

Section 23 21 16

Hydronic Piping Specialties

PART 1 General

1.01 Section Includes

- A. Coalescing Combined Air & Dirt Separators (Basis of design: Winflo Coalescing TwinXtract Magnetic Air & Dirt Separator)
- B. Coalescing Air Separators (Basis of design: Winflo Coalescing VoidXtract - Air Separator)
- C. Coalescing Dirt Separators (Basis of design: Winflo Coalescing SludgeXtract – Magnetic Dirt Separator)

1.02 Related Sections

- A. Section 23 01 70 – Operation & Maintenance of Central HVAC Equipment.
- B. Section 23 20 00 – HVAC Piping and Pumps.
- C. Section 23 21 13 – Hydronic Piping.

1.03 References

- A. ISO - International Standards Organization
 - 1. ISO 9001: Quality management systems.
 - 2. ISO 228-1: Pipe threads for joints not made pressure tight on the threads (BSPP)
- B. EN - European Standard
 - 1. BS EN 1092-1: Flanges and their joints; circular flanges for pipes, valves, fittings and accessories; steel flanges.
 - 2. EN 13445: Unfired Pressure Vessels
 - 3. BS EN 12266-1: Pressure test standard for metallic valves.
- C. PED – Pressure Equipment Directive
 - 1. PED 2014/68/EU: Pressure Equipment Directive
- D. Manufacturer's published product data and installation instructions.

1.04 Submittals

- A. Submit data cover sheet.
- B. Dimensional print(s)
- C. Sales brochure.
- D. Installation, operation & maintenance manual

1.05 Assurance

- A. The product manufacturer shall be fully certified by the International Standards Organization per ISO 9001.
- B. B. Pressure boundary shall be designed, constructed, inspected, and tested in accordance with EN 13445 and shall comply with PED 2014/68/EU.

1.06 Maintenance Material Submittals

PART 2 Products

2.01 General Requirements — All Separators

- A. The separator shall be designed, constructed, inspected, and tested in accordance with EN 13445 (Unfired Pressure Vessels) and shall comply with the Pressure Equipment Directive (PED) 2014/68/EU.
- B. The complete separator shall be rated for a maximum working pressure of 16 bar, or higher where required by the system design pressure as specified in the equipment schedule.
- C. The complete separator shall be rated for a working temperature range of 0 to 110°C.
- D. The separator body shall be carbon steel, externally finished with an electrostatically applied thermoset epoxy powder coating suitable for indoor plantroom installation; for outdoor or chemically aggressive environments the body and fittings shall be stainless steel (SS304 or SS316). The internal coalescing element shall be a low-resistance stainless steel medium (Type 304 standard; Type 316 optional).
- E. The separator shall be selected on the design flowrate and sized on the manufacturer's maximum rated flow and pressure drop; the nominal connection size may be equal to or larger than the main pipe diameter and shall not exceed the manufacturer's rated nozzle velocity. For large system flows a parallel headered arrangement of multiple separators may be used.
- F. Factory-welded integral gauge taps shall be provided on the inlet and outlet nozzles, comprising threaded bosses (ISO 228-1) for direct mounting of pressure-monitoring devices.
- G. Separators of nominal size DN125 (5") and larger shall be supplied with two welded lifting lugs on the upper body, sized for the empty (dry) vessel weight for handling and installation only; the lugs shall not support the operating (flooded) vessel.
- H. All threaded connections shall comply with ISO 228-1 and shall use EPDM O-rings.
- I. The separator shall be supplied with the integral support configuration scheduled. Integral welded body supports shall be provided as standard on combined air & dirt separators DN250 and larger (High-flow) or DN350 and larger (Standard-flow), on air-only and dirt-only separators DN350 and larger, and on all demountable variants; smaller units are supported by the connecting pipework, with body brackets available as an option. Welded legs are an alternative for non-demountable closed-vessel units only.

2.02 Coalescing Combined Air & Dirt Separators

- A. Basis of design : Winflo® Coalescing TwinXtract Magnetic Air & Dirt Separator. The demountable variant shall be selected where any of the criteria for the demountable variant within this product specification apply. Subject to compliance with these specifications, the following manufacturers shall be acceptable
 1. Winflo
 2. Pre-approved equal is acceptable.
- B. Description: The coalescing combined magnetic air and dirt separator incorporates three functions for hydronic systems: air separation, dirt separation and ferrous impurity separation. An internal screen element facilitates coalescing and capture of micro-bubbles to facilitate automatic air removal with the help of the integrated automatic air vent, while concurrently also capturing dirt and debris particulates of sizes down to 5 microns. The integrated magnetic insert includes rare-earth neodymium magnets that capture ferrous particulates such as iron oxide that are microscopic in size and not captured by standard air and dirt separators. Where the demountable variant is specified, a bolted bottom flange with EPDM gasket provides full access to the internals for inspection and cleaning of the coalescing element.
- C. The separator body shall be at least two times the nominal inlet/outlet pipe diameter and should include two equal chambers above and below the inlet/outlet nozzles.

- D. (Optional) The Air and Dirt Separator shall be supplied with a bottom demountable bolted flange with an EPDM gasket to facilitate routine inspection and cleaning of the coalescing medium. The demountable variant shall be specified on the equipment schedule or drawings in accordance with the selection criteria below.
- E. Selection criteria for the demountable variant — the demountable variant shall be specified where any one of the following applies: (a) separator nominal size of DN250 (10") or larger; (b) mission-critical or 24/7 service such as data centres, hospitals, or district energy; (c) systems with known heavy dirt loading, post-construction commissioning duty, or extensive ferrous piping installed prior to magnetic separation; (d) owner, insurer, or authority-having-jurisdiction requirement for periodic internal vessel and coalescing medium inspection. For all other applications, the standard non-demountable TwinXtract shall be supplied, with maintenance performed via the side blowdown valve and the external removable magnetic insert without opening the vessel.
- F. The Air and Dirt Separator shall be capable of removing free air and at least 99% of entrained air (microbubbles) per recirculation, and at least 99% of total non-ferrous particulates down to 5 µm within typical operating cycles.
- G. The Air and Dirt Separator shall include a factory-installed magnet insert to capture at least 99% of ferrous impurities such as iron oxide (magnetite) from the system fluid passing through the unit, in accordance with the manufacturer's rated performance.
- H. The magnetic insert shall comprise Neodymium rare-earth magnets housed within a stainless steel dry well isolated from the system fluid, with a residual flux density of at least 14,000 Gauss. The magnet rod shall be withdrawable while the system is operational and pressurised, releasing captured ferrous particles for flushing through the blowdown valve, with the complete magnet-and-blowdown assembly removable as a single unit. The magnets shall be suitable for continuous operation at the scheduled fluid temperature without irreversible loss of magnetic strength.
- I. The Air and Dirt Separator shall include a factory-installed automatic air vent with threaded connection and EPDM O-ring seal; nickel-plated brass body with polypropylene (PP) float; rated in accordance with the separator's rated maximum working pressure and temperature range.
- J. The Air and Dirt Separator shall include a factory-installed nickel-plated brass drain valve/assembly with threaded connection, to allow for sediment to be regularly cleaned out of the unit.
- K. The Air and Dirt Separator shall include a factory-installed nickel-plated brass skim valve with a threaded connection located on the upper half of the body, below the air vent, to allow manual bleeding air-bleed for removal of trapped air during system filling and to skim-off floating particulates.

2.03 Coalescing Air Only Separators

- A. Basis of design : Winflo[®] Coalescing VoidXtract Separator (Coalescing Air-only). Subject to compliance with these specifications, the following manufacturers shall be acceptable
 - 1. Winflo
 - 2. Pre-approved equal is acceptable.
- B. Description: The coalescing air separator provides air separation for hydronic systems. An internal screen element facilitates coalescing and capture of micro-bubbles to facilitate automatic air removal with the help of the integrated automatic air vent.
- C. The separator body shall be at least two times the nominal inlet/outlet pipe diameter and should include an air collection chamber above the inlet/outlet nozzles.

- D. The Air Separator shall be capable of removing free air and at least 99% of entrained air (microbubbles) per recirculation, in accordance with the manufacturer's rated performance.
- E. The Air Separator shall include a factory-installed automatic air vent with threaded connection and EPDM O-ring seal; nickel-plated brass body with polypropylene (PP) float; rated in accordance with the separator's rated maximum working pressure and temperature range.
- F. The Air Separator shall include a threaded blow down connection with a factory-installed drain plug, to allow the unit to be drained.
- G. The Air Separator shall include a factory-installed nickel-plated brass skim valve with a threaded connection located on the upper half of the body, below the air vent, to allow manual bleeding air-bleed for removal of trapped air during system filling and to skim-off floating particulates.

2.04 Coalescing Dirt Only Separators

- A. Basis of design : Winflo[®] Coalescing SludgeXtract Magnetic Dirt Separator. The demountable variant shall be selected where the demountable selection criteria within this product specification apply. Subject to compliance with these specifications, the following manufacturers shall be acceptable
 - 1. Winflo
 - 2. Pre-approved equal is acceptable.
- B. Description: The coalescing magnetic dirt separator incorporates two functions for hydronic systems: dirt separation and ferrous impurity separation. An internal screen element facilitates capturing non-ferrous debris particulates of sizes down to 5 microns. The integrated magnetic insert includes rare-earth neodymium magnets that capture ferrous particulates such as iron oxide that are microscopic in size and not captured by standard dirt separators. Where the demountable variant is specified, a bolted bottom flange with EPDM gasket provides full access to the internals for inspection and cleaning of the coalescing element.
- C. The separator body shall be at least two times the nominal inlet/outlet pipe diameter and should include a dirt collection chamber below the inlet/outlet nozzles.
- D. (Optional) The Dirt Separator shall be supplied with a bottom demountable bolted flange with an EPDM gasket to facilitate routine inspection and cleaning of the coalescing medium. The demountable variant shall be specified on the equipment schedule or drawings in accordance with the selection criteria below.
- E. Selection criteria for the demountable variant — the demountable variant shall be specified where any one of the following applies: (a) separator nominal size of DN250 (10") or larger; (b) mission-critical or 24/7 service such as data centres, hospitals, or district energy; (c) systems with known heavy dirt loading, post-construction commissioning duty, or extensive ferrous piping installed prior to magnetic separation; (d) owner, insurer, or authority-having-jurisdiction requirement for periodic internal vessel and coalescing medium inspection. For all other applications, the standard non-demountable SludgeXtract shall be supplied, with maintenance performed via the side blowdown valve and the external removable magnetic insert without opening the vessel.
- F. The Dirt Separator shall be capable of removing 99% or more of the total non-ferrous particulates of sizes down to 5 µm.
- G. The Dirt Separator shall include a factory-installed magnet insert to capture at least 99% of ferrous impurities such as iron oxide (magnetite) from the system fluid passing through the unit, in accordance with the manufacturer's rated performance.
 - 1. The magnetic insert shall comprise Neodymium rare-earth magnets housed within a stainless steel dry well isolated from the system fluid, with a residual flux density of at least

- 14,000 Gauss. The magnet rod shall be withdrawable while the system is operational and pressurised, releasing captured ferrous particles for flushing through the blowdown valve, with the complete magnet-and-blowdown assembly removable as a single unit. The magnets shall be suitable for continuous operation at the scheduled fluid temperature without irreversible loss of magnetic strength.
- H. The Dirt Separator shall include a threaded air removal connection with a factory-installed plug, to allow the manual venting of air.
 - I. The Dirt Separator shall include a factory-installed nickel-plated brass drain valve/assembly with threaded connection, to allow for sediment to be regularly cleaned out of the unit.

2.05 Accessories

- A. Blowdown Valve with magnet insert
- B. Skim Valve
- C. Automatic Air Vent

PART 3 Execution

3.01 Installation

- A. Install separator in accordance with manufacturer's instructions.
- B. Install butterfly valves on the inlet and outlet flanges for isolation from the system to facilitate maintenance.
- C. Bypass arrangement. A bypass line with isolation valves around the separator shall be provided in any installation where the separator cannot be isolated for service without an unacceptable interruption to system flow. This requirement is satisfied automatically in two configurations and applies as a positive requirement in a third: (i) Where the separator is installed as a single unit on the main system header (typical of chilled water primary or secondary headers), a full-size bypass with two isolation valves on the main line and one on the bypass shall be installed. (ii) Where multiple separators are installed in parallel on a dedicated separator header, sized so that any one unit may be isolated for service while the remaining units carry the full system flow, no bypass is required; isolation valves shall be installed on the inlet and outlet of each individual separator. (iii) Where a separator is installed at the suction of each pump in a headered pump arrangement (upstream of the pump's suction diffuser), no bypass is required; pump redundancy provides the necessary service isolation. Isolation valves shall be installed on the inlet and outlet of each separator.
- D. Install pressure monitoring devices – (differential pressure gauge or pressure transducer) on the inlet and outlet nozzles of the separator to monitor the differential pressure.
- E. Location. Air separators and combined air & dirt separators shall be installed at the location of lowest air solubility in the system, where free and dissolved air most readily disengages from the fluid. For heating systems, this is on the supply line at the boiler outlet, upstream of the system circulation pumps. For chilled water systems, this is typically on the return line ahead of the chiller, or on the pump suction header. Dirt separators may be installed at any convenient point in the system; locations of low velocity in the return line favour particulate settling. The expansion tank shall be connected at or immediately adjacent to the air separator to establish the point-of-no-pressure-change at the pump suction.
- F. Configuration selection. The selection of separator configuration shall be based on the system flow rate, redundancy requirement, and acceptable shutdown duration: (a) Single header-

- mounted separator with bypass — for any system in which scheduled service requires uninterrupted flow; recommended for chilled water primary or secondary headers and any 24/7 service. (b) Parallel-headered separator system — multiple separators in parallel on a dedicated separator header, each sized so the remaining units carry full system flow with one isolated. (c) Separator-per-pump configuration — one separator installed on the suction of each pump in a headered pump arrangement, upstream of the pump's suction diffuser; recommended where pump redundancy is already provided by the design.
- G. Approach piping. The coalescing separator design requires no minimum straight-pipe approach length upstream or downstream of the unit. Where the unit is supplied with tangential or non-coalescing internals (consult the manufacturer's drawings), provide a straight run equal to at least three pipe diameters at the inlet.
- H. Mounting. The separator shall be mounted in accordance with the support configuration scheduled in Section 2: (a) Pipeline-mounted — units supported entirely by the connecting pipework, which the contractor shall independently support to carry the full operating (flooded) weight without transmitting load to the separator nozzles; (b) Floor-mounted — units with integral body brackets or welded legs carried to the floor on contractor-supplied threaded rods or structural columns; (c) Ceiling- or structure-suspended — units with integral body brackets suspended from an overhead structural slab on contractor-supplied rods. The contractor shall design all supports and anchorage for the certified operating weight stated by the manufacturer on the submittal drawing. Body-bracket mounting supports the vessel by the body and leaves the bottom flange free, permitting in-line withdrawal of the coalescing element on demountable units.
- I. Drain piping. The blowdown valve outlet shall be piped to a floor drain or other suitable discharge point sized to accept the maximum blowdown discharge without flooding.
- J. Clearance below the unit. The installation shall provide sufficient free vertical space below the separator to permit servicing without disturbing the connecting piping.
- K. Insulation. Chilled water separators shall be insulated to the same thickness and vapour-barrier specification as the connecting chilled water piping, including the vessel body, end flanges, blowdown valve assembly, and skim valve assembly. For all demountable variants and for chilled-water installations, the insulation shall be supplied as factory-fitted removable insulation jackets with Velcro (hook-and-loop) strap closures, fabricated from closed-cell elastomeric foam (for chilled water systems) or pre-formed flexible mineral-wool (hot water systems), covering the vessel body, bottom flange, and accessories. Removable jackets shall permit periodic withdrawal of the magnetic insert, opening of the demountable bottom flange, and access to the air vent, skim valve, and blowdown valve without cutting or destroying the insulation. Hard-shell insulation systems (sheet-metal cladding over mineral wool) are not acceptable on demountable units. Heating water separators may be insulated with conventional mineral-wool plus sheet-metal cladding where the demountable variant is not specified; otherwise removable jackets shall be supplied.
- L. Magnetic field safety. Separators fitted with the magnetic insert generate a strong static magnetic field at the magnet pocket. A permanent warning label shall be visible on the separator advising personnel fitted with cardiac pacemakers, implanted cardiac defibrillators, or other electronic medical implants to maintain a minimum distance of 300 mm (12") from the magnet pocket. Ferrous tools and small metal items shall be kept clear during magnet removal.
- M. Commissioning. During the first two weeks of operation following system flushing and start-up, the separator shall be blown down daily through the blowdown valve until the discharge runs visibly clean. Thereafter, the blowdown frequency shall be reduced to weekly for the first three months and to monthly steady-state operation. The magnetic insert shall be withdrawn and

wiped clean at the same intervals. Maintain a logbook of blowdown and magnet-cleaning operations.

END OF SECTION