CATALOG

actuators

AR Series

Rotary Actuator

numatics

EMERSON
Industrial Automation

www.numatics.com

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Rev. 1/09

Rotary Actuator Utilizes a Dual Rack-n-Pinion System

The Torque Rack produces the Rotary output Torque while the control Rack determines Rotary stroke.

The output shaft is supported by two angular contact Bearings. The ***NuMate***™ mounting feature provides a convenient method of mounting the AR-Rotaries to the SH-Series linear slide.

A. Body:

Hardcoat Anodized Aluminum..... Lightweight, durable, High strength to weight ratio, Teflon® impregnated inside and out

Multiple mounting surfaces ..... Flexible, easy access mounting

B. Output Shaft:

Hardened electroless nickel.....Corrosion and wear resistance

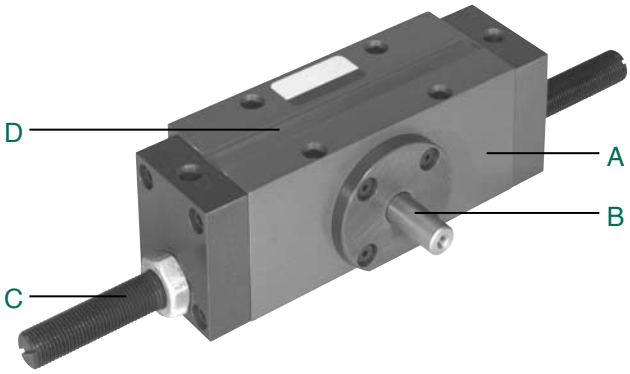
Angular Contact Bearings Two angular contact bearings better supporting both thrust and Radial loads.

C. Stroke Adjustment:

C.W. and C.C.W. Adjustment over 185° total stroke ..... Infinite adjustment in both directions of rotation, secured by jam nut

D. Sensor Mounting Channel:

Machined into body.....Accepts Numatics Motion Control dovetail switches, Easy access, easy adjustment



Magnetic piston is standard on all models.

Permanently lubricated seals are standard on all models, no lube required.
Viton compound for high temperature applications, optional.

Factory lubricated, fluorinated grease. Non-toxic, non-migrating and no chlorine, silicones or chlorofluorocarbons (CFCs). Cleanroom applied.

Additional options:
- Shock absorbers
- Double output shaft

How to Order

AR 020 A 1 A Z C 1 X

Bore Sizes
020 = 20 mm
025 = 25 mm
032 = 32 mm

Rotation
A = 90°-180˚

Seal Option
1 = Buna
2 = Viton

Shaft Option
A = Standard Single Shaft End
Z = Additional Double Shaft End*
*Tapped both ends.

Disk Size**
A = ND020
B = ND025
C = ND032
X = No Disk.

Shock Options
1 = Shocks Yes
2 = Shocks No

Sensing Position
A = Single Position CW
B = Single Position CCW
C = Two Position
D = No Sensing

Sensing Type
Standard Cord Set
1 = Hall Effect - PNP (sourcing)
2 = Hall Effect - NPN (sinking)
3 = Reed Switch
6 = No Sensing
Quick Disconnect Cord Set
Z = Hall Effect - PNP (sourcing)
Y = Hall Effect - NPN (sinking)
X = Reed Switch
See page 7.

Example order:

Part Number: AR020A1AZC1X*
Part Description: AR rotary with 20mm bore, 90° rotation, standard seals, standard single output shaft, Hall PNP quick disconnect sensing, two positions, with shocks without *NuMate*™ disk.

*When entering an order, DO NOT use spaces or dashes. Follow example above.

Sensing Kits

STANDARD CORD SET SWITCH	PART NO.
Hall Effect PNP (Sourcing)	HPNPS31
Hall Effect NPN (Sinking)	HNPNS32
Reed Switch	RSS02
QUICK DISCONNECT CORD SET	**PART NO.**
Hall Effect PNP (Sourcing)	HPNPQ31
Hall Effect NPN (Sinking)	HNPNQ32
Reed Switch	RSQ02
90° 5 meter cable	PXC90
Straight 5 meter cable	PXCST

Replacement Components and Kits

AR Rotary Seal Kit

SERIES	BUNA	VITON
AR020	ARSKB-020	ARSKV-020
AR025	ARSKB-025	ARSKV-025
AR032	ARSKB-032	ARSKV-032

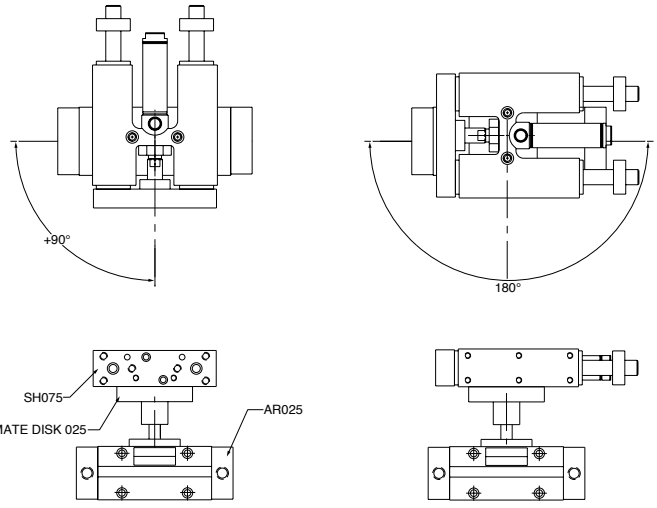
REPLACEMENT	SHOCKS
AR020	SK030
AR025	SK106
AR032	SK106

NuMate™ Disk

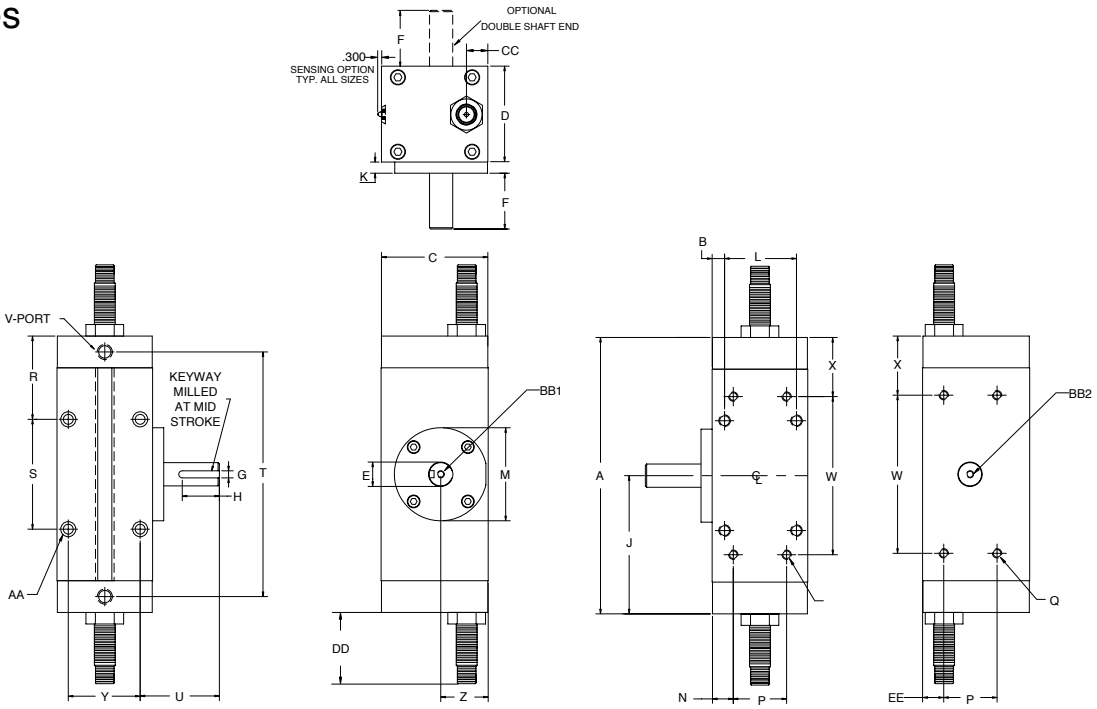
The *NuMate*™ Disk provides a simple solution for combining Rotary and Linear motion

**Compatibility Table

AR Series	SH Series	ND
AR020	SH056	ND020
AR025	SH075	ND025
AR032	SH106	ND032



AR Series

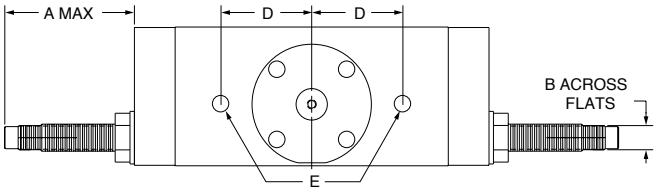


	AR020	AR025	AR032
A	5.18	6.43	7.43
B	0.22	0.22	0.33
C	1.83	2.25	2.89
D	1.76	2.12	2.56
E	0.37	0.47	0.63
F	1.00	1.00	1.50
G	0.093 X 0.054/0.058 DP	0.125 X 0.070/0.074 DP	0.187 X 0.105/0.110 DP
H	0.65	0.75	1.00
J	2.58	3.21	3.71
K	0.24	0.25	0.30
L	1.31	1.57	1.94
M	1.87	2.125	2.50
N	0.47	0.49	0.56
P	0.81	1.13	1.44
Q	10-32	1/4-20	1/4-20
R	1.50	2.02	2.23
S	2.16	2.37	2.96
T	4.46	5.71	6.57
U	1.46	1.75	2.13
V	1/8 NPT	1/8 NPT	1/8 NPT
W	3.38	3.81	4.26
X	0.90	1.30	1.58
Y	1.31	1.57	1.94
Z	0.80	0.98	1.27
AA	C' Bored for M4 SHCS, Tapped M5 X 0.8 from opposite side	C' Bored for M5 SHCS, Tapped M8 X 1.25 from opposite side	C' Bored for M6 SHCS, Tapped M8 X 1.25 from opposite side
BB1	M3 X 0.5	M5 X 0.8	M5 X 0.8
BB2	M3 X 0.5	M5 X 0.8	M5 X 0.8
CC	0.40	0.51	0.58
DD	1.31	1.50	1.81
EE	0.40	0.42	0.56

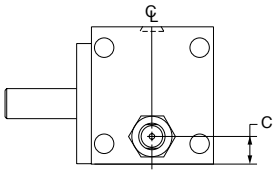
AR Series

MODEL	TORQUE @ 100PSI	DYNAMIC THRUST LOAD	DYNAMIC RADIAL LOAD	DISPLACEMENT PER DEGREE	UNIT WEIGHT	MAXIMUM PRESSURE
AR020	14.6 inlb (1.6 N-m)	106 lbf (471 N)	421 lbf (1872 N)	0.0026 cuin. (0.043 cc)	2.3 lbs	250 psi
AR025	29.4 inlb (3.3 N-m)	127 lbf (564 N)	501 lbf (2228 N)	0.0052 cuin. (0.085 cc)	3.1 lbs	250 psi
AR032	61.3 inlb (6.9 N-m)	191 lbf (849 N)	677 lbf (3011 N)	0.0108 cuin. (0.177 cc)	5.7 lbs	250 psi

Shock Option



Face Mounting



	AR020	AR025	AR032
A	2.70	2.70	2.75
B	0.49	0.49	0.49
C	0.40	0.51	0.58
D	1.69	1.90	2.12
E	M5	M6	M8

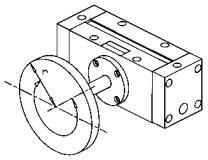
Kinetic Energy Basic Formula

$$KE = 1/2\ J\ \omega^2$$

$$\omega = 0.035\ X\ \frac{\text{Angle traveled (deg.)}}{\text{Rotation time (sec)}}$$

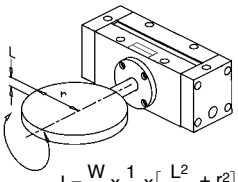
KE = Kinetic Energy
J = Rotational mass moment of inertia (in-lb-sec^2)
(dependent on physical size of object and weight)
W = Peak Velocity (rad/sec) (Assuming twice average velocity)
W = Weight of load (lb)
g = Gravitational constant = 386.4 in/sec^2
r = Radius of gyration (in)

Thin Disk Mounted on Center



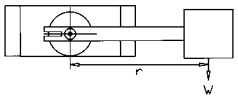
$$J = \frac{W}{g} \times \frac{r^2}{2}$$

Thin Disk End Mounted on Center



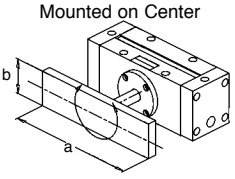
$$J = \frac{W}{g} \times \frac{1}{4} \times \left[\frac{L^2}{3} + r^2\right]$$

Point Load



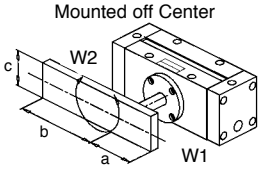
$$J = \frac{W}{g} \times r^2$$

Thin Rectangular Plate Mounted on Center



$$J = \frac{W}{g} \times \frac{a^2 + b^2}{12}$$

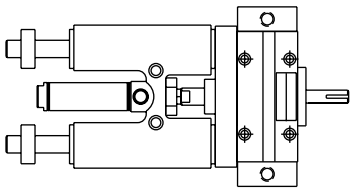
Rectangular Plate Mounted off Center

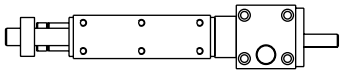


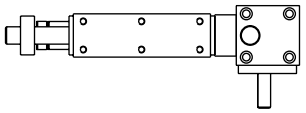
$$J = \frac{W1}{g} \times \frac{4a^2 + C^2}{12} + \frac{W2}{g} \times \frac{4b^2 + C^2}{12}$$

NuMate™ Direct Mount, Mounting System

The *NuMate™* mounting system provides a standard series of drilled, tapped and counterbored holes allowing each slide series to mount with each other and other slide series in various combinations without the use of adapter, transition plates or other costly methods. The *NuMate™* mounting system is the most versatile mounting method of its kind, providing customers with a cost effective method of building modular component automation. The *NuMate™* mounting system is consistent across the *Numatics Motion Control* spectrum of products for automation.





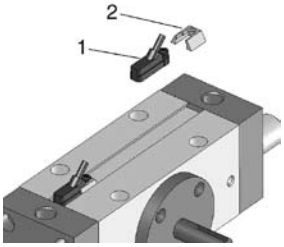


Compatibility Table

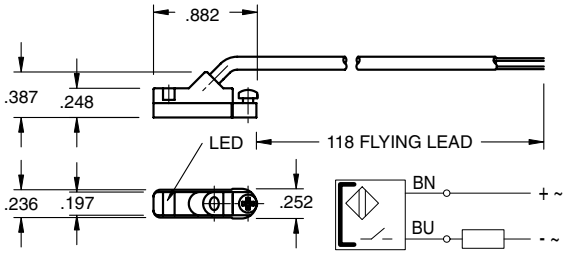
SH SERIES	AR SERIES
SH075	AR020
SH106	AR025
SH150	AR032

AR Series Switch Information

	SWITCH OR BRACKET DESCRIPTION	STANDARD PART NO.	QUICK DISCONNECT PART NO,
1	Hall Effect - PNP (Sourcing)	HPNPS31	HPNPQ31
1	Hall Effect -NPN (Sinking)	HNPNS32	HNPNQ32
1	Reed Switch	RSS02	RSQ02
2	Dovetail Bracket	DSA	DSA



RSS02 – Reed Switch (AC/DC NO), flying lead



Sensing Data

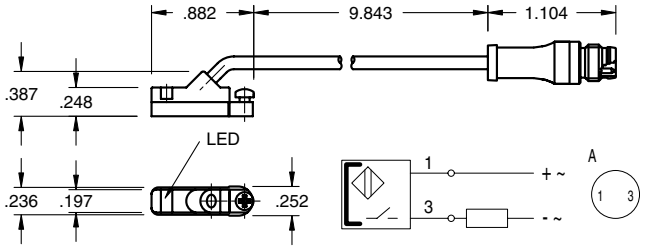
Ambient temperature range T_a	(°F/°C)	-4 to 176 (-20 to 80)
Frequency of operating cycles f at U_e	(kHz)	0.5
Turn on time t	(ms)	<= 0.25
turn off time t	(ms)	0.03
LED function indication		yes

Electrical Data

Rated operational voltage U_e	(V)	3...130 AC/DC
Supply voltage U_B	(V)	3...130 AC/DC
Voltage drop U_d at I_e Stat./dyn.	(V)	3.5
Rated insulation volatage U_i	(V)	2750 DC (EN 60335-1)
Rated supply frequency	(Hz)	AC/DC
Rated operational current I_e	(mA)	50 (10W max.)
No-load supply current I_o at U_e d./und.	(mA)	0

Observe polarity for correct LED function

RSQ02 – 8mm connector

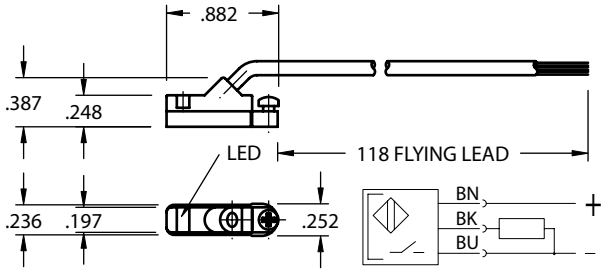


Mechanical Data

Housing material		Polyamide
Material of sensing face		Polyamide
Connection		PVC cable
Degree of Protection	IP	67

Rated shock: half-sinus, 50g, 11 ms
Rated vibration environment: 10g, 10...2000 Hz. 90 min

HPNPS31 – Electronic Switch (PNP NO), flying lead



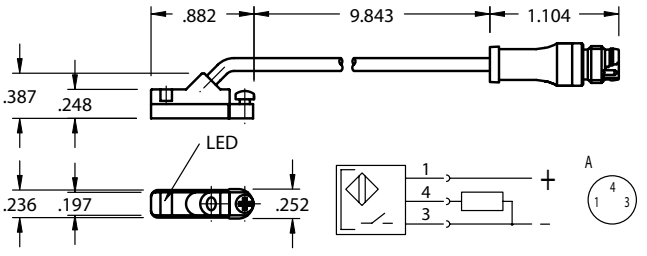
Sensing Data

Ambient temperature range $_d$	(°F/°C)	-13 to +158 (-25 to +70)
Temperature drift	(% of)	<= 0.3%/°C
Frequency of operating cycles f at U_e	(kHz)	10
Turn on time t	(ms)	.05
turn off time t	(ms)	.05
Utilization categories		DC13
Function–/supply voltage indication		YES

Electrical Data

Rated operational voltage U_e	(V)	24 DC
Supply voltage U_B	(V)	10...30 DC
incl. ripple	(% of U_e)	15
Voltage drop U_d at I_e Stat./dyn.	(V)	1/–
Rated insulation volatage U_i	(V)	75 AC
Rated supply frequency	(Hz)	DC
Rated operational current I_e	(mA)	200
No-load supply current I_o at U_e d./und.	(mA)	25/13
Protected against polarity reversal		YES

HPNPQ31 – 8mm connector

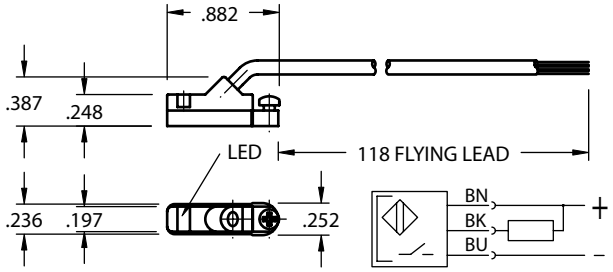


Mechanical Data

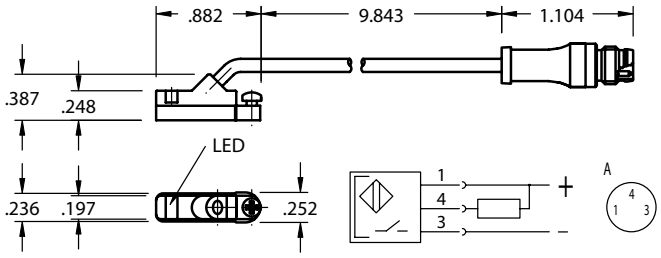
Housing material		Polyamide
Material of sensing face		Polyamide
Connection		PVC cable
Degree of Protection	IP	67

Rated shock: half-sinus, 30 g, 11 ms
Rated vibration environment: 55 Hz, 1mm amplitude, 3 x 30

HNPNS32 – Electronic Switch (NPN NO), flying lead



HNPNQ32 – 8mm connector



Sensing Data

Ambient temperature range $_d$	(°F/°C)	-13 to +158 (-25 to +70)
Temperature drift	(% of S_r)	<= 0.3%/°C
Frequency of operating cycles f at U_e	(kHz)	10
Turn on time t	(ms)	.05
turn off time t	(ms)	.05
Utilization categories		DC13
Function–/supply voltage indication		YES

Electrical Data

Rated operational voltage U_e	(V)	24 DC
Supply voltage U_B	(V)	10...30 DC
incl. ripple	(% of U_e)	15
Voltage drop U_d at I_e Stat./dyn.	(V)	1/–
Rated insulation volatage U_i	(V)	75 AC
Rated supply frequency	(Hz)	DC
Rated operational current I_e	(mA)	200
No-load supply current I_o at U_e d./und.	(mA)	25/13
Protected against polarity reversal		YES

Mechanical Data

Housing material		Polyamide
Material of sensing face		Polyamide
Connection		PVC cable
Degree of Protection	IP	67

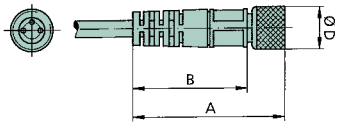
Rated shock: half-sinus, 30 g, 11 ms
Rated vibration environment: 55 Hz, 1mm amplitude, 3 x 30

Female Connectors for Reed Switches and Hall Effect Sensors

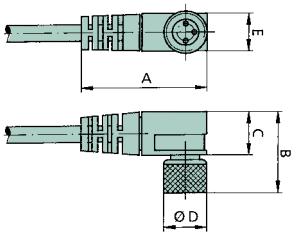
Dimensions (mm)

TYPE	ORDER CODE
Straight, 5 m Cable	PXCST
Elbow, 5 m Calbe	PXC90

Straight Type



Elbow Type



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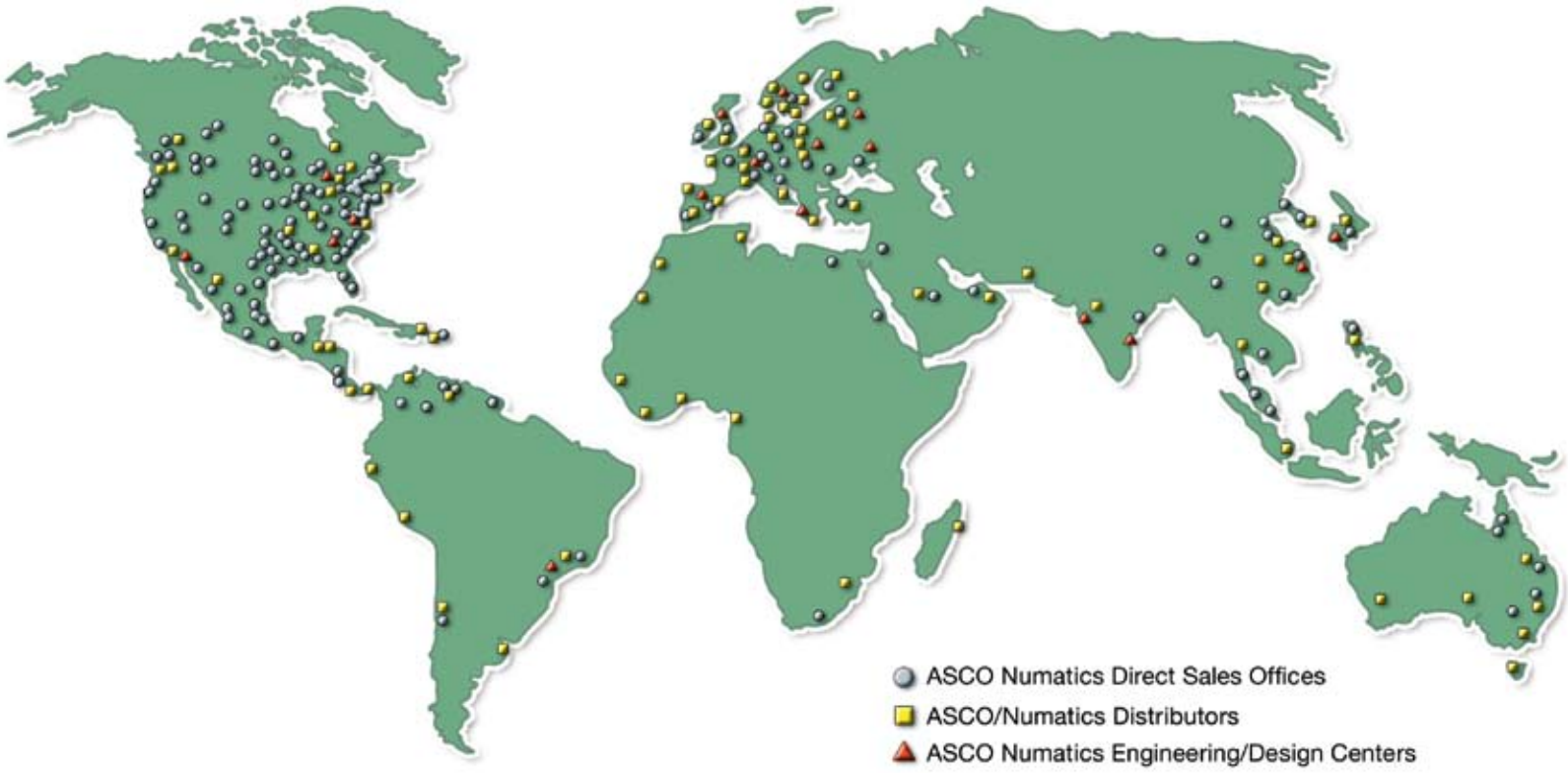

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