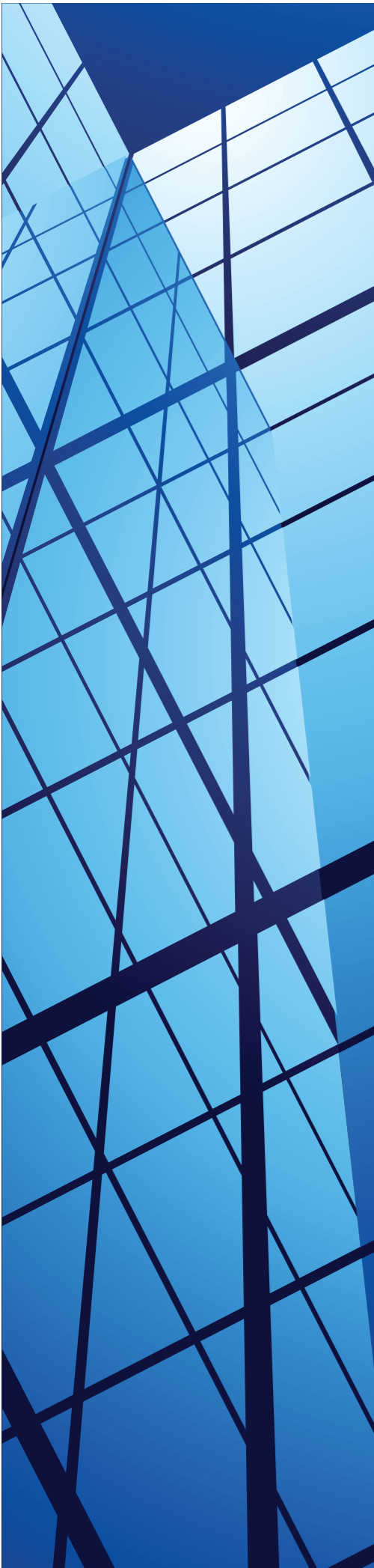




Symbolic photo

T CLASS
AIR COOLED CHILLERS
Oil-Free Centrifugal Chiller

SMARTD



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DOCUMENT PURPOSE

This catalogue provides a general overview of Smardt's T Class air cooled chiller range, including the key features and options available. It is intended as a general guide for the appropriate selection and application of T Class air cooled chiller units.

For specific application information, contact your nearest Smardt sales representative.

The information provided is general in nature, and is subject to change as part of Smardt's commitment to continuous product improvement.

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SMARDT CHILLER GROUP

Smardt is “Global Number One” in oil-free centrifugal chillers, with production facilities in Stuttgart, Germany; Melbourne, Australia; Plattsburgh, New York; Guangzhou, Guangdong and Montreal, Canada. Smardt service networks extend across the globe; they monitor and support the world’s largest installed base of oil-free high-efficiency chillers (well over 5000 by the end of 2015). Smardt started a global reputation with the first oil-free centrifugal prototype built in 2002 to help refine Turbocor’s compressor technology before its launch in 2003.

Smardt’s lowest lifecycle costs make such a major contribution to an owner’s long term values that they make chiller first cost differences largely irrelevant.

Since 2002, Smardt has built, tested and continually refined the world’s widest oil-free chiller range. Water cooled high-efficiency chillers from 200 kW up to over 8 MW, air cooled chillers from 200 kW to 2 MW, adiabatic chillers to over 1 MW, modular, split, condenserless and other variations match a wide range of specific applications. Free cooling (standard coil or thermosyphon) and heat recovery applications are increasingly specified. The Smardt range covers a wide range of non-standard conditions, e. g. in fluids (glycols, brines and others). Increasing focus on low-GWP refrigerants is reflected in installed Smardt chillers in Switzerland and other countries. Smardt innovations have resulted in a number of patents and patent applications.

Unlike all other global chiller brands, Smardt’s global innovation programs are wholly dedicated to Smardt customers and the value they earn from their Smardt chillers. In compressors, Smardt has been working closely with Turbocor since 2002 (Smardt founder Roger Richmond-Smith is also a founder of Turbocor), and the two companies continue to share detailed

test programs. In heat exchangers, Smardt’s research work on metallurgy, corrosion resistance, flow and heat transfer management has led to several patents and patent applications. In systems integration and controls, Smardt software innovations mean major advances in operating efficiencies, effective redundancy and responsiveness. In service support, training, monitoring and continuous commissioning, Smardt programs continue to develop. Seamless optimisation of whole variable speed chiller plants using Smardt chillers shows further major gains in energy efficiency.

SMARDT MARKETS ACHIEVING MAJOR ENERGY REDUCTIONS

- DATA CENTRES
(ESPECIALLY BANKING & OTHER FINANCIAL INSTITUTIONS)
- HOSPITALS & HEALTHCARE
- HOTELS
- PROCESS COOLING
- EDUCATIONAL & INSTITUTIONAL CAMPUSES
- CONCERT HALLS & OPERA HOUSES
- MARINE
- LARGE COMMERCIAL BUILDINGS
- DISTRICT COOLING SYSTEMS



Smardt’s range of T Class air cooled chillers has been designed to reliably deliver high operating efficiencies across a wide range of operating conditions.

It features a base range of models, each with extendable condensers and performance options, creating a multitude of combinations to suit any project requirement.

Smardt have brought their extensive experience in oil-free chiller development, sales and service into designing the T Class Air – a range of air cooled chillers that deliver the highest level of reliability, outstanding efficiency, and the lowest total cost of ownership.

All Smardt chillers are designed to optimise the superior performance of oil-free compressors from Danfoss Turbocor, and the T Class Air is no exception. These compressors, coupled with our extendable condenser design, high efficiency evaporator, and industry-leading fan technology result in the highest efficiency air cooled chiller.

Our class leading performance and quality design ensures the best results for total equipment lifecycle operation and reliability.

The T Class Air range comes with the same benefits as all Smardt chillers, such as ease of installation, simplicity of operation and maintenance, and lower operating and maintenance costs.

HIGHLIGHTS

- Adaptable by design – a base range with options to suit any air cooled application.
- Designed for ease of maintenance and serviceability.
- Advanced corrosion protection on critical operating surface areas.
- Accurately designed for trouble-free and sustained operation across the entire chiller load range.
- Germany manufactured, acceptance tested and pre-commissioned prior to delivery ensuring trouble-free commissioning and startup on every project.

The T Class Air features a high efficiency, extendable condenser, with multiple performance options built around a compact, yet robust structural frame

OIL-FREE COMPRESSOR TECHNOLOGY

At the core of all Smardt chillers is an oil-free Danfoss Turbocor compressor, featuring magnetic bearing technology. With no oil to compromise heat exchanger performance, and no friction losses associated with conventional compressor bearings, Smardt chillers are able to achieve exceptional full- and part-load efficiencies.

This ultra high speed technology eliminates up to 99% of compressor induced vibrations, and dramatically reduces the sound levels emitted by the chiller.

HIGH EFFICIENCY

In addition to its compressor technology, the T Class Air utilizes high performance aluminum/copper coils and industry-leading EC fan technology as standard to deliver a highly-efficient refrigeration circuit.

All Smardt chillers use a premium flooded shell and tube heat exchanger which has superior efficiency and reliability to plate and frame or DX heat exchangers.

CORROSION PROTECTION

The T Class Air condenser has been designed with hostile environmental conditions in mind, utilising marine-grade aluminum, stainless steel and engineered polymer components as standard.

The standard condenser coils are epoxy based and chemical conversion proven salt spray resistance exceeding 1000 hours to ASTM B 117.

Stainless steel fasteners are utilised throughout the condenser construction.

Additionally, UV and colour stabilised High Molecular Weight Polyethylene (HMWPE) panels ensure each chiller maintains a sustainable and long-lasting aesthetic.

ENVIRONMENTALLY RESPONSIBLE

All T Class Air chillers use R134a refrigerant as standard, which has no ozone-depletion potential, is non-toxic, non-harmful and has no phase-out schedule per the Montreal protocol.

Additional low GWP refrigerant options are also available.

PACKAGED CONSTRUCTION

All Smardt chillers are factory assembled and tested, ensuring trouble free start up and commissioning.

DURABLE FRAME CONSTRUCTION

The T Class Air features a rigid, truss-like frame that has been constructed from structural sections, then hot-dip galvanised to provide premium protection.

This design provides a strong and durable frame for worry-free lifting, installation and longevity.

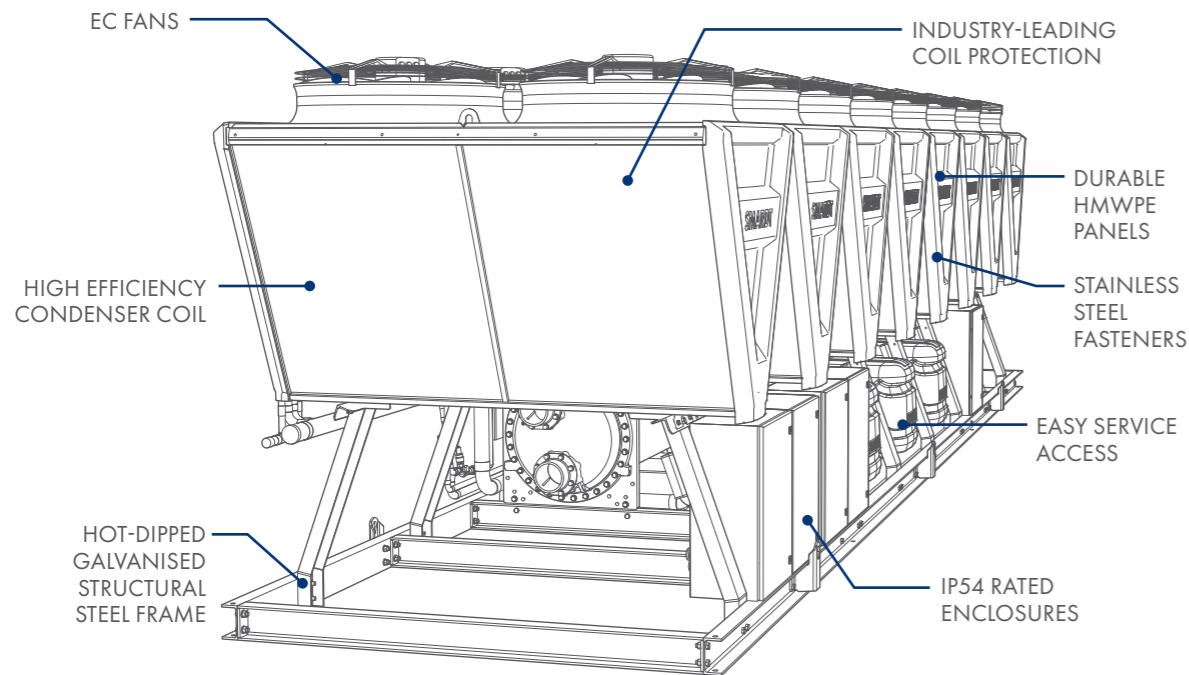


Illustration picture

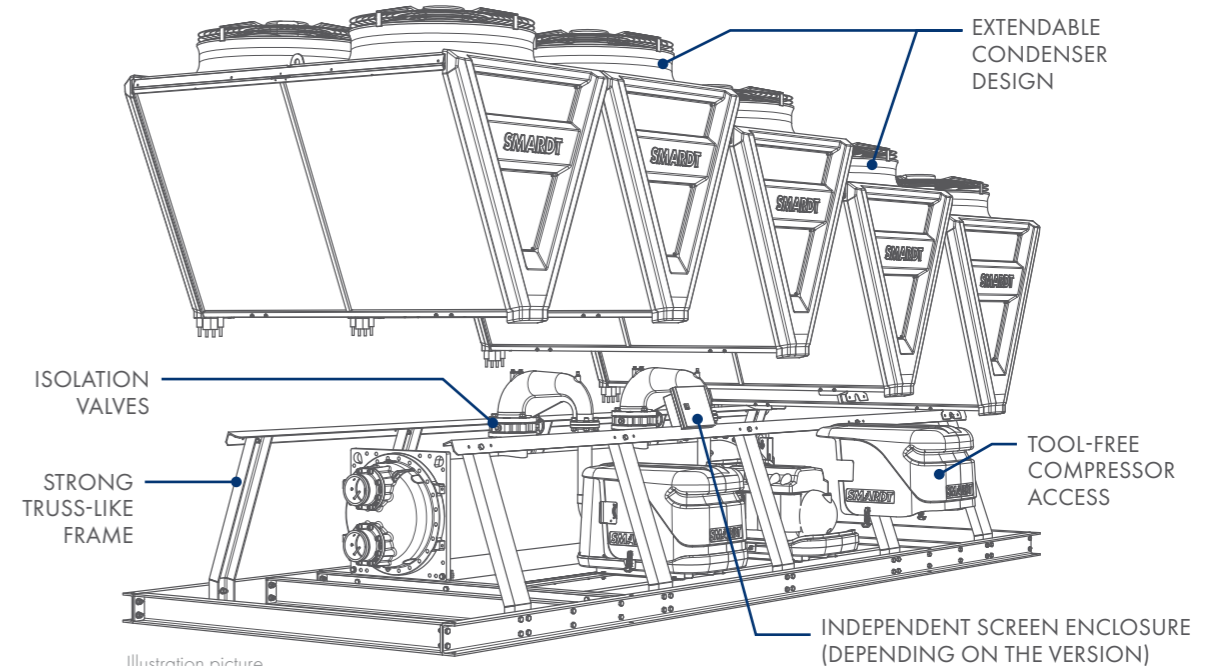


Illustration picture

ADAPTABLE BY DESIGN

The configuration of each T Class Air base model is extremely flexible in performance and footprint, and can be adapted to suit any air-cooled application.

The T Class Air extendable condenser design allows for a range of different efficiency options based on job location, application and critical operating environment.

In addition, an extensive range of performance, functional and connectivity options are offered – all specific to project application and customer requirements.

CONTROL SYSTEM

Proven across years of industry experience in oil free chiller operation, Smardt's advanced chiller controller is designed to optimize the performance & capabilities of the T Class Air chiller range. Capacity can be reduced to as little as 10% of full-load capacity (for some models).

Simple integration with building management systems via MODBUS RTU is provided as standard.

CONTROL PANEL WEB-BASED

The Smardt Control provides a web-based alternative to traditional hardware controls. The web panel combined with the touch screen display gives the customer both the ease-of-use of a traditional control panel and the flexibility of a web panel.

The web panel software is installed on the chiller, while the user interface can be accessed from my device (f.i. cell phones, tablets or computers) running a web browser and that have access to the local network. Switching between different control panels is as easy as following a web link.

To access remotely, Smardt offers the modem connection possibility as an option. This way, my device connected to the internet can, through an user password, connect to the chiller.

SERVICEABILITY

All Smardt chillers include refrigerant isolation valves on both sides of all serviceable components as standard. This facilitates servicing without the need to pump down the entire unit, and in most cases can be undertaken while the chiller remains operational.

The majority of serviceable components are readily accessible from the perimeter of the unit, with each compressor accessed using the quick-release latches on its weather resistant cover.

The controller interface is conveniently housed in a separate lockable enclosure located between condenser coils where it is shielded from rain and sun glare (depending on the version).

RELIABILITY & REDUNDANCY

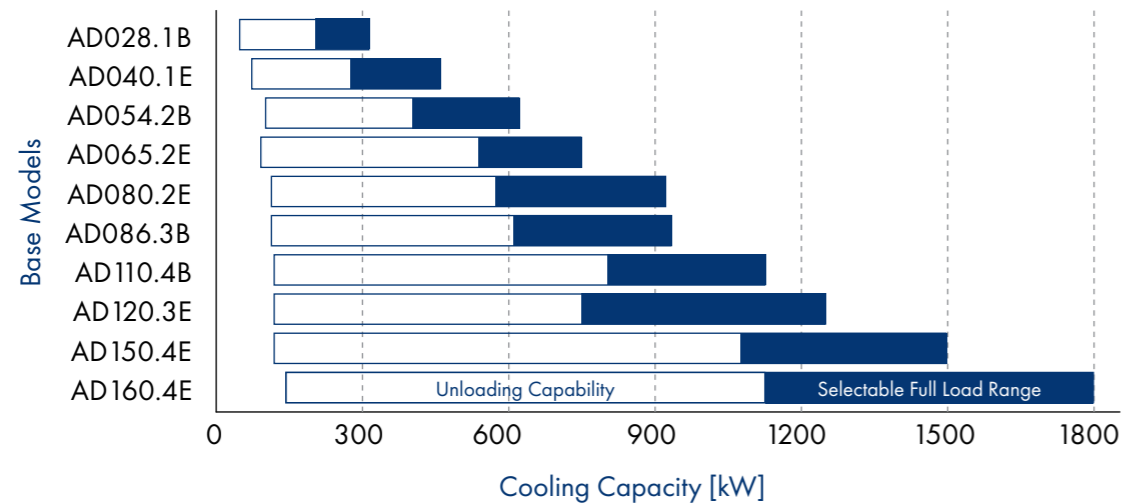
With the experience of more than 5000 oil-free centrifugal chillers now installed worldwide, Smardt chillers offer outstanding reliability – unsurprising when an estimated 80% of all chiller field problems relate to failures in the compressor oil-return.

On multiple-compressor models, mechanical and electrical isolation provides significant redundancy and failsafes. In the event of a compressor outage, Smardt's controller will automatically adjust its logic to continue serving the chilled water load with the remaining available compressors. Should a compressor require servicing, it can be quickly & easily isolated, even removed, without stopping the chiller.

CAPACITY RANGE



The T Class Air range has been designed to meet a wide variety of applications, with full load capacities ranging from 200kW_R up to 1800kW_R.



Note: Available cooling capacity will vary with operating conditions and chiller configuration. Capacities shown are based on standard Eurovent conditions.

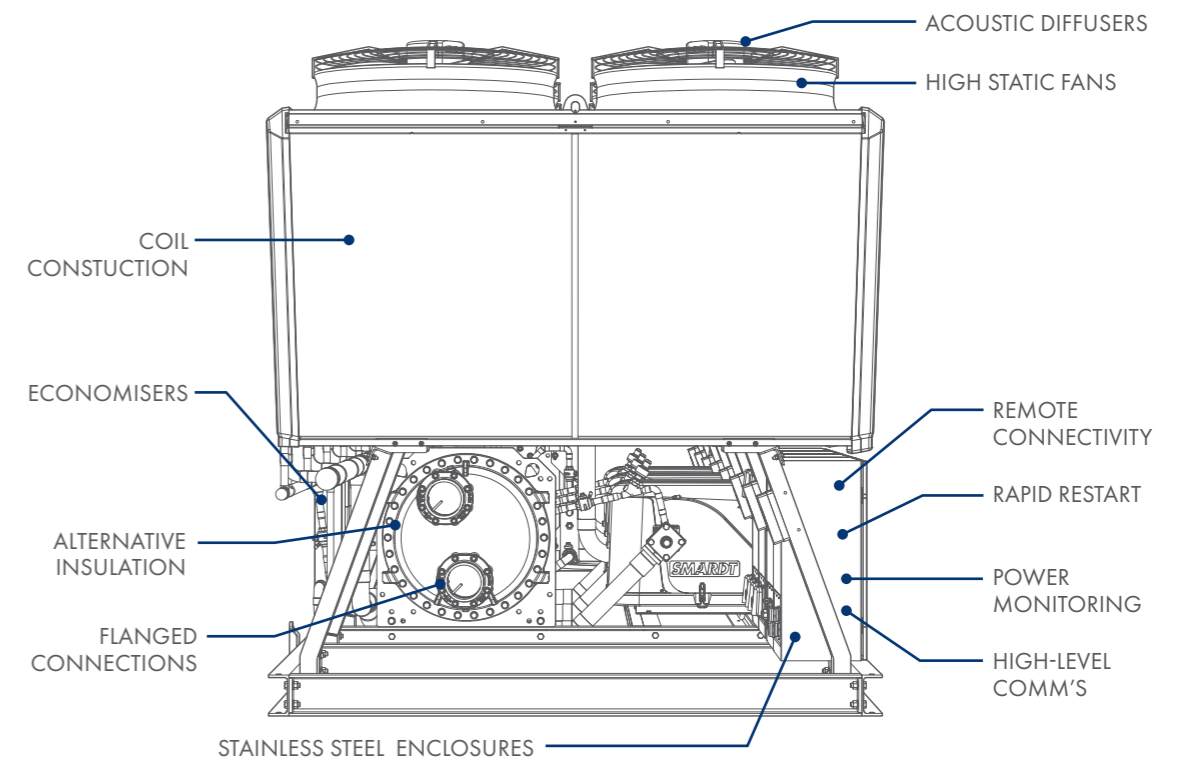
STANDARD CONFIGURATIONS

BASE MODEL	EVAP. PASSES				FAN COUNTS												FAN TYPES		CONFIG.	
	1	2	3	4	4	6	8	10	12	14	16	18	20	24	28	32	A	N	E	D
AD028.1B				●	●	●	●										●	●	●	
AD040.1E			●	●	●	●	●										●	●	●	
AD054.2B		●	●	●			●	●	●								●	●	●	●
AD065.2E		●	●	●				●	●	●							●	●	●	●
AD080.2E		●	●	●					●	●	●						●	●	●	●
AD086.3B		●	●	●					●	●	●						●	●	●	
AD110.4B	●									●			●	●			●	●	●	●
AD120.3E		●	●							●	●						●	●	●	
AD150.4E		●											●	●	●		●	●	●	●
AD160.4E		●												●	●	●	●	●	●	●

FAN TYPES: A – 900 mm standard EC fans
N – 900 mm High Static EC fans

CONFIG.: E – BPHE economiser for each compressor
D – BPHE economiser on half compressors (even compressor numbers)

AVAILABLE OPTIONS



COIL CONSTRUCTION

Cu/Cu coils are available as an alternative to the standard SBS-coated Cu/Al coils. Alternative fin coatings, including nano and epoxy are also available.

ECONOMISERS

Economisers are available on all models, which extend the capacity of the chiller and/or further increase its operating efficiency.

ALTERNATIVE INSULATION

All models are fitted with 19mm [3/4"] closed-cell rubber, wrapped in 3 mm thick UV stabilised insertion rubber, as standard. 38 mm rubber, aluminium cladding, 50 mm polystyrene and 50 mm polyurethane options are also available.

FLANGED CONNECTIONS

Grooved connections are supplied as standard on all models. Flanged options are available on request.

STAINLESS STEEL ENCLOSURES

All TA Class electrical enclosures are powder-coated. For additional protection, powder-coated stainless steel enclosures can also be requested.

REMOTE CONNECTIVITY

Access data trending, or real time feedback on chiller status and performance remotely (see Control Panel web-based).

ACOUSTIC DIFFUSERS

Acoustic diffusers are available on all TA Class models, offering up to 7 dB(A) reduction in fan acoustic pressure, and a 25 % reduction in fan energy consumption with unchanged airflow.

HIGH STATIC FANS

High efficiency EC fans are installed as standard on all models. Increased condenser performance can be achieved with the addition of high static fans.

HIGH-LEVEL COMMUNICATIONS

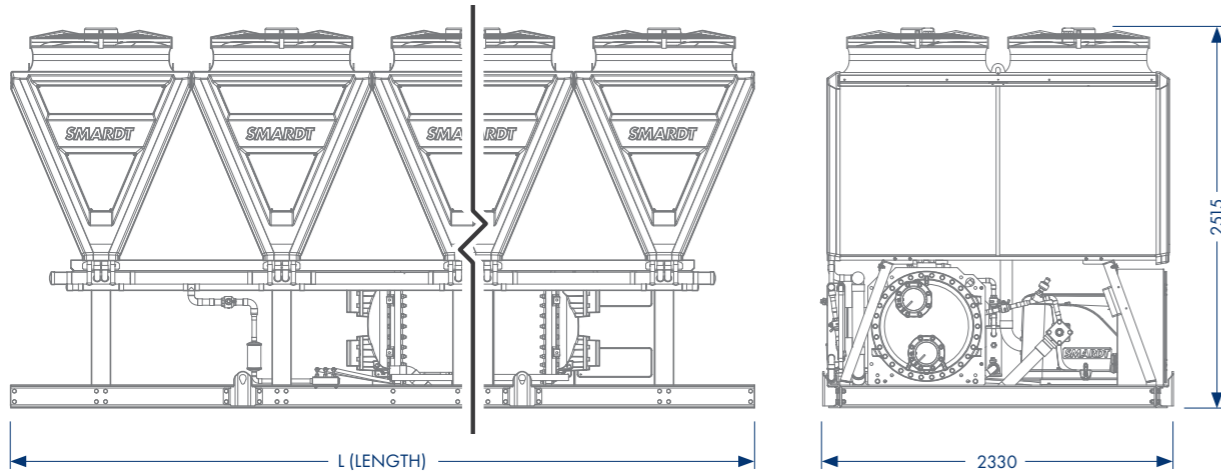
Modbus TCP/IP, BACNET IP, Profibus, LON, SBUS and REMOTE communication options are available as alternatives to MODBUS RTU, which is included as standard.

POWER MONITORING

An integrated monitoring system, providing absolute power usage & quality in real time.

PHYSICAL DATA

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BASE MODEL	FAN QTY	OVERALL LENGTH 'L' (mm)	OPERATING WEIGHT (kg)	SHIPPING WEIGHT (kg)
AD028.1B	4	2400 + 400**	3205	3080
	6	3600 + 400**	3765	3645
AD040.1E	6	3600 + 400**	4305	4135
	8	4800 + 400**	4870	4700
	10	6000 + 400**	5515	5345
AD054.2B	8	4800 + 400**	5415	5245
	10	6000 + 400**	6060	5890
	12	7200 + 400**	6620	6450
AD065.2E	10	6000 + 400**	6535	6315
	12	7200 + 400**	7095	6880
	14	8400 + 400**	7660	7445
AD080.2E	12	7200 + 400**	7240	7005
	14	8400 + 400**	7800	7570
	16	9600 + 400**	8365	8130
AD086.3B	12	7200 + 400**	7700	7435
	14	8400 + 400**	8265	8000
	16	9600 + 400**	8825	8560
AD110.4B*	16 (8+8)	9600 (4800+4800) + 400**	10790 (5505+5285)	10435 (5320+5115)
	20 (10+10)	12000 (6000+6000) + 400**	11920 (6635+6415)	11565 (6450+6245)
	24 (12+12)	14400 (7200+7200) + 400**	13050 (7765+7545)	12695 (7580+7375)
AD120.3E	16	9600 + 400**	9475	9150
	18	10800 + 400**	10040	9715
AD150.4E*	20 (10+10)	12000 (6000+6000) + 400**	12980 (6555+6425)	12480 (6305+6175)
	24 (12+12)	14400 (7200+7200) + 400**	14110 (7685+7555)	13610 (7435+7305)
	28 (14+14)	16800 (8400+8400) + 400**	15240 (8815+8685)	14740 (8565+8435)
AD160.4E*	24 (12+12)	14400 (7200+7200) + 400**	14440 (7285+7155)	13920 (7025+6895)
	28 (14+14)	16800 (8400+8400) + 400**	15570 (8415+8285)	15050 (8155+8025)
	32 (16+16)	19200 (9600+9600) + 400**	16700 (9545+9415)	16180 (9285+9155)

* Dual circuit chillers, shipped in two sections.

** To accommodate the electric cabinet, depending on the version.

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APPLICATION CONSIDERATIONS

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APPROPRIATE CLIMATE

Humidity has little effect on the efficiency of an air cooled chiller, therefore giving the T Class Air the greatest advantage in high-humidity environments.

For applications involving lower humidity, consider Smardt's range of E Class high efficiency, oil free, purpose built evaporative chillers.

CHILLED WATER REQUIREMENTS

All external pipework must be self-supporting, and aligned to prevent strain and distortion on the chiller's headers and couplings.

EVAPORATOR WATER CIRCUITS

The chiller performance and efficiency can be adversely affected by contaminants in the water circuit. As such, strainers should be located on the inlet side of the evaporator.

The water circuit should be arranged so that the pumps discharge through the evaporator, with the return water to the chiller connected to the lower connection of the evaporator.

CHILLED WATER TEMPERATURE LIMITS

T Class Air chillers are optimised for chilled water temperatures between 4°C and 22°C. For applications outside this range, please consult your local sales representative.

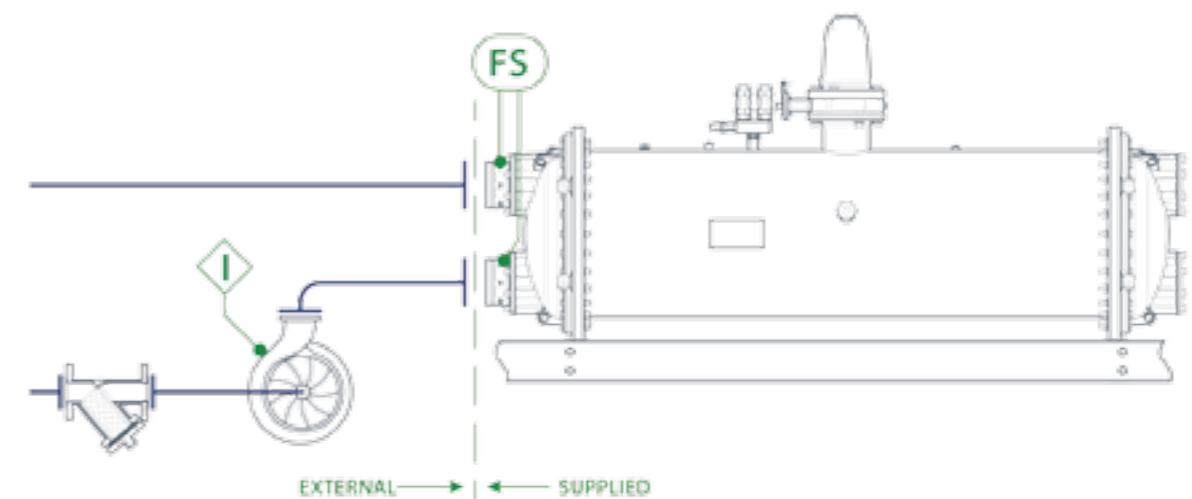


FLOW SAFETY INTERLOCKS

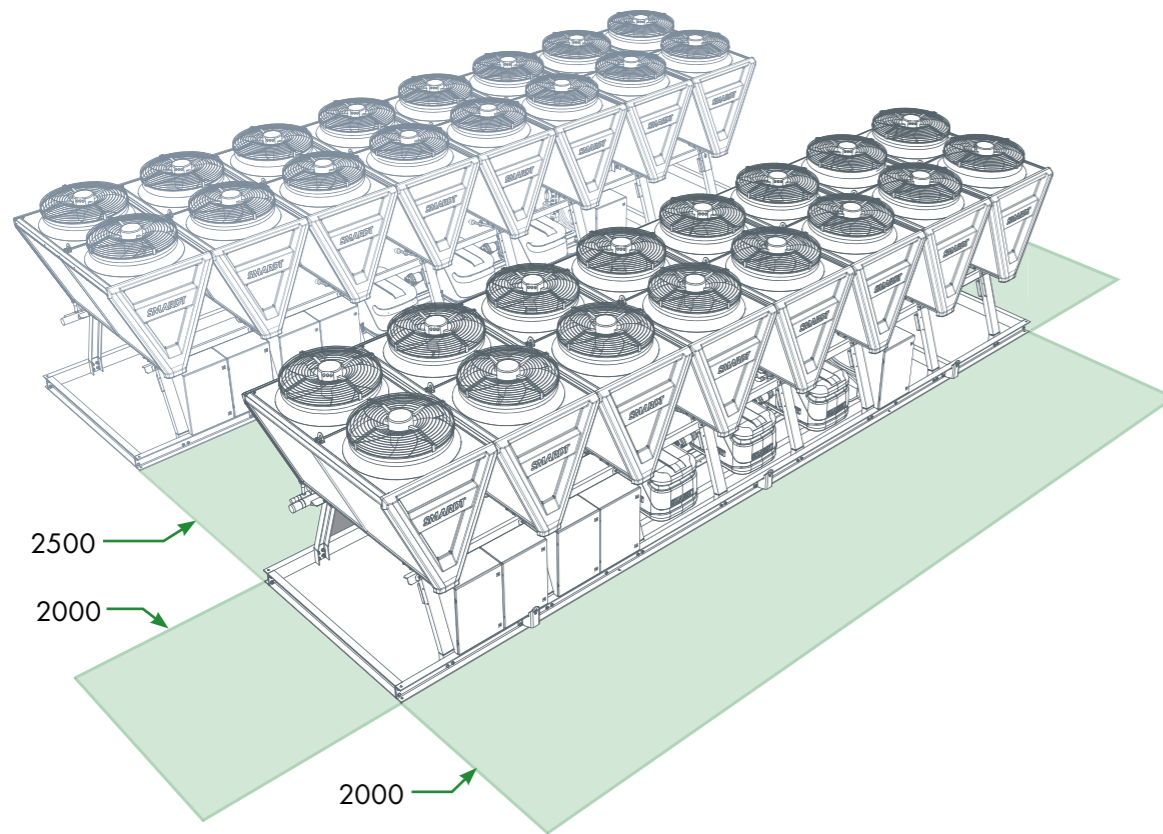
Flow switches (FS) are fitted as standard on all Smardt chillers, which enables the chiller to shutdown in the event of low or high flow through the evaporator.

An additional field-supplied chilled water pump interlock, or a VSD interlock signal are required on all installations.

If the chiller is intended for an application using variable chilled water flow, please confirm the appropriate cut off point with Smardt.



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SITE CLEARANCES

A nominal clearance of 2000 mm is required around all four (4) sides of T Class Air chillers, and 2500 mm between adjacent chillers.

A clearance equal to the length of the evaporator is recommended at either end of the vessel for service access requirements.

Contact Smardt for advice on restrictive installations.

MOUNTING REQUIREMENTS

The chiller shall be installed on a flat surface, with a minimum of 75 mm flange width around the perimeter of the base frame. Refer to individual product information for these dimensions.

Waffle pads can be used in place of spring mounts for most installations requiring structural isolation.

DESCRIPTION

Microprocessor controlled, electric water chiller using HFC- 134a or R- 1234ze refrigerant, oil free, two stage centrifugal variable speed compressor and high efficiency corrosion resistant condenser.

QUALITY ASSURANCE

Construction shall comply with relevant European codes; vessels shall be manufactured in accordance with PED code. Selected units can be run tested at the factory prior to shipment (functional testing without water in the shell; optional).

EQUIPMENT

Fully integrated, factory assembled, air-cooled packaged liquid chiller fitted with oil-free magnetic bearing compressors, variable speed EC fans, and all factory wiring, piping, controls and refrigerant.

COMPRESSOR(S)

The compressor(s) shall be an OIL FREE semi-hermetic two stage direct driven variable speed centrifugal. Compressor(s) shall be equipped with discharge and suction shutoff (isolating) valves for mechanical isolation as standard.

Capacity control shall be provided by variable speed drive and inlet guide vanes, capable of reducing unit capacity to below 15% of full load.

Compressor shall start unloaded and current inrush shall be limited by control to less than 5 amps. Motor cooling shall be provided by an integrated liquid refrigerant injection system controlled by the compressor(s). The compressor(s) shall require no oil lubrication.

Compressors shall be housed in weatherproof ABS plastic enclosures with quick release covers which when removed provide full access for servicing requirements.

EVAPORATOR

Provide shell and tube design evaporator with seamless copper tubes mechanically expanded into boiler quality mild steel tube sheets with mild steel water boxes. Form the evaporator shell from carbon steel plate, designed, tested and stamped in accordance with PED and CE safety codes for unfired pressure vessels. Rate the water tubes to a pressure to suit the installation but in any case be not less than 10 bar.

Insulate the evaporator with 19 mm closed cell PVC nitrile rubber sponge and further wrap with 1.5 mm thick insertion rubber.

Provide a water drain connection and single bulb well for low temperature cut-out, load limit thermostat, and temperature controller.

CONDENSER

Shall have multiple vertical finned heat exchanger coils housed in marine grade aluminium frames which shall be of 3 mm thick welded construction.

Fans shall be high efficiency EC variable speed fans.

The condenser shall be comprised of vertically-finned coils, installed as 2 fan/2 coil sections.

Untreated plain aluminium finned coils shall not be provided.

Standard condenser coils shall be epoxy based and chemical conversion to achieve precise and consistent coating across entire coil including fin edge seal. The coil coating shall be salt spray certified to ASTM B117-97 / DIN 53167 for 1,000 hrs.

Structural panels shall be shrouded with full size covers made of HMWPE (high molecular weight polyethylene), with added UV & colour stabilisers.

All fixings shall be of stainless steel.

REFRIGERATION COMPONENTS

Pressure Relief Valves shall be provided on the evaporator in a paired assembly to allow for either to be isolated without the introduction of any safety hazard.

Each compressor shall be fitted with Discharge and Suction isolation valves.

Electronic Expansion valves shall be provided.

Electronic Level Sensors shall be provided to allow for accurate expansion valve control.

Evaporator shall be fitted with a sight glass to allow for visual inspection of the tubes.

There shall be a minimum of 9 isolation valves within the refrigeration pipework to allow for rapid serviceability of individual components. Isolatable components shall be accompanied by a service port to allow for localized refrigerant reclaim.

STANDARD CONTROLS, INTERLOCKS & SAFETIES

Provide and mount in the chiller set control cubicle the interlocks, time delays, relays, surge controls, capacity control, safety controls, relays, connections for interlocks with external pumps and flow switches and the like necessary for safe and satisfactory operation and for restarting the chiller set immediately upon restoration of interrupted power supply.

Unit controls shall include the following minimum components:

- Microprocessor control with non-volatile memory.
- Power and control circuit terminal blocks.
- ON/OFF control switch.
- Temperature sensors installed to measure cooler entering and leaving fluid temperatures.
- Sensors for suction and discharge pressures.
- Sensors for suction and discharge temperatures.
- EMI filters class A (one per compressor)

Unit controls shall include the following functions as standard:

- Capacity control based on leaving or entering chilled water temperature with set point offset load compensation.
- Rate of change control at start up to prevent overshoot.
- Control of condenser fans to optimise condensing pressure and maximize efficiency.
- Auto restart after power failure.
- The control panel shall include a 8 inch, clear backlit, colour LCD touch screen with menu driven user interface for setting of user set points and options, and for providing operating information descriptions.
- Control Panel web-based

Unit controls shall include the following display variables as part of the user interface:

- General operational data including; entering and leaving chilled water temperatures, chilled water set point, ambient air temperature, time and date, active timers, system demand, chiller status, active faults and alarms.
- Compressor data including; communication integrity, active alarms, actual compressor(s) demand, impeller speed, IGV position, active pressure ratio, suction pressure, discharge pressure, active power input, desired power input, 3 phase Amps, surge RPM, choke RPM.
- Trending Data including; entering and leaving chilled water temperatures, input kW, % of design chilled water flow, % of design capacity, system refrigerant level, EXV position, suction and discharge pressures, saturated suction temperatures, saturated discharge temperatures, system demand, number of compressors running.
- The control system shall allow software upgrade without the need for new hardware.

The controller shall include contacts for interfacing to the building management system for the following functions:

- Summary fault
- Start/Stop
- Chilled water flow interlock
- Chiller water reset
- Demand limit

STANDARD CONTROLS, INTERLOCKS & SAFETIES (CONT'D)

Unit shall be equipped to provide the following protection:

- Loss of refrigerant charge.
- Low chilled water temperature.
- Power supply error.
- Compressor motor thermal or electrical overload.
- Phase loss.
- High pressure.
- Low pressure.
- Loss of chilled water flow.
- Standard communication protocol: MODBUS RTU.

OPERATING CHARACTERISTICS

Unit shall be capable of starting up with 35°C entering fluid temperature to the cooler and sustained operation in ambient air on conditions exceeding 40°C

ELECTRICAL

Unit primary electrical power supply shall enter the unit at a single location.

Unit shall operate on 3-phase power at 400 volts, 50Hz.

Control voltage shall be 24VDC

Unit shall be shipped with factory control and power wiring installed.

Power factor shall be greater than 0.9 (compressors only) at full design load.

Provide EMI filtration for high frequencies EMC compliance.

High impedance reactors providing enhanced low frequency harmonic mitigation.

UNIT OPTIONS

- Several options of high-level interface communication
- Economisers for extended operating range/efficiency.
- High Static fans.
- Nano Coated Condenser Coils – Dust repellent and 5000 hrs salt spray rating
- Alternative evaporator insulation.
- Acoustic condenser air diffusers.
- Stainless steel electrical enclosures.
- Flanged chilled water connections.
- Communications options: Modbus TCP/IP, BACNET IP, Profibus, LON, SBUS and REMOTE communication.
- Low GWP refrigerant R1234ze version.



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