

Bolt Safe
Load Measuring Systems



Product sheet

CMS-NC Bolt Load Sensor

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The latest CMS evolution; the CMS-NC bolt load sensor.

The CMS-NC is the next step in the evolution of BoltSafe's well-known CMS load sensor. This sensor offers the possibility of disconnecting the cable from the CMS load cell. This is very useful in the case of continuous monitoring when a permanent cable is not an option, because of increased risk of damaging a permanent cable or when there is no place for an IoT.

With the CMS-NC, you have the best of both worlds. The security of accurate bolt load measurement on demand. Connecting the cable gives you an instant overview of the bolt load of your bolted connections.

How does the CMS bolt load sensor work?

The BoltSafe bolt load cell monitors the (residual) bolt load in bolted joints. CMS stands for Continuous Monitoring System, which allows for continuous monitoring of the bolt load from one connection point.

Using a BoltSafe load cell eliminates any uncertainties about the bolt load. This results in enhanced safety, dependable joints and better control over the structure.



While tightening the bolt, the force being applied to the load washer results in minor deformations of the washer. The sensor measures changes in electrical resistance caused by these deformations. The data is used to determine the (residual) bolt load at any moment.



CMS-NC characteristics

Rugged Design and Durability of the load cells to withstand harsh conditions, like heavy industrial environments.

Suitable for contact with oil, rain, seawater, ice, and temperatures up to 80°C (176°F).

Each sensor features an ASIC (Application Specific Integrated Circuit) for signal conditioning and digital communication.

Unique serial numbers ensure individual identification and traceability.

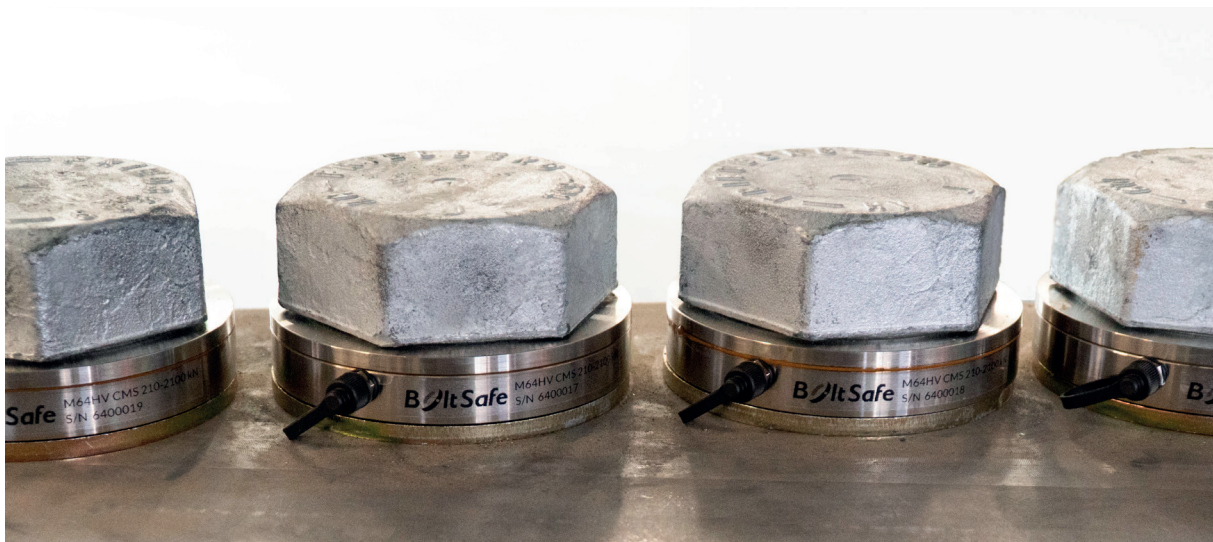
Digital monitoring system measures residual bolt load and monitors sensor temperature.

Sensors are calibrated once by BoltSafe. No need for recalibration during service life if used according to specifications.

Plug-and-play, without recalibration when using different readout methods.

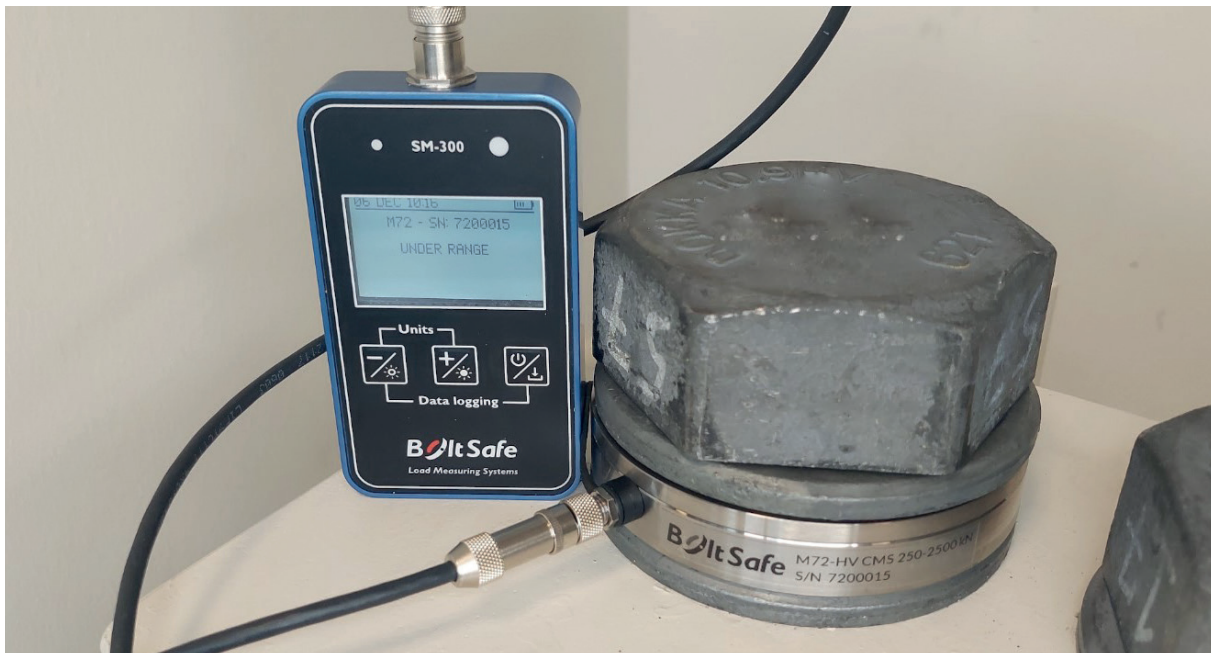
Ideal in temporary construction to ensure load stability and prevent collapse.

Sensors can act as washers to monitor load in structures.



Benefits of a continuous monitoring bolt load sensor

With continuous monitoring, it is a lot easier to determine the bolt load while the load cell is mounted, at any time. In addition to checking the bolt load at any given time, it is also possible to view historical data. This helps to determine when and where a problem with the bolt load might have occurred. The CMS-NC sensor is usually slightly smaller than the PMS sensor. Another benefit of the CMS-NC load cell is that it can be linked with other CMS-NC load cells in a network, where data from all sensors can be monitored at once. The live data from the bolt load cells can be checked remotely with different readout methods.



Readout methods that are compatible with the CMS-NC sensor

The CMS-NC load cell data can be read by various readout systems. The first option is our handheld reader, the SM-300 (as shown in the pictures). The second method is Network with PDI (CM-1000 box with PDI). The next method is Network with PDI-NT (CM-1000 box with PDI-NT). Another method is the RS-232 and Analog Converter. The last possible readout method is our newest innovation, the IoT-node.



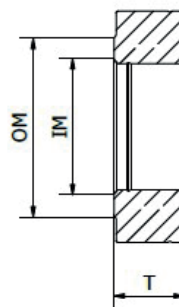
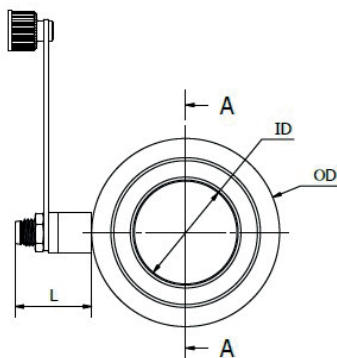
Sizes	To fit bolt sizes from M20 to M100 (7/8" to 4")
Cable lengths	Standard: 1 meter (3.3 feet) (5 or 10 m optional)
Full Scale Load (FS)	From 166 kN to 2500 kN (37318 lbf to 562022 lbf) depending on sensor size
Maximum Load at ambient temperature	FS range x 1.3 (without affecting the validity of the calibration)
Temperature range	-40°C to 80°C (-40°F to 176°F)
Storage Temperature	-40°C to 80°C (-40°F to 176°F)
Minimum Load	10% FS
Total accuracy at ambient temperature (rms)	<1% 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
Sensor Output	Serial digital signal
Power Supply	Powered through electronic interface
Connection	M12 connector male 5 pole
Intrinsic Safe Code	II 2 G, EEx ib IIC T4 (upon special request)

We also produce CMS-NC bolt load sensors that are able to withstand and measure 15% higher loads, the dimensions of these sensors stay the same (see next page for dimensions). Contact us for more information about these sensors through info@boltsafe.com or by phone +31 24 6790797.



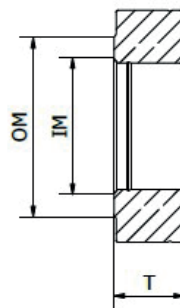
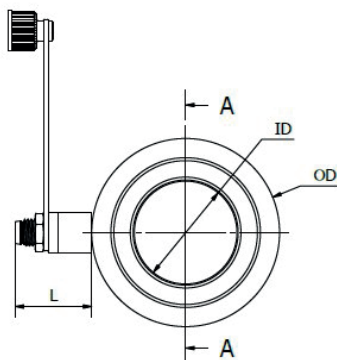
Dimensions of the bolt load sensor (metric)

Bolt Size	Clearance Hole ID		Outside Diameter OD		Size L	Overall Thickness T		Steel Weight		Max. Load		Measuring Surface IM		Measuring Surface OM	
	mm	inch	mm	inch		mm	inch	gr	oz	kN	lbf	mm	inch	mm	inch
M20	20,4	0,80	37,0	1,46	25.8	14	0,55	72	2,54	164	36869	22,0	0,87	27,7	1,09
M22	22,4	0,88	40,0	1,57	25.8	14	0,55	83	2,94	222	49908	24,2	0,95	31,4	1,24
M24	24,4	0,96	44,0	1,73	24.8	14	0,55	103	3,65	240	53954	26,4	1,04	33,3	1,31
M27	27,4	1,08	50,0	1,97	23.8	14	0,55	137	4,82	318	71490	29,7	1,17	38,0	1,50
M30	30,6	1,20	56,0	2,20	22.8	17	0,67	211	7,44	405	91048	33,0	1,30	42,8	1,69
M33	33,6	1,32	58,0	2,28	23.6	17	0,67	213	7,51	480	107909	36,3	1,43	46,6	1,83
M36	36,6	1,44	66,0	2,60	21.6	17	0,67	292	10,30	580	130390	39,6	1,56	51,1	2,01
M39	39,6	1,56	68,0	2,68	22.6	17	0,67	294	10,38	710	159615	42,9	1,69	55,9	2,20
M42	42,6	1,68	75,0	2,95	21.0	20	0,79	436	15,38	810	182096	46,2	1,82	60,0	2,36
M45	45,6	1,80	80,0	3,15	20.5	20	0,79	496	17,50	950	213570	49,5	1,95	64,7	2,55
M48	48,6	1,91	86,0	3,39	19.5	20	0,79	581	20,48	1.120	251787	52,8	2,08	69,5	2,74
M52	52,6	2,07	92,0	3,62	18.8	20	0,79	659	23,24	1.260	283261	57,2	2,25	74,2	2,92
M56	56,6	2,23	100,0	3,94	17,00	20	0,79	790	27,87	1.395	313610	61,6	2,43	78,7	3,10
M60	60,8	2,39	108,0	4,25	15.3	23	0,91	1.070	37,73	1.515	340587	66,0	2,60	83,4	3,28
M64	64,8	2,55	114,0	4,49	14.6	23	0,91	1.183	41,72	1.680	377681	70,4	2,77	88,2	3,47
M64HV	68,4	2,69	116,0	4,57	13.8	23	0,91	1.178	41,54	1.880	422643	73,5	2,89	93,0	3,66
M68	68,8	2,71	121,0	4,76	15.8	23	0,91	1.335	47,10	1.860	418147	74,9	2,95	92,9	3,66
M72	72,8	2,87	128,0	5,04	17.3	23	0,91	1.497	52,80	2.120	476597	79,4	3,13	97,7	3,85
M72HV	72,8	2,87	130,0	5,12		23	0,91	1.565	55,22	2.940	660941	78,4	3,09	110,0	4,33
M76	76,8	3,02	135,0	5,31		23	0,91	1.668	58,83	2.300	517063	83,7	3,30	102,4	4,03
M80	80,8	3,18	142,0	5,59		23	0,91	1.848	65,18	2.500	562025	88,1	3,47	107,2	4,22
M85	85,8	3,38	151,0	5,94		23	0,91	2.096	73,94	2.825	635088	96,6	3,80	113,9	4,48
M90	90,8	3,57	160,0	6,30		23	0,91	2.360	83,25	3.210	721640	99,1	3,90	121,1	4,77
M100	100,8	3,97	177,0	6,97		23	0,91	2.885	101,77	4.040	908232	110,2	4,34	135,4	5,33



Dimensions of the bolt load sensor (imperial)

Bolt Size	Clearance Hole ID		Outside Diameter OD		Size L	Overall Thickness T		Steel Weight		Max. Load		Measuring Surface IM		Measuring Surface OM	
	mm	inch	mm	inch		mm	inch	gr	oz	kN	lbf	mm	inch	mm	inch
7/8"	22,6	0,89	47,0	1,85	23,0	14	0,55	134	4,72	282	63396	25,8	1,02	32,9	1,30
1"	25,8	1,02	52,0	2,05		14	0,55	162	5,70	348	78234	29,0	1,14	37,1	1,46
1-1/8"	29,0	1,14	57,1	2,25	21,7	14	0,55	193	6,79	415	93296	32,2	1,27	41,4	1,63
1-1/4"	32,3	1,27	63,0	2,48	20,7	17	0,67	285	10,04	490	110157	35,5	1,40	45,7	1,80
1-3/8"	35,5	1,40	69,0	2,72	19,6	17	0,67	342	12,08	570	128142	38,7	1,52	50,0	1,97
1-1/2"	38,7	1,52	78,0	3,07	17,0	17	0,67	453	15,97	665	149499	41,9	1,65	54,3	2,14
1-5/8"	41,9	1,65	80,0	3,15	17,9	17	0,67	457	16,12	770	173104	45,4	1,79	58,6	2,31
1-3/4"	45,1	1,78	85,0	3,35	17,5	20	0,79	602	21,24	910	204577	48,9	1,93	63,6	2,50
1-7/8"	48,2	1,90	91,0	3,58	16,5	20	0,79	693	24,45	1.050	236051	52,4	2,06	67,9	2,67
2"	51,4	2,02	98,0	3,86	15,00	20	0,79	813	28,68	1.180	265276	55,9	2,20	72,2	2,84
2-1/4"	57,8	2,28	108,8	4,28	13,7	23	0,91	1.145	40,38	1.530	343959	62,9	2,48	81,8	3,22
2-1/2"	64,3	2,53	116,6	4,59	13,8	23	0,91	1.275	44,97	1.860	418147	69,9	2,75	90,6	3,57
2-3/4"	70,8	2,79	124,0	4,88	14,1	23	0,91	1.396	49,26	2.220	499078	76,4	3,01	99,0	3,90
3"	77,0	3,03	135,0	5,31		23	0,91	1.662	58,61	2.700	606987	83,5	3,29	109,2	4,30
3-1/4"	83,3	3,28	147,0	5,79		23	0,91	1.989	70,14	3.150	708152	90,4	3,56	118,3	4,66
3-1/2"	89,7	3,53	158,0	6,22		23	0,91	2.298	81,05	3.640	818308	97,4	3,83	127,4	5,02
3-3/4"	96,1	3,78	169,0	6,65		23	0,91	2.629	92,75	4.200	944202	104,3	4,11	136,5	5,37
4"	102,4	4,03	180,0	7,09		23	0,91	2.986	105,33	4.800	1079088	111,3	4,38	145,6	5,73





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