

## RHM

### 015L/02L/03L/04L

#### Compact Low Flow Coriolis Flow Sensors

### 사양

- 압력 적용 범위 20000 psi / 1379 bar
- 온도 적용 범위 -196 ~ +350°C (-320 ~ +662°F)
- 질량 유량 정밀도 0.10% (골드라인 기준)
- 재현성 0.05%
- 응답성 30ms 이내
- 유량 범위 1 g/min ~ 30 kg/min
- 센싱 튜브에 따라 parallel 및 serial 구성 가능
- 오메가 디자인 : 유일한 대칭형 기준 진동 시스템
- 맞춤형 connection 제작 가능
- 작은 공간에 적합한 소형 디자인
- 방폭 지역 사용 인증 완료
- StainlessSteel 외함 가능
- 유지보수가 쉬운 분리형 manifold connection
- 분리형이며 소형의 트랜스미터

### 적용

- 일반 유량 측정
- 고압 가스 Dispensing
- Additive Dosing
- Mixing and Batching (정량 제어)
- Chemical Injection
- Package and Container Filling
- 폴리우레탄, 페인트, 접착제

### 장점

- 대칭형 기준 진동자 디자인은 외란 영향을 적게 받아 안정적이고 탁월한 측정이 보장된다.
- 외부 노이즈 및 진동에 영향 받지 않는다.
- 배관 압력 변화에 민감하지 않다.
- 견고하고 두꺼운 센서 튜브는 안전한 운전 성능 보장
- 대칭형 기준 진동으로 기계적인 스트레스 영향이 적어 센서의 내구성 보장
- 동작 부분이 없어 고장이 없다.
- 고성능(goldline) 센서 선정 가능

## General Specification Overview

	RHM015L	RHM02L	RHM03L	RHM04L
<b>Nominal Flow (<math>Q_{nom}</math>)*</b>	0.8 kg/min (1.76 lb/min)	2 kg/min (4.4 lb/min)	6 kg/min (13.2 lb/min)	15 kg/min (33 lb/min)
<b>Maximum Flow (<math>Q_{max}</math>)*</b>	1.8 kg/min (3.97 lb/min)	4 kg/min (8.8 lb/min)	12 kg/min (26.4 lb/min)	30 kg/min (66 lb/min)
<b>Minimum Flow (<math>Q_{min}</math>)*</b>	0.008 kg/min (0.018 lb/min)	0.050 kg/min (0.11 lb/min)	0.1 kg/min (0.22 lb/min)	0.2 kg/min (0.44 lb/min)
<b>Serial Tube/ Single Path Versions</b>	Flow rates $Q_{nom}$ , $Q_{max}$ , $Q_{min}$ will be 50% of the above listed parallel/dual tube version of the same size			
<b>Operating Temperature</b>	Temperature range options cover applications from -196°C to 350°C (-320°F to 662°F)			
<b>Pressure Ratings</b>	Up to 1379 bar / 20000 psi - dependent upon material			
<b>Electrical Connection</b>	Cable entry M25 x 1.5 (standard), M20 x 1.5, ½" NPT, ¾" NPT (optional) Max. cable length to remote RHE transmitter 100m / 330ft (300m application dependent)			
<b>Sensor Enclosure Materials</b>	304 stainless steel (standard), 316 stainless steel (optional) Epoxy coated aluminum terminal box (standard), 316 stainless steel terminal box (optional)			
<b>Enclosure Type</b>	Protection class IP 66 / NEMA 4 (standard), NEMA 4X, IP68/69K (optional)			
<b>Wetted Materials</b>	1.4435(316L) / 1.4539 (904L) / 1.4571 (316Ti) / 2.4602 (Alloy C22) 100% Tantalum UNS R05200 (ideal for hydrochloric acids) Sandvik HP160 (ideal for very high pressure hydrogen), 1.4410 (SuperDuplex) Standard seal types (manifold construction): FKM, FFKM, FVQM Additional/customer specific materials available upon request			
<b>Process Connections</b>	Nearly any - <b>the RHEONIK Connectivity Promise</b> . Consult factory for types not listed			
<b>Pressure Rating Compliance</b>	Europe - PED according to Sound Engineering Practice (SEP)			
<b>Certifications and Approvals</b>	ATEX / IECEx Approvals for zone 0 and 1 (suitably rated RHE required), ATEX rating for zone 2 North American Approvals for Class I, Div. 1, Groups ABCD (suitably rated RHE required) American Bureau of Shipping (ABS) Product Type Approval for use on marine vessels			
<b>Documentation, Testing and Inspection</b>	All sensors are hydro tested, calibrated and supplied with a traceable calibration certificate. Customized calibration and testing services available			
<b>Project Documentation and QA Services</b>	Rheonik offers of full set of services for large and complex engineering projects. Typical services offered are, but not limited to: <ul style="list-style-type: none"> <li>▪ Certificates of origin and conformity, mill certificates</li> <li>▪ Data books including WPAR, WQS, NDT, test &amp; quality plans, functional testing, calibration procedures, customized packing, factory acceptance etc.</li> <li>▪ Start up and commissioning services on/offshore</li> </ul>			
<b>Options</b>	Enclosure heating for high temperature applications Mounting brackets: wall and floor mounting versions available Cleaning for oxygen service Full service painting to project specifications – consult factory			

\* At  $Q_{nom}$ , pressure drop across a parallel tube sensor will be approximately 3 bar (40 psi) for H<sub>2</sub>O. Sensors can be operated up to  $Q_{max}$  where pressure drop across the sensor can reach up to 20 bar (290psi) and flow velocity within sensor up to 20 m/s. Beyond  $Q_{max}$ , cavitation may occur.  $Q_{min}$  is the recommended lowest flow rate. Sensors will measure flow rates lower than  $Q_{min}$ , but uncertainty will increase beyond 0.5% of rate.

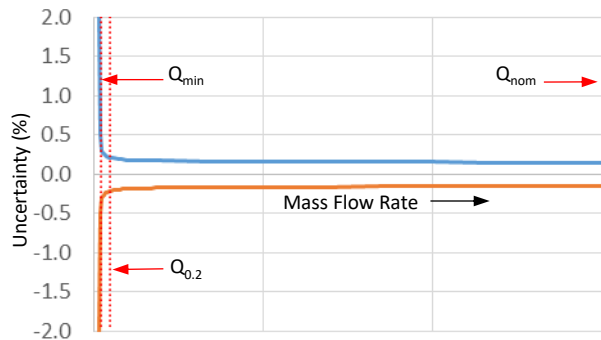
\* The flow specifications above relate to standard pressure parallel tube sensor versions. Models with higher pressure ratings have increased wall thickness and will have higher pressure drops and lower  $Q_{nom}$  values.

## Measurement Performance

### Standard Calibration A or B

A	<b>0.5% Uncertainty</b> ±0.5% uncertainty between $Q_{nom}$ and $Q_{min}$
B	<b>0.2% Uncertainty</b> ±0.2% uncertainty between $Q_{nom}$ and $Q_{0.2}$

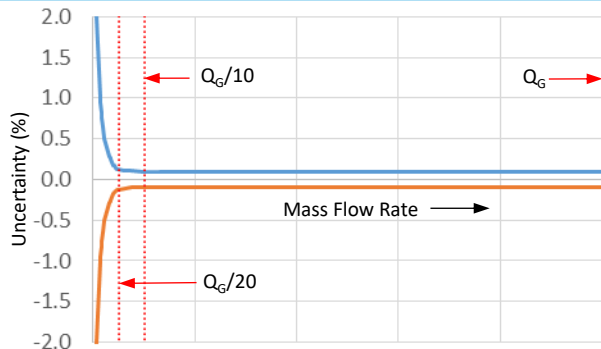
Higher pressure units may have lower  $Q_{nom}$  values due to reduced tube ID



### Goldline (Selected Sensor) Calibration G or P

G	<b>0.12% Uncertainty</b> ±0.12% uncertainty between $Q_G$ and $(Q_G/20)$
P	<b>0.1% Uncertainty</b> ±0.1% uncertainty between $Q_G$ and $(Q_G/10)$

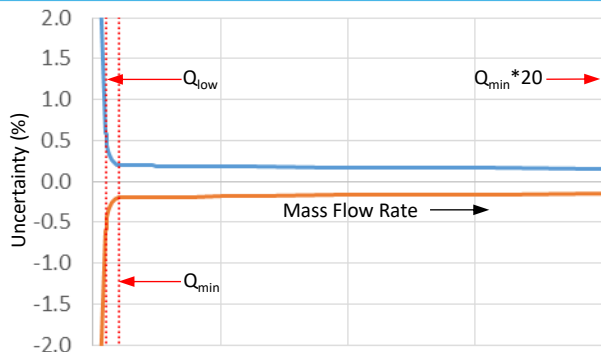
Only for sensors with standard temperature and pressure range  
Customized calibration services are available – consult factory



### Low Flow (Selected Sensor) Calibration C or 1

C	<b>1:20 Turn Up Calibration</b> ±0.2% uncertainty between $Q_{min}$ and $(Q_{min} * 20)$
1	<b>Low Flow Optimized Calibration*</b> ±0.2% uncertainty between $Q_{min}$ and $(Q_{min} * 20)$ and ±0.6% uncertainty between $Q_{min}$ and $Q_{low}$

Only for sensors with standard temperature and pressure range  
\* Low flow calibration is not available with RHM02L



	RHM015L	RHM02L	RHM03L	RHM04L
$Q_{max}$	1.8 kg/min (3.97 lb/min)	4 kg/min (8.8 lb/min)	12 kg/min (26.4 lb/min)	30 kg/min (66 lb/min)
$Q_{nom}$	0.8 kg/min (1.76 lb/min)	2 kg/min (4.4 lb/min)	6 kg/min (13.2 lb/min)	15 kg/min (33 lb/min)
$Q_{min}$	0.008 kg/min (0.018 lb/min)	0.05 kg/min (0.11 lb/min)	0.10 kg/min (0.22 lb/min)	0.2 kg/min (0.44 lb/min)
$Q_G$	0.6 kg/min (1.32 lb/min)	2 kg/min (4.4 lb/min)	5 kg/min (11.0 lb/min)	10 kg/min (22 lb/min)
$Q_{0.2}$	0.03 kg/min (0.066 lb/min)	0.10 kg/min (0.22 lb/min)	0.25 kg/min (0.55 lb/min)	0.5 kg/min (1.10 lb/min)
$Q_{low}$	0.003 kg/min (0.007 lb/min)	N/A	0.075 kg/min (0.17 lb/min)	0.1 kg/min (0.22 lb/min)

### Calibration Reference Conditions

Performance statements relate to the following conditions:

- Water
- Temperature: 20 to 23°C (68 to 74°F)
- Pressure at 1 to 3 barg (15 to 45 psig)

### Flow Measurement Repeatability

Standard ± 0.1% of rate  
Goldline ± 0.05% of rate

### Density Performance Options

Density calibration can be provided with the RHM02L/03L/04L sensor only

N	Density/volume flow indication is available using RHE FixDens function (no density calibration)
S	Standard density calibration, 0.5% uncertainty of reading
D	Advanced density calibration, 0.2% uncertainty of reading

### Temperature Performance

Better than ±1°C

## Measurement Tube Pressure Ratings

The maximum pressure ( $P_{max}$ ) of a sensor is determined by its lowest rated part. The lowest rated part can be either the measurement tube ( $P_{max}$  indicated below), the construction type ( $P_{max}$  indicated in the Part Number Code section, last page) or the process connection (for  $P_{max}$  see published standards or manufacturer information).

	RHM 015L		RHM 02L		RHM 03L		RHM 04L	
P1	904 L		904 L		316 Ti		316 L	
	bar	psi	bar	psi	bar	psi	bar	psi
50°C / 122°F	362	5250	345	5000	275	3985	170	2465
120°C / 248°F	300	4350	300	4350	250	3625	150	2175
210°C / 410°F	250	3625	292	4235	231	3350	130	1885
350°C / 662°F	200	2900	240	3480	200	2900	110	1595
<b>P1 - Tantalum</b>	bar	psi			bar	psi		
50°C / 122°F	196	2845			160	2320		
120°C / 248°F	150	2175			123	1785		
210°C / 410°F	122	1770			99	1435		
<b>P2 - SS 904L</b>					bar	psi	bar	psi
50°C / 122°F					372	5395	332	4815
120°C / 248°F					300	4351	319	4625
210°C / 410°F					250	3626	281	4075
350°C / 662°F					200	2901	231	3350
<b>P2 - Alloy C22</b>	bar	psi	bar	psi				
50°C / 122°F	612	8875	622	9020				
120°C / 248°F	540	7830	540	7830				
210°C / 410°F	463	6715	470	6815				
350°C / 662°F	384	5570	390	5655				
<b>P2 - Sandvik HP160</b>					bar	psi	bar	psi
50°C / 122°F					630	9135	630	9135
120°C / 248°F					540	7830	540	7830
210°C / 410°F					410	5945	410	5945
<b>PH - Sandvik HP160</b>					bar	psi	bar	psi
50°C / 122°F					1070	15520	1070	15520
120°C / 248°F					900	13050	900	13050
210°C / 410°F					723	10485	723	10485
<b>P3 - Super Duplex</b>	bar	psi	bar	psi				
50°C / 122°F	1070	15520	1070	15520				
120°C / 248°F	900	13055	900	13055				
210°C / 410°F	720	10445	720	10445				
<b>P4 - Super Duplex</b>	bar	psi	bar	psi	bar	psi	bar	psi
50°C / 122°F	1379	20000	1379	20000	1379	20000	1379	20000
120°C / 248°F	1220	17695	1220	17695	1220	17695	1220	17695
210°C / 410°F	1150	16675	1150	16675	1150	16675	1150	16675

## Other Materials

Other wetted materials (e.g. Inconel, Monel, 304 stainless steel, others) may be possible for chemical compatibility, lower pressure drop, abrasion allowance, other application specific requirements.

Contact factory with specification for assessment and availability.

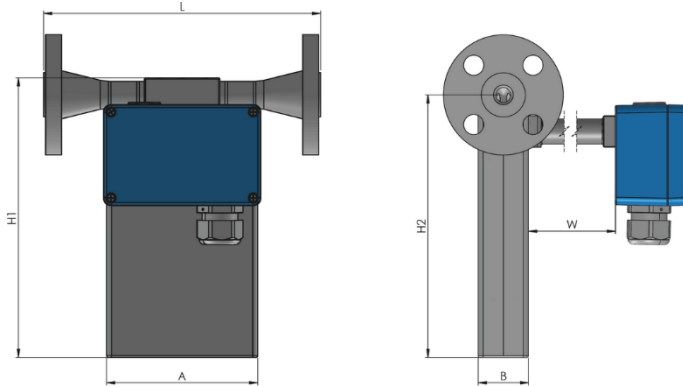
## Mechanical Construction

Sensors are manufactured with two internal measurement tubes arranged side by side. In parallel or dual path sensors (order code Pxx), these tubes are connected in parallel and the flowing fluid is split equally between them. In serial or single path sensors (order code Sxx), the tubes are connected end to end, creating a single path through which all fluid flows. Manifold designs have a removable inlet/outlet manifold block and utilize seals between the manifold and sensor body. In seal-less designs, the measurement tubes are continuous between the process connections and do not have seals. Manifold designs offer shorter delivery lead times and may have a lower pressure drop than seal-less designs for the same flow rate.

### - TYPE 1. Manifold design with seals and flange connections

PM0: parallel/dual path

SMO: serial/single path



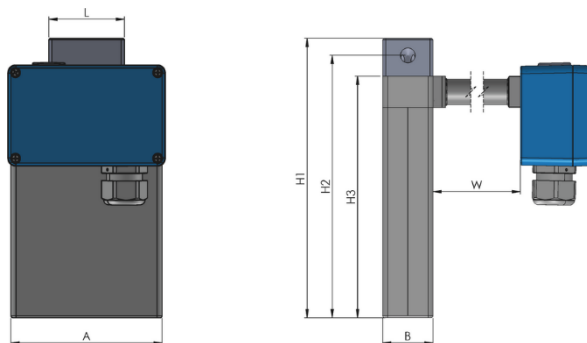
Dimensions on next page

Process Connection	Face to Face (L)		Order Code
	mm	in	
ANSI ½" 150#RF	220	8.66	A1
ANSI ½" 300#RF	220	8.66	A2
ANSI ½" 600#RF	220	8.66	A3
ANSI ½" 1500#RF	300	11.81	A6
ANSI ½" 1500#RTJ	300	11.81	R1
DIN DN15/PN40	220	8.66	D1
DIN DN15/PN100	220	8.66	D2
DIN DN15/PN160	220	8.66	D3
JIS RF10K 15A (½")	220	8.66	J1
JIS RF20K 15A (½")	220	8.66	J2

### - TYPE 2. Manifold design with seals and threaded connections

PM0/PH0/PV0: parallel/dual path

SMO/SH0/SV0\*: serial/single path



\*SV0 version only available with RHM015L  
Dimensions on next page

Process Connection	Face to Face (L)		Order Code
	mm	in	
Female Thread G ¼"	60	2.36	G1
Female Thread ¼" NPT	60	2.36	N1
Autoclave ⅜" MP (⅜"-18 UNF female thread)	70	2.76	P2

### Material of Manifold Seals (Wetted Part)

Depending upon sensor temperature range, sensors are supplied with the following seal types as standard:

Temperature Range	PM0	SMO	PH0	SH0	PV0	SV0
N1	FKM	FKM	FKM	FKM	FKM	FKM
NA	FVMQ	FVMQ	FVMQ	FVMQ	FVMQ	FVMQ
E2*	FFKM	FFKM				

For non-standard sealing (e.g. FVMQ seals for N1) and seals for higher temperature ranges, please see Options / contact factory  
\*PH0, PV0, SH0, SV0 manifolds are not recommended with E2 temperature range

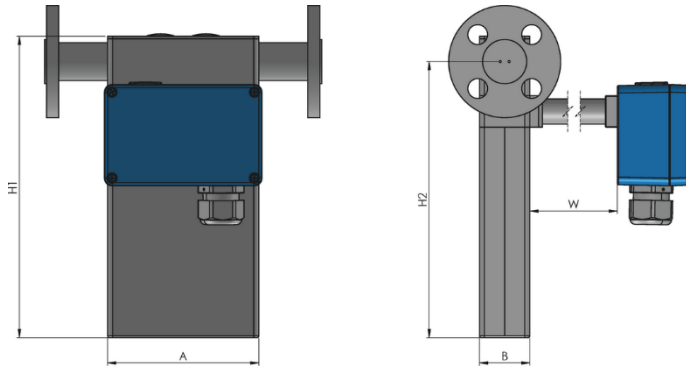
All dimensions are for standard products. For customization of face to face length and/or process connection types other than the ones listed on this page, please consult factory. Note that larger diameter flange process connections are always possible.

## Mechanical Construction (continued)

### - TYPE 3. Seal-less design with flange connections

PFO: parallel/dual path

SFO: serial/single path



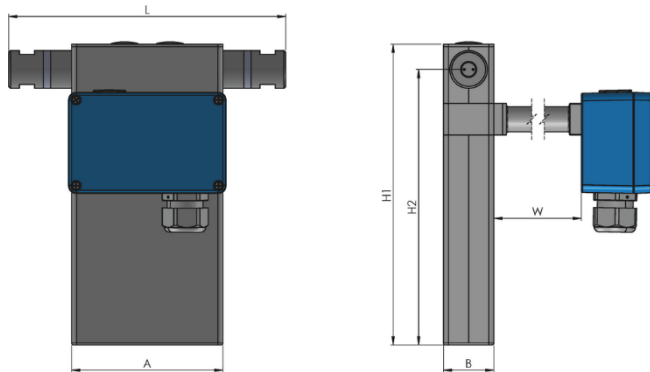
Meter will be supplied with a wetted material facing disc and 1.4571 (316Ti) stainless steel backing flange for some material selections (e.g. Tantalum)

Process Connection	Face to Face (L)		Order Code
	mm	in	
ANSI ½" 150#RF	220	8.66	A1
ANSI ½" 300#RF	220	8.66	A2
ANSI ½" 600#RF	220	8.66	A3
ANSI ½" 1500#RF	300	11.81	A6
ANSI ½" 1500#RTJ	300	11.81	R1
ANSI ½" 2500#RF	300	11.81	A8
DIN DN15/PN40	220	8.66	D1
DIN DN15/PN100	220	8.66	D2
DIN DN15/PN160	220	8.66	D3
JIS RF10K 15A (½")	220	8.66	J1
JIS RF20K 15A (½")	220	8.66	J2
Sanitary ½" Triclamp DIN 32676 - only with SFO	220	8.66	S1

### - TYPE 4. Seal-less design with threaded connections

PFT: parallel/dual path

SFT: serial/single path



Process Connection	Face to Face (L)		Order Code
	mm	in	
Female Thread G ¼"	220	8.66	G1
Female Thread ¼" NPT	220	8.66	N1
Swagelok® ¼" Tube Fitting (SS-400-14W)	220	8.66	W1
Autoclave ⅜" MP (⅝"-18 UNF female thread)	220	8.66	P2

Dimensions	mm	in
A	120	4.72
B	40	1.57
H1 (PMO, PHO, PVO)	222	8.74
H1 (SMO, SHO, SVO)	267	10.51
H1 (PFO, SFO, PFT, SFT)	239	9.41
H2	208	8.19
H3	192	7.56

Standard blue terminal box in Aluminum, size = 125 x 80 x 57 mm (4.92 x 3.15 x 2.24 in)  
Optional SS 316 box, size = 100 x 100 x 61 mm (3.94 x 3.94 x 2.40 in)

W = 2 mm (0.08 in) for Aluminum box and Temperature Range N1 and NA  
W = 30 mm (1.2 in) for SS 316 box and Temperature Range N1 and NA  
W = 100 mm (3.94 in) for all other Temperature Ranges

Terminal box size for compact mount RHE16 transmitter = 140 x 140 x 91 mm (5.51 x 5.51 x 3.58 in):  
W = 2 mm (0.08 in) for Temperature Range N1 and NA, fluid max. +85°C, ambient max. +50°C  
W = 50 mm (2 in) for Temperature Range N1 and NA, fluid max. +120°C, ambient max. +50°C

NOTE: Junction boxes are supplied with M25 x 1.5 cable entries as standard. M20 x 1.5, ½" NPT, ¾" NPT cable entries are optionally available and must be ordered separately.

All dimensions are for standard products. For customization of face to face length and/or process connection types other than the ones listed on this page, please consult factory. Note that larger diameter flange process connections are always possible.

## Options and Accessories

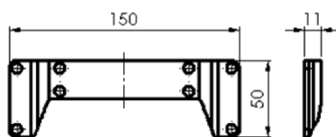
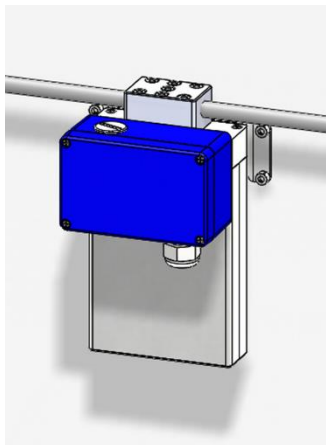
Options Codes	
HE	Electrical Heating Jacket (IP40, ordinary area only)
H1	Steam/Oil Heating Jacket
SH	Entire Enclosure in 316 SS
P2	Housing Purge ½" NPT (2 pcs)
PD	Housing Purge ½" NPT, with Integrated Rupture Disk
RD	Rupture Disk on Housing
FK	FFKM Manifold O-Ring Seals instead of Standard
FO	FVMQ Manifold O-Ring Seals instead of Standard

Options (order separately)	
ORHM-E1	½" NPT Terminal Box Cable Entry
ORHM-E2	M20 x 1.5 Terminal Box Cable Entry
ORHM-E3	¾" NPT Terminal Box Cable Entry

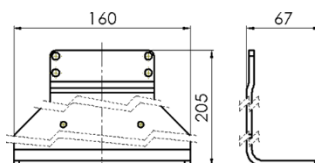
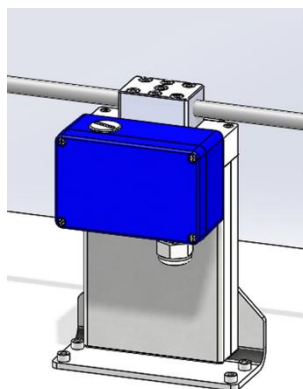
Accessories	
ORHMS-M	Wall mounting bracket (highly recommended for low flow installations)
ORHMS-MF	Floor mounting bracket standard
ORHMS-MG	Floor mounting bracket upside down installation (not for serial manifold versions)

NOTE: when specifying a sensor with multiple part code options (i.e. SH and RD), separate each code with a comma in the part string (...SH,RD...)

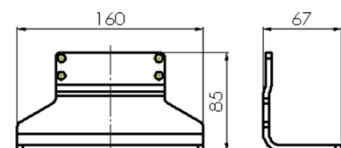
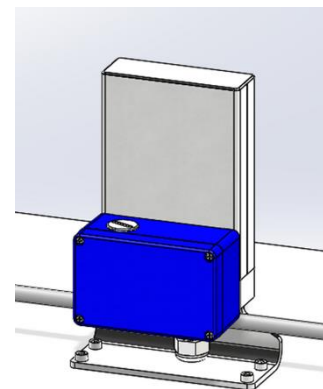
### Mounting Bracket Accessory Details



Type M  
Wall Mount



Type MF  
Floor Mount



Type MG  
Floor Mount

## 트랜스미터 종류



모든 레오닉 질량 유량 트랜스미터는 레오닉 질량 유량 센서와 상호 호환성이 있으며 어떠한 프로세스 조건의 질량 유량 측정도 가능하다. 레오닉 질량 유량 트랜스미터는 특히 공정, 산업 및 OEM 업체 적용에 적합하게 공급할 수 있다. 센서 및 트랜스미터는 시스템 디자이너와 사용자를 위해 광범위한 옵션을 제공한다.

## 레오닉에 대해

레오닉의 목표는 최고의 코리올리스 유량계를 설계하고 제조하는 것입니다.

R&D 및 엔지니어링 팀은 비용면에서 효율적이고 정밀도가 뛰어난 유량 솔루션을 제공하기 위해 전념하고 있으며 생산팀은 각각의 제품들에 대한 원자재 공급부터 운송까지 책임지고 있고, 서비스 팀은 귀사에서 사용하는 모든 레오닉 제품을 세분화, 통합화, 시운전 및 유지 보수까지 가능하도록 지원합니다.

레오닉 제품을 사용하는 귀사는 우리의 소중한 비즈니스 파트너이며 우리의 기존 제품에서 적합한 제품을 찾지 못하였다면 귀사의 솔루션을 위하여 맞춤 제작도 가능합니다.

레오닉은 오직 코리올리스 질량 유량계만 제조합니다. 그러므로 우리는 코리올리스 전문가입니다.