

## BoltSafe Sensor CMS

**BoltSafe Sensor CMS (Continuous Monitoring System) is a specially designed sensor to monitor the residual bolt load in bolted joints. In this way the uncertainty in achieving the desired residual bolt load can be removed. This will result in enhanced safety, dependable joints, better control and improved cost benefit both during installation and throughout the joint's service life.**



### The sensor

BoltSafe Sensor CMS is shaped as a regular washer, used as a washer, and is available in standard sizes to fit both metrical and imperial bolts in sizes from M20 to M64 (corresponding 7/8" to 2 1/2"). The design is rugged and able to withstand tough environments.

BoltSafe Sensor CMS employs an ASIC (Application Specific Integrated Circuit) in each unit, which performs all the signal conditioning, digital network connection and a selective identification number for each unit. This means that each BoltSafe Sensor will have its unique serial number for identification and traceability. The calibration of the sensors is done once, and there is no need for re-calibration throughout the lifetime of the sensor when used within the specification.

The BoltSafe Sensor CMS can be read one by one using the handheld instrument SM-200 BoltSafe Reader, or directly from a PC through the CM-1000 Network Adapter, or directly from a PDI-NT. The PDI-NT provides different output signals.

### Cable lengths

BoltSafe Sensors CMS have a cable installed for the purpose of interconnecting several sensors into a network and hence monitor the residual bolt load in a continuous manner from one connecting point. CMS washers are delivered with 1m cable as standard. Optional delivered with 3m, 5m, or 10m, always to be specified in the order.

*The BoltSafe Sensor should always be placed directly under a nut to obtain the best possible accuracy of the residual bolt load.*

### General specification

Sizes:	To fit bolt sizes from M20 to M64 (Correspondingly 7/8" to 2 1/2") See enclosed table of dimensions
Full Scale Load (FS):	From 286 kN to 1794 kN dependent on Sensor size. (See table of dimensions)
Maximum Load at ambient temperature:	FS range x 1.3 (Load without affecting the validity of the calibration)
Temperature range:	-40°C to 80°C
Storage Temperature:	-40°C to 80°C
Total accuracy at ambient temperature (rms):	< 5 % FS (machined parallel surfaces in bolt-nut assembly)
Linearity:	< 1.5 % FS
Hysteresis:	< 0.9 % FS
Creep:	< 0.1 % FS
Repeatability:	< 0.5 % FS
Typical Temperature effects:	< ± 0.08 % FS/°C
Sealing:	IP66
Material:	Stainless Steel 17-4 PH, Condition H1025
Classification:	10.9
Sensor Output:	Serial digital signal
Power Supply:	Powered through electronic interface
Electrical Connection:	Connector or Flying leads (three wire)
Intrinsic Safe Code:	II 2 G, EEx ib IIC T4 (upon special request)

### Remarks:

Note that imperfections in the joining surfaces may lead to degraded accuracy in the reading of residual bolt load.

If the user, due to mechanical constraints, needs to use BoltSafe Sensors in other ways, there is a risk that the calibration will not be valid and that the accuracy cannot be maintained. Please contact your local distributor in each case.



## Table of dimensions

See the enclosed table for physical dimensions and corresponding max load.

## BoltSafe Sensor CMS Imperial Sizes

Size	Normal Bolt Size (mm)	Clearance Hole (mm)	Outside Diameter (mm)	Overall Thickness (mm)	Steel Wight (gr)	Clamping Load Class 10.9 (kN)
7/8"	22,2	22,6	47	14	133	214
1"	25,4	25,8	52	14	160	280
1 1/8"	28,6	29	57,1	14	191	354
1 1/4"	31,8	32,3	63	17	286	437
1 3/8"	34,9	35,5	69	17	343	529
1 1/2"	38,1	38,7	74	17	391	629
1 5/8"	41,3	41,9	80	17	543	739
1 3/4"	44,5	45,1	85	20	608	857
1 7/8"	47,6	48,2	91	20	698	983
2"	50,8	51,4	98	20	816	1119
2 1/4"	57,2	57,8	108,8	23	1156	1416
2 1/2"	63,5	64,3	116,6	23	1289	1748

## BoltSafe Sensor CMS Metric Sizes

Size	Normal Bolt Size (mm)	Clearance Hole (mm)	Outside Diameter (mm)	Overall Thickness (mm)	Steel Wight (gr)	Clamping Load Class 10.9 (kN)
M20	20	20,4	37	14	73	166
M22	22	22,4	40	14	85	208
M24	24	24,4	44	14	104	239
M27	27	27,4	50	14	137	315
M30	30	30,6	56	17	214	385
M33	33	33,6	58	17	218	480
M36	36	36,6	66	17	295	560
M39	39	39,6	68	17	300	670
M42	42	42,6	75	20	445	772
M45	45	45,6	80	20	506	905
M48	48	48,6	86	20	591	1018
M52	52	52,6	92	20	669	1221
M56	56	56,6	100	20	798	1408
M60	60	60,8	108	23	1083	1647
M64	64	64,8	114	23	1196	1794

### For more information:

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