALLATION

PLUG & PLAY SOLUTION

The **MIRAI XS** machine is the ideal solution for retrofitting in existing installation and is easy to implement in new projects due to its Plug & Play design, compatible with multiple industry standard connection types.

LOOPS OPERATING EXAMPLES



OPTIONS



EXTENDED WARRANTY

Up to 3 years



MACHINE WHEELS

For convenience transportation of machine in manufacture



EXTERNAL EXPANSION TANK

Installation of external expansion tank, up to 80 liters in capacity.



REMOTE MONITORING

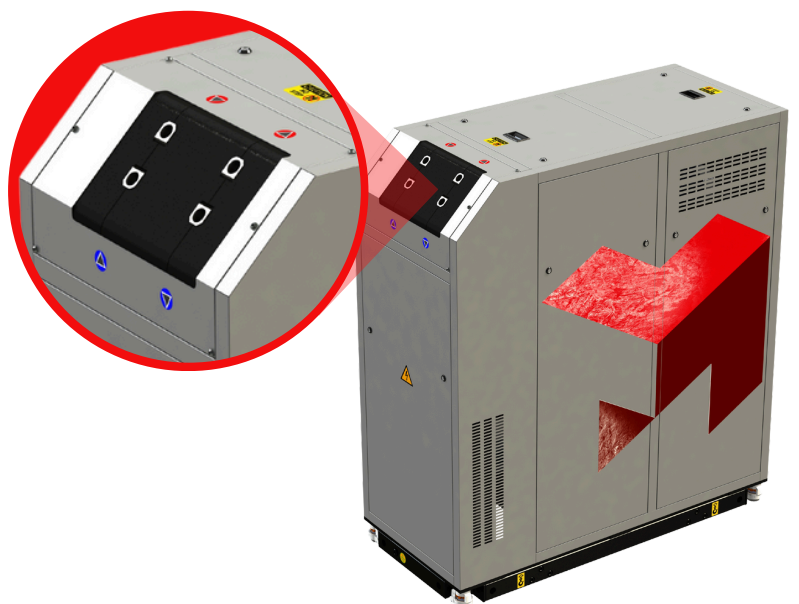
Available remote monitoring or remote access systems



VARIOUS HIGH-LEVEL COMMUNICATION PROTOCOLS



INDIVIDUAL WATER CONNECTION

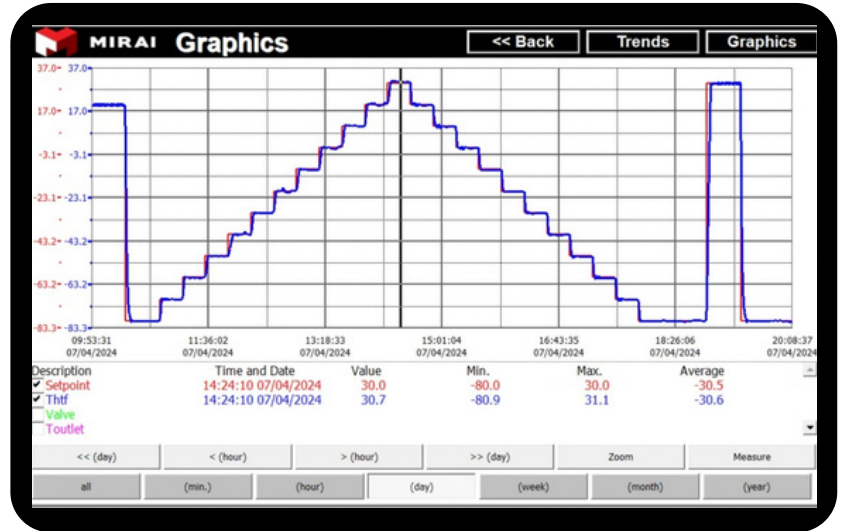


TESTS COLD LOOP

The following section focuses on the various tests of the **MIRAI XS 40** machine, which are very important and decisive for use in various applications in different markets. Temperature accuracy and machine control are very important aspects in selecting the right machine for production.

PROCESS CONTROL ACCURACY TEST

This screenshot from the machine's control system screen shows the results of a heat-up and cool-down process with high-precision temperature control, at 10°C intervals every 20 minutes. This screenshot demonstrates that the temperature control accuracy of the **MIRAI XS 40** is very precise.

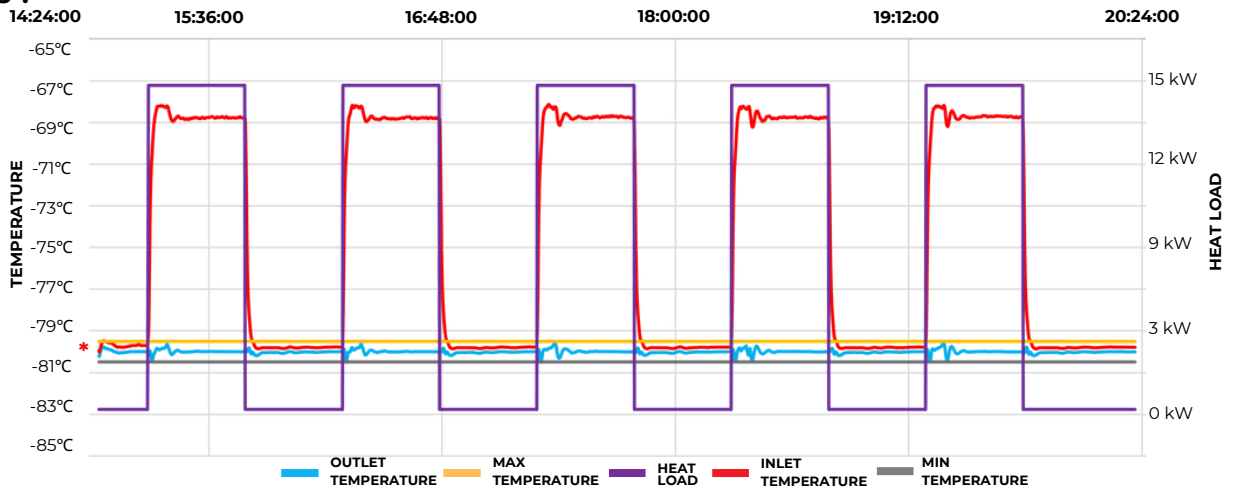


CHANGING LOAD TEST

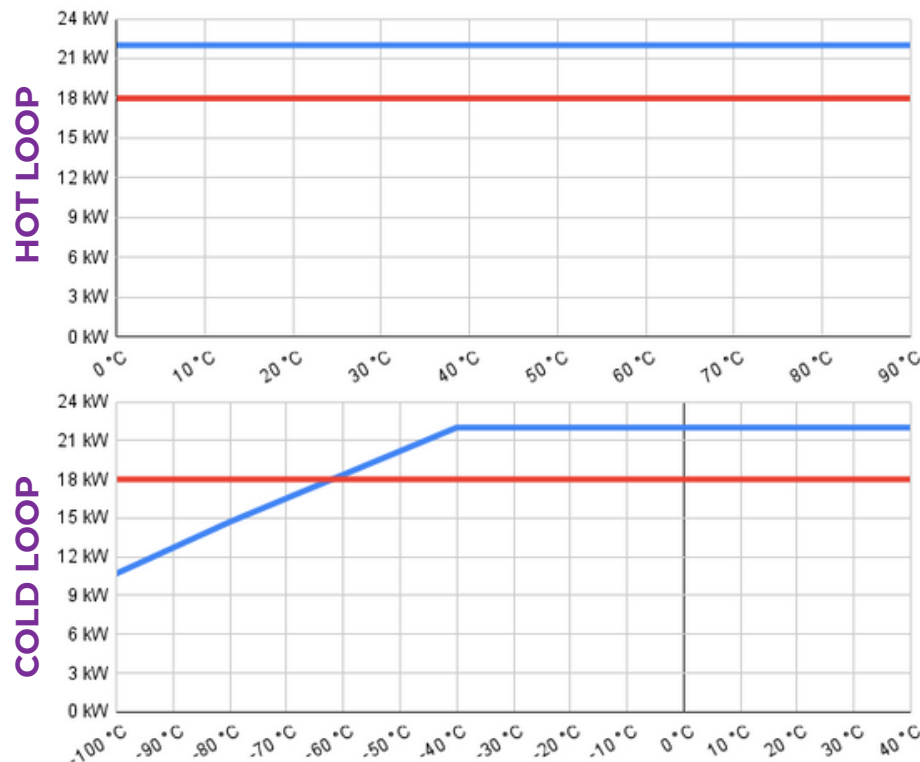
This test focuses on temperature maintenance when the heat load on the machine is changing. Specifically in this case, the test was conducted at a change from 0 kW to 15 kW. The results showed that **temperature control under changing load is $\pm 0.5^\circ$** .

Above the graph is the time interval when the test started and ended, how long the loads were measured for.

The mark [*] indicates the location where the temperature change was measured.

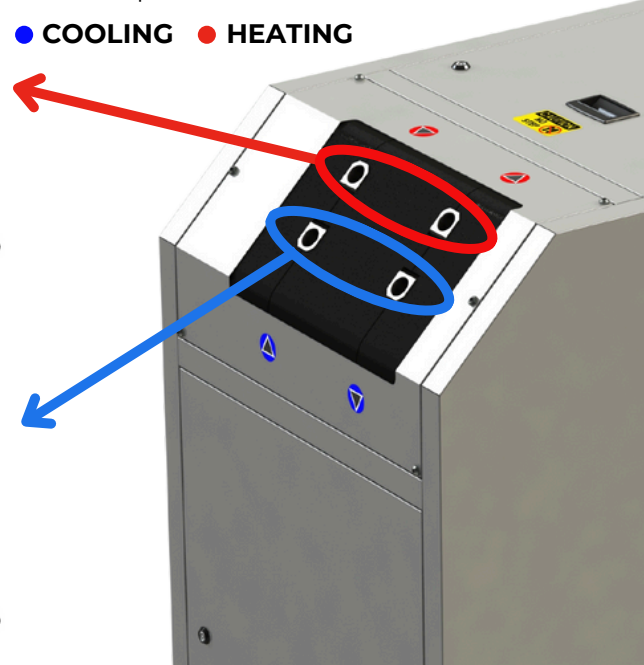


LOOPS



Cooling or heating capacity of the **MIRAI XS 40** in cold or hot loop. At cooling water temperature +25 °C.

● COOLING ● HEATING



SPECIFICATIONS

TECHNICAL DATA

MIRAI XS 40

Channel		COLD LOOP ^{*1}			HOT LOOP ^{*1}
Cooling method		Air-cycle refrigeration with Mirai Turbo-Compressor			
Refrigerant		Natural air (R-729) ^{*2}			
Temperature control method		PID control			
Temperature range	°C	-160 to +50			0 to +80
Cooling capacity ^{*3}	°C	-100	-80	-60	
	kW	13.2	16.9	20.5	
Heating capacity	kW	18			
Temperature accuracy	°C	±0.05 ^{*4} / 0.5 ^{*5}			±0.8 ^{*4}

CIRCULATING FLUID

Fluid type		Non-flammable, non-explosive			
Kinematic viscosity	cSt	up to 30			
Flow rate nominal ^{*6}	l/min	50	63	76	max 80
Pressure drop nominal/max	MPa	0.02/0.4 ^{*7*}			
Supply pressure max	MPa	1			
Expansion tank		External ^{*9*}			

AMBIENT CONDITION

Temperature	°C	+5 to +35			
Humidity	%RH	up to 80, no condensation			
Altitude	m	up to 1000			
Atmosphere		Non corrosive, non flammable			

COOLING LIQUID^{*11}

Temperature	°C	+5 to +30			
Inlet pressure	MPa	0.25 to 1			
Nominal pressure drop	MPa	0.25			
Flow rate nominal/max	l/min	145/165			
Water quality		See specification ^{*12}			

POWER REQUIREMENTS

Power supply		~3PE, 400 V/440 V/480 V +/- 10%, 50 Hz/60 Hz			
Nominal current at specified voltage	[V]	400	440	480	
	[A]	90	83	75	
Main circuit breaker	[A]	150			
Machine consumption	kW	Heating	Refrigeration	Pump	Nominal consumption
		18	44	4	50 ^{*1}
Communication		ProfiNET, EtherCAT, Ethernet/IP, PowerLink (another protocols by request)			

DIMENSIONS AND CONSTRUCTION

Operation display panel		LCD touch screen			
Circulating fluid wetted material		Stainless steel, copper, brass, silver, PTFE, Ni-Silicon carbide, Graphite, KLINGER® TOP-CHEM 2000			
Facility water wetted material		Stainless steel, Aluminum alloy (Al-Mg), Copper, Silicone, PTFE, Brass, NBR, EPDM, PPE+PS NorylTM 30 % reinforced fiberglass, Viton, PP			
Weight	kg	1800±50			
Body color		Grey with logo			
Dimensions (HxLxW) ±5 mm		1972x1770x800			

*1 loops are switched, at one time only one loop is working, no HTF circulation for loop in standby mode, switching time 20s

*2 automatic filling system

*3 conditions for HTF Fragoltherm X-T9-A temperature difference 10°C. Water temperature +10°C, pressure drop on HTF side 0.2 bar for more data see diagram

*4 after reaching setpoint at constant load

*5 under the changing load

*6 flow rate for HTF Fragoltherm X-T9-A temperature difference 10°C

*7 reduced cooling capacity at pressure drop more than nominal, up to 1.6 kW at maximum pressure drop

*8 bigger pressure drop on request

*9 pressure tank can be supplied on request, optionally pressure regulation in expansion tank is possible

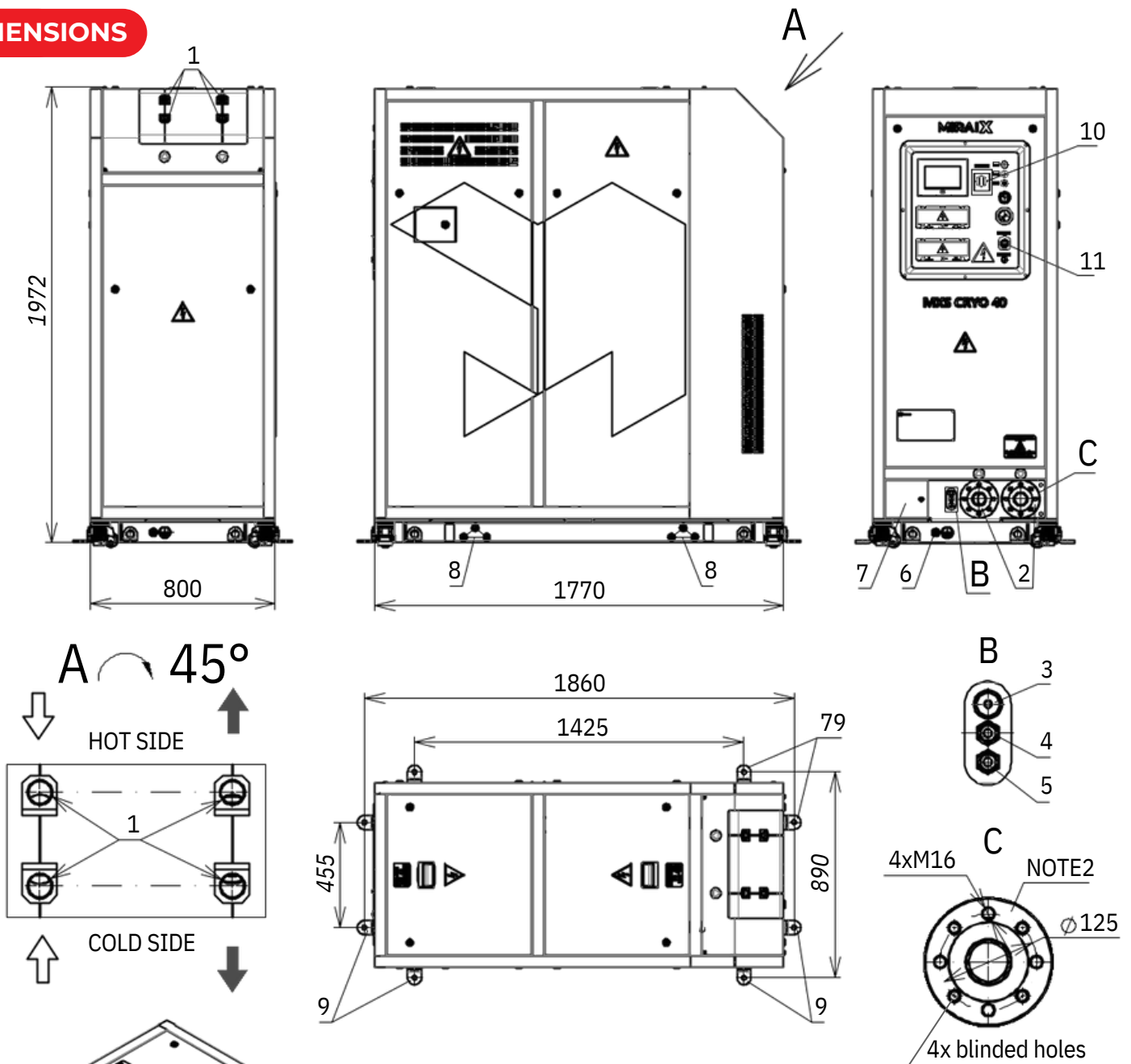
*10 one expansion tank for two loops

*11 data are valid for the water, in case of usage another coolant, connect with us for data calculation

*12 the water should contain a corrosion inhibitor that protects aluminum alloys and copper in the concentration recommended by the manufacturer (for detailed information contact MIRAI Intex.)

Performance is nominal and individual units may vary. The efficiency of each refrigeration unit will depend on the specific operating conditions.

DIMENSIONS



1. Heat transfer fluid (HTF) connection: 4*(1-11.5 NPT)
2. Cooling water/glycol mixture: flange EN1092-1/
DN50/PN16 or G2
3. Air/Nitrogen, Quick disconnect coupling DN 7.2
(Euro standard)
4. Cooling liquid drain, Connection for plastic tube 8/6mm
5. Condensate drain, Connection for plastic tube 8/6mm
6. Grounding point (PE) - M16
7. Power connection hatch
8. Slinging place
9. Fixing place to floor (optionally with brackets,
possibility of fixation from any side)
10. Main switch
11. Emergency stop button

Mirai Intex: MXS CRYO 40