ORION® INSTRUMENTS
A MAGNETROL® Company

Vector™ Magnetic Level Indicator

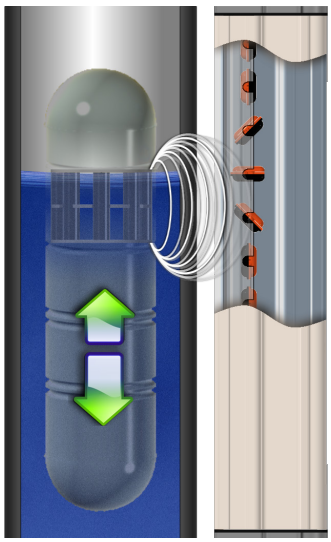
DESCRIPTION

Vector™ is a rugged, reliable and cost-effective Magnetic Level Indicator (MLI). Suitable for a variety of installations, Vector has many basic features and is precision-engineered and manufactured to ensure a long service life.

MLIs are widely used to replace high-maintenance sight and gauge glass indicators and are increasingly used in new applications. Optional switches and transmitters are available to provide various output signals for level control.

APPLICATIONS

- **Feedwater heaters**
- **Oil/water separators**
- **Flash drums**
- **Surge tanks**
- **Gas chillers**
- **Deaerators**
- **Blowdown flash tanks**
- **Hot wells**
- **Vacuum tower bottoms**
- **Alkylation units**
- **Propane vessels**
- **Storage tanks**

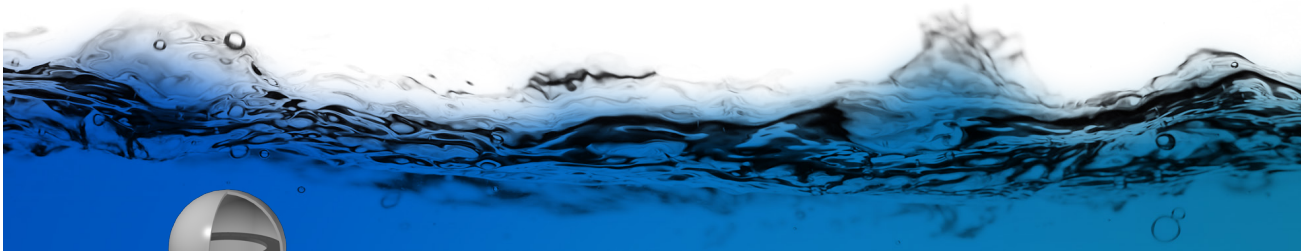


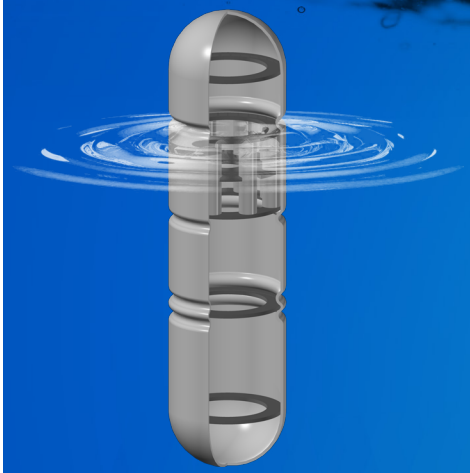
PRINCIPLE OF OPERATION

A float travels up and down in a chamber that is mounted to a liquid-containing vessel. The float contains a magnetic assembly that interacts with an externally-mounted visual indicator. As the float follows the liquid surface or liquid-liquid interface, the magnetic field causes highly contrasting flags in the visual indicator to rotate. The result is a clearly defined representation of the liquid level in the vessel.

FEATURES

- Rugged, industrial-grade construction
- Field adjustable visual indicator for convenient viewing
- Continuous measuring range up to 538 cm (212”)
- Compatible with electronic point switches and continuous level transmitters
- Media specific gravity as low as 0.55
- Shatter-resistant viewing window
- Single magnet per flag to enhance float coupling effect and self-alignment



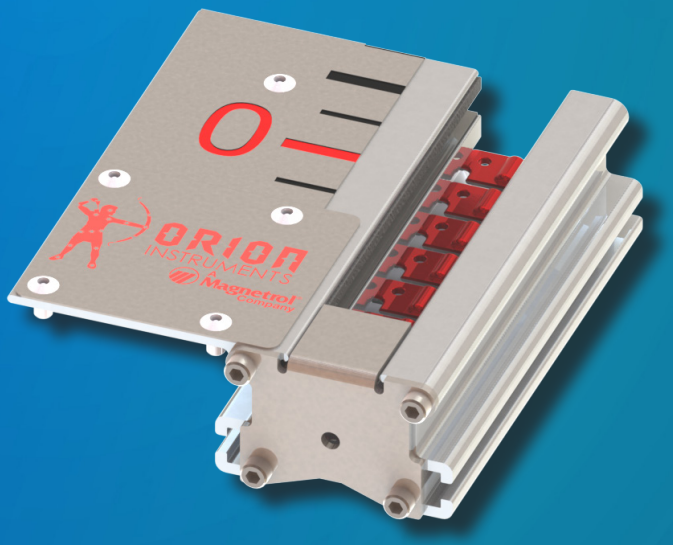


The Vector™ float contains high-strength alloy magnets that facilitate a strong coupling with the externally-mounted visual indication, as well as any switches or transmitters.

Every float is manufactured specifically for each application. Process pressure, temperature, and media specific gravity are all factored into the custom design.

The Vector™ high-visibility visual indicator is constructed with quality materials and engineered for reliable performance.

Each flag contains an alloy magnet that maximizes coupling with the float. The flags are mechanically limited to a half-rotation, which eliminates the possibility of over-rotation common with other magnetic level indicators.



Model:	4																								
Digit:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25

1 PRODUCT NAME

4	**Vector**™ Magnetic Level Indicator

2 UNIT OF MEASUREMENT

E	English (in.)
M	Metric (cm)

3 MOUNTING CONFIGURATION & CHAMBER CONSTRUCTION

	Connection orientation	Chamber top	Chamber bottom
A	Side / Side	Welded end plate	Threaded plug (NPT)
B	Side / Side	Threaded plug (NPT)	Welded end plate
1	Side / Side	Welded end plate	Flange
2	Side / Side	Flange	Welded end plate

4 CHAMBER/FLANGE RATING

A	ASME 150# CHAMBER & PROCESS FLANGES
B	ASME 300# CHAMBER & PROCESS FLANGES
1	ASME 150# CHAMBER FLANGES EN 1092-1 PN16 PROCESS FLANGES
2	ASME 300# CHAMBER FLANGES EN 1092-1 PN25 PROCESS FLANGES
3	ASME 300# CHAMBER FLANGES EN 1092-1 PN40 PROCESS FLANGES

5 MATERIAL OF CONSTRUCTION

A	316/316L stainless steel chamber
B	316/316L stainless steel chamber with carbon steel fittings & flanges
C	304/304L stainless steel chamber
D	304/304L stainless steel chamber with carbon steel fittings & flanges

6 CONSTRUCTION GRADE

A	Industrial PED
1	Industrial non-PED
8	Industrial Grade (extruded outlet), Non-PED

7 CHAMBER FLANGE TYPE

N	No chamber flange (Available only when digit 3 = A or B)
A	RF ASME slip-on flange (Available only when digit 3 = 1 or 2)

8 PROCESS CONNECTION TYPE

A	RF ASME slip-on flange (Available only when digit 4 = A or B)
M	Threaded NPT-M (male), up to 1 1/2" (Available only when digit 6 is A or 1 and digit 3 = A or B)
R	Pipe nipple butt weld end, up to 1 1/2" (Available only when digit 4 = A or B)
B	RF ASME weld neck flange up to 1 1/2" (Available only when digit 4 = A or B)
8	RF weld neck flange EN 1092-1 Type 11 - B1 (Available only when digit 4 = 1, 2 or 3)

9 PROCESS CONNECTION SIZE

ASME

A	1/2" (Available only when digit 6 is A or 1)
B	3/4" (Available only when digit 6 is A or 1)
C	1"
D	1 1/2"
E	2" (machined to 1" size)

EN 1092-1

1	DN 15
2	DN 20
3	DN 25
4	DN 40

10 GASKET STYLE FOR CHAMBER FLANGE (IF APPLICABLE)

N	None (digit 3 = A or B)
A	Flexible fibre ring (digit 3 = 1 or 2)

11 CHAMBER BOLTING MATERIAL

N	None (digit 3 = A or B)
M	Alloy steel A-193 Gr. B7 / A-194 Gr. 2H (Available only when digit 3 = 1 or 2 and digit 5 = B or D)
C	316 SST A-193 Gr.B8M CLASS 2 / A-194 Gr.8M
S	Alloy steel with zinc plating A-193 Gr B7 / A-194 Gr 2H (+200 °C (+390 °F) is max. temp for zinc-plated bolting) (Available only when digit 3 = 1 or 2 and digit 5 = A or C)

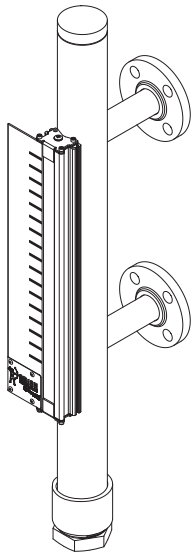
12-13 VENT SIZE & TYPE

NN	None
11	1/2" NPT with hex plug
21	3/4" NPT with hex plug

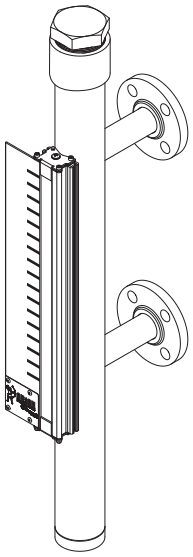
14-15 DRAIN SIZE & TYPE

NN	None
11	1/2" NPT with hex plug
21	3/4" NPT with hex plug

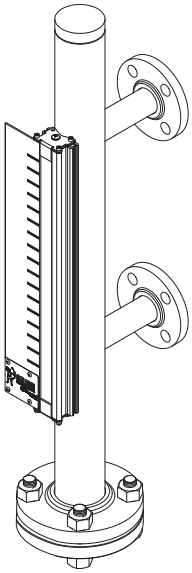
3 MOUNTING CONFIGURATION & CHAMBER CONSTRUCTION



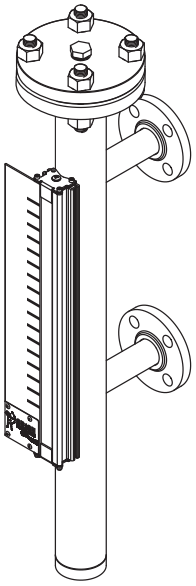
Option **A**



Option **B**

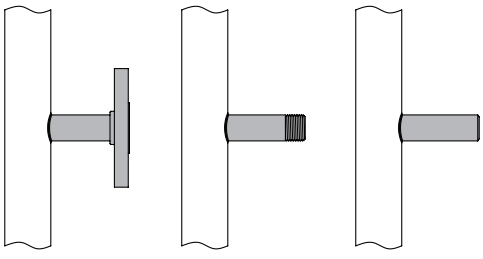


Option **1**



Option **2**

8 PROCESS CONNECTION TYPE



Flange Option **A**

Threaded NPT-M Option **M**

Butt weld Option **R**

Model: ☐☐☐-☐☐☐☐-☐☐☐☐-☐☐☐☐☐☐☐☐☐☐

Digit: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

16 CHAMBER MODIFICATION FOR MOUNTING OF OPTIONAL SWITCHES AND/OR TRANSMITTER

VECTOR can be combined with various externally mounted accessories, including switches and transmitters. In these cases minor changes to the chamber and float design may be required.
For digit 16, match up the MLI product with the appropriate transmitter, switch or combination of both.
For OES/ORS switch, refer to the switch selection data for temperature limitations and insulation options. Match up the switch model code digit 7 with the MLI model codes 16 and 17.
For OCT transmitter, refer to digit 17 for temperature limitations and match up the OCT model code with the MLI model codes 16 and 17.
For Jupiter transmitter, refer to digit 17 for temperature limitations and possible mounting configurations. Match up the Jupiter model code with the MLI model codes 16 and 17.
If SIL enhanced Jupiter transmitter is required then use Atlas model with float diagnostics indicator, instead of Vector model.
All transmitters and switches must be ordered separately.

N	No switch or transmitter added

Switch only (no transmitter)	
Y	OES or ORS switch(es) clamp mounted to chamber

OCT reed chain transmitter (no switches)	
8	Top mount
9	Bottom mount

Jupiter magnetostrictive transmitter only (no switches)	
1	Top mount without offset ① max. 79 to 316 °C (175 to 600 °F) with insulation (digit 17 = K)
2	Top mount offset, with or without high temperature bend
3	Bottom mount offset, with or without high temperature bend

Jupiter magnetostrictive transmitter with at least one OES or ORS switch	
Mounting of Jupiter	clamp mounted to chamber
Top mount without offset ①	A ②
Top mount offset, with or without high temperature bend	B
Bottom mount offset, with or without high temperature bend	C

① Available only in combination with digit 3 = 1 or A and digit 13 = N or 1.

② Jupiter: max. 79 to 454 °C (175 to 850 °F) with insulation (digit 17 = K).

17 INSULATION OPTIONS

N	None	Indicator: ≤ 121 °C (250 °F) OES switch: max. 93 °C (200 °F)	ORS switch: max. 93 °C (200 °F) OCT transmitter: max. 93 °C (200 °F)	Jupiter transmitter: max. 79 °C (175 °F)

Insulation pad for indicator and/or transmitter			
E	Indicator only	digit 16 = N, Y and digit 18 = 4 or 8	121 to 316 °C (250 to 600 °F)
K	Jupiter only	digit 16 = 1, 2, 3, A, B, C	79 to 316 °C (175 to 600 °F)
M	Indicator & Jupiter	digit 16 = 2, 3, B, C	121 to 316 °C (250 to 600 °F)
Z	OCT transmitter only	digit 16 = 8, 9	93 to 371 °C (200 to 700 °F)

18 MEASUREMENT TYPE & INDICATION STYLE

Total level

2	Yellow / black plastic flags
3	Red / white plastic flags (standard)
4	Red / silver metal flags

Interface level ③

6	Yellow / black plastic flags
7	Red / white plastic flags (standard)
8	Red / silver metal flags

③ Use with digit 21 = 9 and digit 22 = 9.

19 MEASURING SCALE

N	No scale	4	Percent (markings in increments of 5 %)
1	Feet / inches	7	Meters / Millimeters
3	Running inches	8	Meters / Centimeters

20 CHAMBER CODE

1	2" S10	7	2" Sch 5 (Available only in combination with digit 6 = 1)

21-22 FLOAT CODE

Total level measurement
Float types 2 and B (digit 21) cover full 150 # rating of carbon steel and 316/316L SST flanges up to 260 °C (500 °F).
Float type D (digit 21) covers full 300 # rating of 316/316L SST flanges up to 260 °C (500 °F) and of carbon steel flanges up to 200 °C (400 °F).
Pressure rating of float type D: max. 74.7 bar @ 40 °C (1083 psi @ 100 °F), max. 35.8 bar @ 260 °C (519 psi @ 500 °F);
hydrotest pressure: 89.6 bar @ 40 °C (1300 psi @ 100 °F).

Chamber rating	150 #, PN 16, PN 25 ④		300 #, 600 #, PN 25, PN 40, PN 63, PN 100
Float material	316 SST	Ti ⑤	Ti ⑤
Oper. S.G.	Code ⑥	Code ⑥	Code ⑥
0,55 - 0,64	—	BE	-
0,65 - 0,74	—	BE	DE
0,75 - 0,84	2C	BB	DC
0,84 - 0,94	2B	BB	DB
0,95 - 1,04	2B	BB	DB

④ Float types 2 and B (digit 21) do not cover full PN 25 rating of flanges in some cases; check the application data (pressure/temperature) with the float graphs before selecting one of these floats.

⑤ Titanium float is factory default

⑥ Code 99 is used for special float. Depending on the application a factory assigned code different from the listed ones is possible.

Interface level measurement

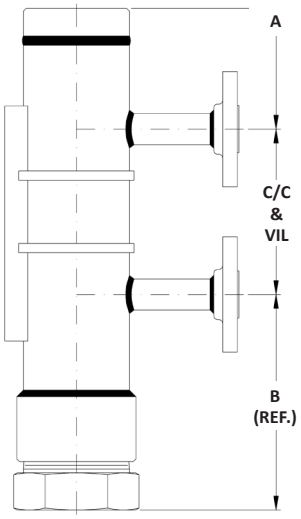
99	Special float

23-25 CENTER-TO-CENTER & VISUAL INDICATION LENGTH

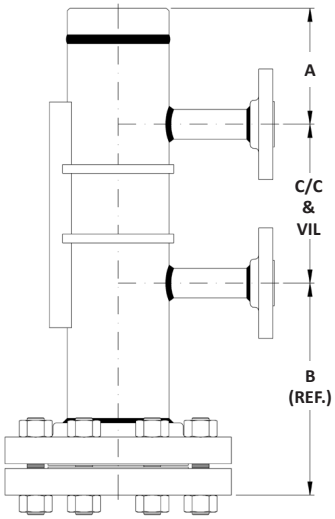
X X X	Specify in **INCHES** (maximum = 212") when model code 2 is **E** (minimum = 12") Specify in **CENTIMETERS** (maximum = 538 cm) when model code 2 is **M** (minimum = 30 cm)

Example #1: Center-to-Center is 84 inches. Enter as 084. (model digit 2 must be "E")
Example #2: Center-to-Center is 124 centimeters. Enter as 124. (model digit 2 must be "M")
Example #3: Center-to-Center is 124.25 inches. Enter as 124 inches and X the model for 124.25 inches. Consult factory for assistance.
Example #4: Center-to-Center is 724 millimeters. Enter as 072 centimeters and X the model for 724 millimeters.
Consult factory for assistance.

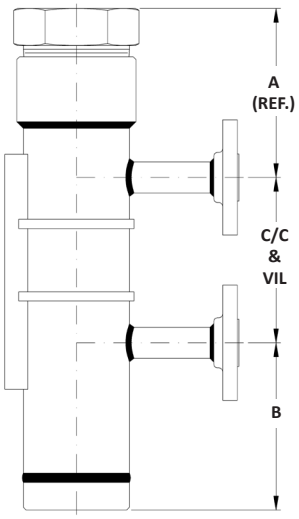
DIMENSIONS ①



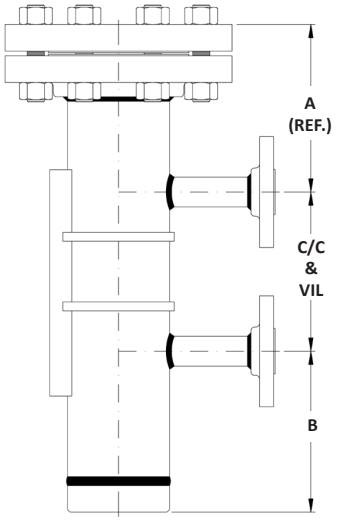
Digit 3 = A



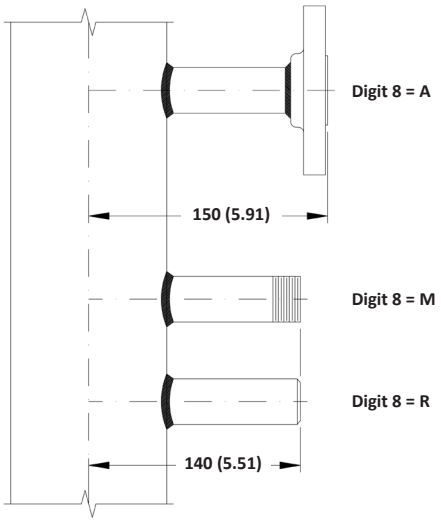
Digit 3 = 1



Digit 3 = B



Digit 3 = 2



① Consult factory

SPECIFICATIONS | VECTOR™ MAGNETIC LEVEL INDICATOR

Product name	Vector™
Materials of construction – Chamber	316/316L stainless steel, 304/304L stainless steel
	Carbon steel process connections and fittings available
– Rail & window	Aluminum rail with polycarbonate window
– Float	316 stainless steel and titanium - *varies depending on process conditions*
Construction grade	Industrial PED or non-PED
Approvals	Industrial PED units: ATEX II 1 G c T6 (non-electrical equipment)
Certified material test report (CMTR)	Available upon request
Pressure class ratings	ASME 150# & 300#
Process connection sizes	1/2" 3/4" 1" 1 1/2" 2"
Process connection types	Flanged, threaded nipple, butt weld nipple
Measuring range	30 cm to 538 cm (12" to 212")
Temperature range	-40 to +316 °C (-40 to +600 °F)
Pressure range	Full vacuum to 51 bar (740 psi)
	All chambers are hydrostatically tested at 1.5× design pressure
Specific gravity	Min 0.55
Visual indicators	Magnetically actuated flag assembly in contrasting orange/black, yellow/black,
	red/white or red/silver colors
Maximum viewing distance	Approximately 30 m (100 ft)
Measuring scale	Feet/inches, meters/millimeters, running inches, %
Switch options	Model OES electric cam operated snap action switch (refer to bulletin BE 46-138)
	Model ORS electric reed switch (refer to bulletin BE 46-138)
Transmitter options	Model JM4 magnetostrictive transmitter (refer to bulletin ORI-150)
High temperature insulation	Fiberglass material

ACCESSORIES

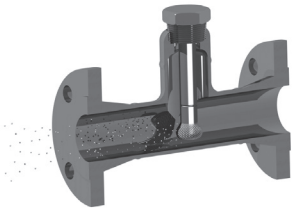
Electric point level switches

Model: OES
10 A DPDT snap action switch

Model: ORS
1 A SPDT reed switch

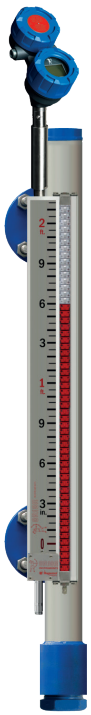
Magnetic particle trap

Ideal for process media containing ferrous particles. These particles can enter the MLI chamber and coat the magnetic float rendering it inoperable. The trap will collect these particles so that they can be periodically removed.



Continuous level transmitters

Model: Jupiter
Magnetostrictive transmitter



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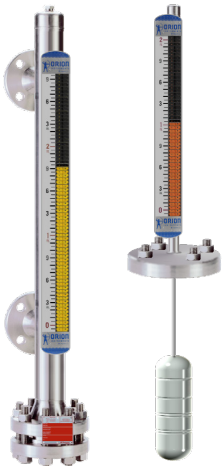
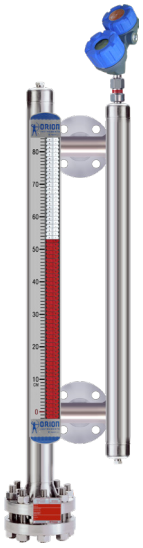


Atlas™

Magnetic Level Indicator (MLI)

Aurora®

MLI with integral guided wave radar



Gemini™

Dual-chamber MLI

Jupiter®

Magnetostrictive tansmitter

QUALITY ASSURANCE - ISO 9001

THE QUALITY ASSURANCE SYSTEM IN PLACE AT MAGNETROL GUARANTEES THE HIGHEST LEVEL OF QUALITY DURING THE DESIGN, THE CONSTRUCTION AND THE SERVICE OF CONTROLS.
OUR QUALITY ASSURANCE SYSTEM IS APPROVED AND CERTIFIED TO ISO 9001 AND OUR TOTAL COMPANY IS COMMITTED TO PROVIDING FULL CUSTOMER SATISFACTION BOTH IN QUALITY PRODUCTS AND QUALITY SERVICE.

PRODUCT WARRANTY

ALL MAGNETIC LEVEL INDICATORS ARE WARRANTED FREE OF DEFECTS IN MATERIALS AND WORKMANSHIP FOR FIVE FULL YEARS (MECHANICAL PARTS) / 18 MONTHS (ELECTRONIC PARTS) FROM THE DATE OF ORIGINAL FACTORY SHIPMENT.
IF RETURNED WITHIN THE WARRANTY PERIOD; AND, UPON FACTORY INSPECTION OF THE CONTROL, THE CAUSE OF THE CLAIM IS DETERMINED TO BE COVERED UNDER THE WARRANTY; THEN, MAGNETROL INTERNATIONAL WILL REPAIR OR REPLACE THE CONTROL AT NO COST TO THE PURCHASER (OR OWNER) OTHER THAN TRANSPORTATION.
MAGNETROL SHALL NOT BE LIABLE FOR MISAPPLICATION, LABOR CLAIMS, DIRECT OR CONSEQUENTIAL DAMAGE OR EXPENSE ARISING FROM THE INSTALLATION OR USE OF THE EQUIPMENT. THERE ARE NO OTHER WARRANTIES EXPRESSED OR IMPLIED, EXCEPT, SPECIAL WRITTEN WARRANTIES COVERING SOME MAGNETROL PRODUCTS.

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EFFECTVE: MARCH 2020
SUPERSEDES: April 2019

UNDER RESERVE OF MODIFICATIONS

European Headquarters & Manufacturing Facility
Heikensstraat 6
9240 Zele, Belgium
Tel: +32-(0)52-45.11.11 • Fax: +32-(0)52-45.09.93
e-mail: info@magnetrol.be

www.magnetrol.com