

1 **UK-TYPE EXAMINATION CERTIFICATE**

2 **Safety Device, Controlling Device or Regulating Device intended for use outside a potentially explosive atmosphere but required for or contributing to the safe functioning of Product and Protective Systems with respect to the risks of explosion**
UKSI 2016:1107 (as amended) – Schedule 3A, Part 1

3 UK-Type Examination **BAS21UKEX0440**
Certificate Number:

4 Product: **MTL7700 Series Shunt Zener Diode Barriers (IIC)**

5 Manufacturer: **Eaton Electric Limited**

6 Address: **Great Marlings, Butterfield, Luton, Bedfordshire, LU2 8DL**

7 This product and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

8 SGS Baseefa, Approved Body number 1180, in accordance with Regulation 43 of the Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 2016, UKSI 2016:1107 (as amended), certifies that this product has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres given in Schedule 1 of the Regulations.

The examination and test results are recorded in confidential Report No. **21(C)0386/01**

9 Compliance with the Essential Health and Safety Requirements has been assured by compliance with:


EN IEC 60079-0:2018 EN 60079-11:2012

except in respect of those requirements listed at item 18 of the Schedule.

10 If the sign “X” is placed after the certificate number, it indicates that the product is subject to the Specific Conditions of Use specified in the schedule to this certificate.

11 This UK-TYPE EXAMINATION CERTIFICATE relates only to the design and construction of the specified product. Further requirements of the Regulations apply to the manufacturing process and supply of this product. These are not covered by this certificate.

12 The marking of the product shall include the following:

 **II (1) GD** [Ex ia Ga] IIC (-20°C ≤ T_a ≤ +60°C)
[Ex ia Da] IIC (-20°C ≤ T_a ≤ +60°C)

SGS Baseefa Customer Reference No. **0703**

Project File No. **21/0386**

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R S SINCLAIR
TECHNICAL MANAGER
On behalf of SGS Baseefa Limited

13

Schedule

14

Certificate Number BAS21UKEX0440

15 Description of Product

The MTL7700 Series Shunt Zener Diode Barriers are designed to restrict the transfer of energy, from unspecified safe area equipment to intrinsically safe circuits, by limitation of voltage and current. The range consists of single, dual, triple and quad channel barriers covering polarised (positive and negative) and non-polarised (ac) barriers and diode return barriers. Certain versions of the barriers may have the non-hazardous supply provided by a power bus, where adjacent barriers are connected together via a power bus terminal (link).

The barriers consist of electronic components on a single printed circuit board encapsulated within a moulded plastic enclosure which incorporates one or two pairs of sockets at each end of the barrier. Circuits are connected to the socket via plugs which incorporate a screw terminal. When fitted with the screw terminals the enclosure meets the requirements of IP20. The barrier is connected to earth via a spring mounted foot on to a DIN rail or alternatively a single high integrity screw terminal. The barriers are asymmetrical and have a blue label defining the hazardous area terminals. Barriers may be fitted adjacent to each other on the DIN rail.

The certificate also covers the MTL774* Series Switch / Proximity Input Barriers. These barriers are designed to restrict the transfer of energy from unspecified safe area equipment to intrinsically safe circuits by limitation of voltage and current and provide isolation by using relay and open collector solid state interfaces. The range consists of single and dual channel barriers of similar construction to the other MTL7700 Series barriers with either relay or open collector solid state interfaces.

For all versions of the MTL7700 Shunt Zener Barriers: - Input Parameters

Single Channel - Terminal 1 wrt 2 (including DIN Rail Foot)

Dual Channel - Terminal 1 & 2 wrt to DIN Rail Foot

Triple Channel - Terminals 1, 2 & 5 wrt to DIN Rail Foot

Quad Channel - Terminals 1, 2, 5 & 6 wrt DIN Rail Foot

$$U_m = 250V$$

Output Parameters

Single Channel 1 - Terminal 3 wrt 4 (including DIN Rail Foot)

Dual, Triple & Quad Channel 1 - Terminal 3 wrt to DIN Rail Foot

$$U_o = \text{See a or a1 below}$$

$$I_o = \text{See a or a1 below}$$

$$P_o = \text{See a or a1 below}$$

Dual, Triple, & Quad Channel 2 - Terminal 4 wrt to DIN Rail Foot

$$U_o = \text{See a2 below}$$

$$I_o = \text{See a2 below}$$

$$P_o = \text{See a2 below}$$

Triple & Quad Channel 3 - Terminal 7 wrt to DIN Rail Foot

$$U_o = \text{See a3 below}$$

$$I_o = \text{See a3 below}$$

$$P_o = \text{See a3 below}$$

Quad Channel 4 - Terminal 8 wrt to DIN Rail Foot

U_o = See a4 below
I_o = See a4 below
P_o = See a4 below

Type	Description	DC/AC		U _o (V)	R _{min} (Ω)	I _o (mA)	P _o (W)	C _i (μF)
MTL7706	28V, 300R	+ (PB)	a	28	300	93	0.65	-
MTL7707	28V, 300R	+ (PB)	a1	28	300	93	0.65	-
	Diode		a2	28	† (see note 4)			-
			b	28	300	93	0.65	-
MTL7710	10V, 50R	+/-	a	10	50	200	0.50	-
MTL7710P	10V, 33.3R	+	a	10	33.3	300	0.75	-
MTL7715	15V, 100R	+/-	a	15	100	150	0.56	-
MTL7715P	15V, 50R	+/-	a	15	51.5	291	1.09	-
MTL7722	22V, 150R	+/-	a	22	150	147	0.81	-
MTL7728	28V, 300R	+/-/ac	a	28	300	93	0.65	-
MTL7728P	28V, 237R	+/-	a	28	234.6	119	0.83	-
MTL7751	1V, 10R	ac	a1	1	10	100	0.025	-
	1V, 10R		a2	1	10	100	0.025	-
			b	1	5	200	0.05	-
			c	2	20	100	0.05	-
MTL7755	3V, 10R	ac	a1	3	10	300	0.225	-
	3V, 10R		a2	3	10	300	0.225	-
			b	3	5	600	0.45	-
			c	6	20	300	0.45	-
MTL7756	3V, 10R	ac	a1	3	10	300	0.225	-
	3V, 10R		a2	3	10	300	0.225	-
	3V, 10R		a3	3	10	300	0.225	-
			b1	3	5	600	0.45	-
			b2	3	3.3	900	0.675	-
			c1	6	20	300	0.45	-
			c2	6	15	400	0.60	-
MTL7758	7.5V, 10R	+/-	a1	7.5	10	750	1.40	-
	7.5V, 10R		a2	7.5	10	750	1.40	-
			b	7.5	5	1,500	2.80	-
MTL7760	10V, 50R	ac*	a1	10	50	200	0.5	-
	10V, 50R		a2	10	50	200	0.5	-
			b	10	25	400	1.00	-
MTL7761	9V, 90R	ac	a1	9	90	100	0.225	-
	9V, 90R		a2	9	90	100	0.225	-
			b	9	45	200	0.45	-
			c	18	180	100	0.45	-
MTL7761P	9V, 350R	ac	a1	9	351.5	26	0.058	-
	9V, 350R		a2	9	351.5	26	0.058	-
			b	9	175.5	52	0.115	-
			c	18	702.9	26	0.115	-
MTL7764	12V, 1K	+/-	a1	12	1,000	12	0.036	-
	12V, 1K		a2	12	1,000	12	0.036	-
			b	12	500	24	0.072	-
MTL7764	12V, 1K	ac	a1	12	1,000	12	0.036	-
	12V, 1K		a2	12	1,000	12	0.036	-
			b	12	500	24	0.072	-
			c	24	2,000	12	0.072	-

Type	Description	DC/AC		U _o (V)	R _{min} (Ω)	I _o (mA)	P _o (W)	C _i (μF)
MTL7765	15V, 100R	ac*	a1	15	100	150	0.56	-
	15V, 100R		a2	15	100	150	0.56	-
			b	15	50	300	1.125	-
MTL7766	12V, 150R	ac	a1	12	150	80	0.24	-
	12V, 150R		a2	12	150	80	0.24	-
			b	12	75	160	0.48	-
			c	24	300	80	0.48	-
MTL7766P	12V, 75R	ac	a1	12	76.4	157	0.471	-
	12V, 75R		a2	12	76.4	157	0.471	-
			b	12	38.2	314	0.942	-
			c	24	152.9	157	0.942	-
MTL7767	15V, 100R	+/-	a1	15	100	150	0.56	-
	15V, 100R		a2	15	100	150	0.56	-
			b	15	50	300	1.125	-
MTL7768	22V, 149.6R	+	a1	22	149.6	147	0.81	-
	22V, 149.6R		a2	22	149.6	147	0.81	-
			b	22	74.8	294	1.62	-
MTL7772	22V, 301.4R	ac	a	22V	301.4	73	0.40	-
MTL7778	28V, 600R	ac*	a1	28	600	47	0.33	-
	28V, 600R		a2	28	600	47	0.33	-
			b	28	300	93	0.654	-
MTL7779	28V, 300R	+/-	a1	28	300	93	0.65	-
	28V, 300R		a2	28	300	93	0.65	-
			b	Not permitted ‡ (see note 3)				
MTL7787	28V, 300R	+/- (PB)	a1	28	300	93	0.65	-
	28V (Diode)		a2	28	† (see note 4)			-
			b	28	300	93	0.65	-
MTL7787P	28V, 237R	+/- (PB)	a1	28	234.6	119	0.835	-
	28V (Diode)		a2	28	† (see note 4)			-
			b	28	234.6	119	0.835	-
MTL7788	28V, 300R	+/- (PB)	a1	28	300	93	0.65	-
	10V, 50R		a2	10	50	200	0.5	-
			b	28	42.85	294@12.57V	0.92	-
MTL7788R	28V, 300R	+/- (PB)	a1	28	300	93	0.65	-
	10V, 50R		a2	10	50	200	0.5	-
			b	28	42.85	294@12.57V	0.92	-
MTL7789	28V, 600R	+/- (PB)	a1	28	600	46.5	0.33	-
	Diode		a2	28	† (see note 4)			-
	28V, 600R		a3	28	600	46.5	0.33	-
	Diode		a4	28	† (see note 4)			-
			b3	28	300	93	0.65	-
			c	28	600	46.5	0.33	-
MTL7796	26V, 300R	+/-	a1	26	300	87	0.56	-
	20V, 390R		a2	20	390	51	0.26	-
			b	26	169.56	138@23.4V	0.81	-

Reference to data in the standard shows that with the maximum supply current and voltage as defined in the above table, such a value has a factor of safety of at least 1.5 for Group IIC.

Notes:

1. +/- - Shunt zener diode barriers may be of positive or negative polarity dependant on the configuration of the zener diodes. The certification label will detail the exact type.

ac - non-polarised barriers

ac* - non-polarised star connected

Diode - diode return barrier

(PB) - shunt zener diode barriers may have the non-hazardous supply provided by a power bus. Adjacent barriers are connected together via a bus power terminals

2. Circuit configuration for output parameters

a - Single channel

a1 - First channel of a dual/triple/quad channel barrier

a2 - Second channel of a dual/triple/quad channel barrier

a3 - Third channel of a triple/quad channel barrier

a4 - Fourth channel of a quad channel barrier

b - Both channels of a dual channel barrier connected in parallel, with respect to earth.

b1 - Two channels of a triple channel barrier connected in parallel, with respect to earth.

b2 - Three channels of a triple channel barrier connected in parallel, with respect to earth.

b3 - Four channels of a four channel barrier connected in parallel, with respect to earth.

c - Both channels of a dual channel barrier interconnected, with no earth return.

c1 - Two channels of a triple channel barrier interconnected, with no earth return.

c2 - Three channels of a triple channel barrier interconnected, with no earth return (this assumes two of the channels are in parallel).

3. The intrinsically safe terminals of two channels of any MTL7700 Series dual barrier which are marked ‡, must not be interconnected in Group IIC atmospheres. It is acceptable for these barriers to be interconnected in Group IIB atmospheres.
4. The hazardous area terminals of each of the barrier outputs marked † must be considered at the voltage U_o . This is considered as the theoretical maximum to which a capacitive load across the hazardous area terminals could become charged by leakage through the series blocking diodes. This voltage does not contribute to the short circuit

Load Parameters

The capacitance or either the inductance or the inductance to resistance ratio (L/R) of the load connected to the output terminals must not exceed the following values.

Type	ac/ dc		IIC			IIB**			IIA		
			C (μ F)	L (mH)	L/R (μ H/ Ω)	C (μ F)	L (mH)	L/R (μ H/ Ω)	C (μ F)	L (mH)	L/R (μ H/ Ω)
MTL7706	+	a	0.083	4.2	54	0.65	12.6	218	2.15	33.6	435
MTL7707	+	a1	0.083	4.2	54	0.65	12.6	218	2.15	33.6	435
		a2	0.083	-	-	0.65	-	-	2.15	-	-
		b	0.083	4.2	54	0.65	12.6	218	2.15	33.6	435
MTL7710	+/-	a	3	0.91	71	20	2.72	284	100	7.25	569
MTL7710P	+	a	3	0.395	42	20	1.58	170	100	3.16	341
MTL7715	+/-	a	0.58	1.45	63	3.55	7.22	252	14	14	505
MTL7715P	+/-	a	0.58	0.33	32	3.55	0.99	130	14	2.64	260
MTL7722	+/-	a	0.165	1.65	44	1.14	7.22	176	4.2	14	353

Type	ac/ dc		IIC			IIB**			IIA		
			C (μF)	L (mH)	L/R ($\mu\text{H}/\Omega$)	C (μF)	L (mH)	L/R ($\mu\text{H}/\Omega$)	C (μF)	L (mH)	L/R ($\mu\text{H}/\Omega$)
MTL7728	+/- /ac	a	0.083	4.2	54	0.65	12.6	218	2.15	33.6	435
MTL7728P	+/-	a	0.083	2.51	44	0.65	7.53	168	2.15	20.0	340
MTL7751	ac	a1	100	3.55	1422	1000	14.2	5688	1000	28.4	11377
		a2	100	3.55	1422	1000	14.2	5688	1000	28.4	11377
		b	100	0.88	711	1000	3.55	2844	1000	7.1	5688
		c	100	3.55	711	1000	14.2	2844	1000	28.4	5688
MTL7755	ac	a1	100	0.37	158	1000	1.37	632	1000	3.66	1264
		a2	100	0.37	158	1000	1.37	632	1000	3.66	1264
		b	100	0.13	79	1000	0.39	316	1000	1.03	632
		c	40	0.37	79	1000	1.37	316	1000	3.28	632
MTL7756	ac	a1	100	0.37	158	1000	1.37	632	1000	3.66	1264
		a2	100	0.37	158	1000	1.37	632	1000	3.66	1264
		a3	100	0.37	158	1000	1.37	632	1000	3.66	1264
		b1	100	0.13	79	1000	0.39	316	1000	1.03	632
		b2	100	0.06	52	1000	0.19	208	1000	0.49	417
		c1	40	0.37	79	1000	1.37	316	1000	3.28	632
		c2	40	0.23	59	1000	0.70	237	1000	1.86	474
MTL7758	+/-	a1	11.1	0.07	25	174	0.20	101	1000	0.54	202
		a2	11.1	0.07	25	174	0.20	101	1000	0.54	202
		b	11.1	0.02	12	174	0.05	50	1000	0.14	101
MTL7760	ac*	a1	3.0	0.91	71	20	2.72	284	100	7.25	568
		a2	3.0	0.91	71	20	2.72	284	100	7.25	568
		b	3.0	0.20	35	20	0.60	142	100	1.61	284
MTL7761	ac	a1	4.9	3.72	158	40	15	632	500	31	1264
		a2	4.9	3.72	158	40	15	632	500	31	1264
		b	4.9	0.91	79	40	2.72	316	500	7.2	632
		c	0.31	3.72	79	1.78	15	316	7.6	31	632
MTL7761P	ac	a1	4.9	56	617	40	208	2468	500	419	4937
		a2	4.9	56	617	40	208	2468	500	419	4937
		b	4.9	14	308	40	55	1232	500	116	2465
		c	0.31	56	308	1.78	208	1234	7.6	419	2468
MTL7764	+/-	a1	1.41	240	987	9	932	3950	36	1000	7901
		a2	1.41	240	987	9	932	3950	36	1000	7901
		b	1.41	61	493	9	226	1975	36	452	3950
MTL7764	ac	a1	1.41	240	987	9	932	3950	36	1000	7901
		a2	1.41	240	987	9	932	3950	36	1000	7901
		b	1.41	61	493	9	226	1975	36	452	3950
		c	0.125	240	493	0.93	932	1975	3.35	1000	3950
MTL7765	ac*	a1	0.580	1.45	63	3.55	7.22	252	14.0	14.42	505
		a2	0.580	1.45	63	3.55	7.22	252	14.0	14.42	505
		b	0.580	0.32	31	3.55	0.95	126	14.0	2.54	252
MTL7766	ac	a1	1.41	5.8	148	9	23	592	36	48	1185
		a2	1.41	5.8	148	9	23	592	36	48	1185
		b	1.41	1.47	74	9	4.4	296	36	11	592
		c	0.125	5.8	74	0.93	23	296	3.35	48	592
MTL7766P	ac	a1	1.41	1.47	75	9	4.4	301	36	11	603
		a2	1.41	1.47	75	9	4.4	301	36	11	603
		b	1.41	0.34	37	9	1.02	150	36	2.71	301
		c	0.125	1.15	37	0.93	3.44	151	3.35	9.1	302

MTL7767	+/-	a1	0.58	1.45	63	3.55	7.22	252	14	14	505
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Type	ac/ dc		IIC			IIB**			IIA		
			C (μF)	L (mH)	L/R ($\mu\text{H}/\Omega$)	C (μF)	L (mH)	L/R ($\mu\text{H}/\Omega$)	C (μF)	L (mH)	L/R ($\mu\text{H}/\Omega$)
MTL7768	+	a2	0.58	1.45	63	3.55	7.22	252	14	14	505
		b	0.58	0.32	31	3.55	0.95	126	14	2.54	252
		a1	0.165	1.65	43	1.14	6.58	175	4.20	13.16	351
		a2	0.165	1.65	43	1.14	6.58	175	4.20	13.16	351
		b	0.165	0.41	21	1.14	1.64	87	4.2	3.29	175
MTL7772	ac	a	0.165	6.67	88	1.14	26.6	353	4.2	53.3	707
MTL7778	ac*	a1	0.083	16	108	0.65	62	435	2.15	130	870
		a2	0.083	16	108	0.65	62	435	2.15	130	870
		b	0.083	4.2	54	0.65	12.6	217	2.15	33.6	435
MTL7779	+/-	a1	0.083	4.2	54	0.65	12.6	217	2.15	33.6	435
		a2	0.083	4.2	54	0.65	12.6	217	2.15	33.6	435
		b	Not permitted								
MTL7787	+/-	a1	0.083	4.2	54	0.65	12.6	217	2.15	33.6	435
		a2	0.083	-	-	0.65	-	-	2.15	-	-
		b	0.083	4.2	54	0.65	12.6	217	2.15	33.6	435
MTL7787P	+/-	a1	0.083	2.51	42	0.65	7.53	170	2.15	20.0	340
		a2	0.083	-	-	0.65	-	-	2.15	-	-
		b	0.083	2.51	42	0.65	7.53	170	2.15	20.0	340
MTL7788	+/-	a1	0.083	4.2	54	0.65	12.6	217	2.15	33.6	435
		a2	3.0	0.91	71	20	2.72	284	100	7.25	568
		b	0.083	0.33	38	0.65	0.99	154	2.15	2.64	308
MTL7788R	+/-	a1	0.083	4.2	54	0.65	12.6	217	2.15	33.6	435
		a2	3.0	0.91	71	20	2.72	284	100	7.25	568
		b	0.083	0.33	38	0.65	0.99	154	2.15	2.64	308
MTL7789	+/-	a1	0.083	16	108	0.65	63	435	2.15	133	870
		a2	0.083	-	-	0.65	-	-	2.15	-	-
		a3	0.083	16	108	0.65	63	435	2.15	133	870
		a4	0.083	-	-	0.65	-	-	2.15	-	-
		b3	0.083	4.2	54	0.65	12.6	217	2.15	33.6	435
		c	0.083	16	108	0.65	63	435	2.15	133	870
MTL7796	+/-	a1	0.1	4.91	63	0.77	20	252	2.60	40	504
		a2	0.22	13	138	1.41	51	554	5.50	108	1109
		b	0.1	1.94	44	0.77	8.5	176	2.60	16	352

** Group IIB parameters also applicable for associated apparatus [Ex ia Da] IIIC

Notes:

- The above load parameters apply when one of the two conditions below is given:
 - the total L_i of the external circuit (excluding the cable) is $< 1\%$ of the L_o value or
 - the total C_i of the external circuit (excluding the cable) is $< 1\%$ of the C_o value.
- The above parameters are reduced to 50% when both of the two conditions below are given:
 - the total L_i of the external circuit (excluding the cable) is $\geq 1\%$ of the L_o value and
 - the total C_i of the external circuit (excluding the cable) is $\geq 1\%$ of the C_o value.

The reduced capacitance of the external circuit (including cable) shall not be greater than $1\mu\text{F}$ for Groups IIIC, IIB & IIA and 600nF for Group IIC.

The values of L_o and C_o determined by this method shall not be exceeded by the sum of all of the L_i plus cable inductance in the circuit and the sum of all C_i plus cable capacitances respectively.

**For all versions of the MTL774x Series Switch / Proximity Barriers: -
Input Parameters**

Single Channel - Terminal 1 wrt 2 (including DIN Rail Foot)

Dual Channel - Terminal 1 & 2 wrt to DIN Rail Foot

$$U_m = 250V$$

Output Parameters

Type	Description	DC/AC		U _o (V)	I _o (mA)	P _o (W)	C _i (μF)
MTL7741	10V, 19mA	+ (PB)	b	10	19	0.039	0.135
MTL7742	10V, 19mA	+ (PB)	b	10	19	0.039	0.135
MTL7743	10V, 19mA	+ (PB)	b4	10	19	0.039	0.135
	10V, 19mA		b4	10	19	0.039	0.135
			b3	10	38	0.078	0.270
MTL7744	10V, 19mA	+ (PB)	b4	10	19	0.039	0.135
	10V, 19mA		b4	10	19	0.039	0.135
			b3	10	38	0.078	0.270
MTL7745	10V, 19mA	+ (PB)	b	10	19	0.039	0.135

Reference to data in the standard shows that with the maximum supply current and voltage as defined in the above table, such a value has a factor of safety of at least 1.5 for Group IIC.

Notes for Barriers:

1. + (PB) - Positive polarity shunt zener diode barrier which may have the non-hazardous supply provided by a power bus. Adjacent barriers are connected together via a bus power terminals
2. Circuit configuration for output parameters
 - b - Both channels of a dual channel barrier connected in parallel, with respect to earth.
 - b3 - Four channels of a four channel barrier connected in parallel, with respect to earth.
 - b4 - Either pair of channels of a four channel barrier interconnected, with earth return.
(For MTL7743 and MTL7744: CON1, 1 and CON1, 2 of CON4, 1 and CON4, 2).

The MTL7741 (safe area terminals 2, 5, & 6), MTL7743 (safe area terminals 1, 2, 5, & 6) and MTL7745 (safe area terminals 2, 5, & 6) are connected to relay change-over contacts which can switch up to 125V a.c. / 0.5A or 30V d.c. / 1A.

The MTL7742 (safe area terminals 5 & 6) and MTL7744 (safe area terminals 1, 2 & 5, 6) are connected to an opto-isolator which may have an input source of up to 35V and 56mA.

Load Parameters (Ex ia & Ex ib)

The capacitance or either the inductance or the inductance to resistance ratio (L/R) of the load connected to the output terminals must not exceed the following values.

Type	ac/dc		IIC			IIB**			IIA		
			C (μF)	L (mH)	L/R (μH/Ω)	C (μF)	L (mH)	L/R (μH/Ω)	C (μF)	L (mH)	L/R (μH/Ω)
MTL7741	+	b	2.86	96	748	19.86	365	2,992	99.86	696	5,984
MTL7742	+	b	2.86	96	748	19.86	365	2,992	99.86	696	5,984
MTL7743	+	b4	2.86	96	748	19.86	365	2,992	99.86	696	5,984
		b4	2.86	96	748	19.86	365	2,992	99.86	696	5,984
		b3	2.73	25	374	19.73	91	1,496	99.73	193	2,992
MTL7744	+	b4	2.86	96	748	19.86	365	2,992	99.86	696	5,984
		b4	2.86	96	748	19.86	365	2,992	99.86	696	5,984

Type	ac/dc		IIC			IIB**			IIA		
			C (μ F)	L (mH)	L/R (μ H/ Ω)	C (μ F)	L (mH)	L/R (μ H/ Ω)	C (μ F)	L (mH)	L/R (μ H/ Ω)
		b3	2.73	25	374	19.73	91	1,496	99.73	193	2,992
MTL7745	+	b	2.86	96	748	19.86	365	2,992	99.86	696	5,984

** Group IIB parameters also applicable for associated apparatus [Ex ia Da] IIC

Notes:

- The above load parameters apply when one of the two conditions below is given:
 - the total L_i of the external circuit (excluding the cable) is $< 1\%$ of the L_o value or
 - the total C_i of the external circuit (excluding the cable) is $< 1\%$ of the C_o value.
- The above parameters are reduced to 50% when both of the two conditions below are given:
 - the total L_i of the external circuit (excluding the cable) is $\geq 1\%$ of the L_o value and
 - the total C_i of the external circuit (excluding the cable) is $\geq 1\%$ of the C_o value.

The reduced capacitance of the external circuit (including cable) shall not be greater than 1μ F for Groups IIC, IIB & IIA and 600nF for Group IIC.

The values of L_o and C_o determined by this method shall not be exceeded by the sum of all of the L_i plus cable inductance in the circuit and the sum of all C_i plus cable capacitances respectively.

Load Parameters (Ex ic)

The following load parameters when connecting to an Ex ic system give a factor of safety of at least 1 for Gas Group IIC.

For all versions of the MTL7700 Shunt Zener Barriers

The capacitance or either the inductance or the inductance to resistance ratio (L/R) of the load connected to the output terminals must not exceed the following values.

Type	ac/dc		IIC			IIB**			IIA		
			C (μ F)	L (mH)	L/R (μ H/ Ω)	C (μ F)	L (mH)	L/R (μ H/ Ω)	C (μ F)	L (mH)	L/R (μ H/ Ω)
MTL7706	+	a	0.272	9.24	122	1.65	36.9	489	6.60	73.9	979
MTL7707	+	a1	0.272	9.24	122	1.65	36.9	489	6.60	73.9	979
		a2	0.272	-	-	1.65	-	-	6.60	-	-
		b	0.272	9.24	122	1.65	36.9	489	6.60	73.9	979
MTL7710	+/-	a	20	2.00	160	450	8.00	640	1000	16	1280
MTL7710P	+	a	20	0.888	94	450	3.55	382	1000	7.11	767
MTL7715	+/-	a	3.0	3.55	142	20.2	14.2	568	100	28.4	1137
MTL7715P	+/-	a	3.0	0.94	73	20.2	3.77	292	100	7.55	585
MTL7722	+/-	a	0.63	3.70	98	3.90	14.8	395	15.0	29.6	791
MTL7728	+/- /ac	a	0.272	9.24	122	1.65	36.9	489	6.60	73.9	979
MTL7728P	+/-	a	0.272	5.64	96	1.65	22.5	384	6.60	45.1	768
MTL7751	ac	a1	1000	8	3199	1000	32	12798	1000	64	25598
		a2	1000	8	3199	1000	32	12798	1000	64	25598
		b	1000	2	1599	1000	8	6399	1000	16	12798
		c	1000	8	1599	1000	32	6399	1000	64	12798
MTL7755	ac	a1	1000	0.88	355	1000	3.55	1422	1000	7.11	2844
		a2	1000	0.88	355	1000	3.55	1422	1000	7.11	2844
		b	1000	0.22	177	1000	0.88	711	1000	1.77	1422

Type	ac/ dc		IIC			IIB**			IIA		
			C (μ F)	L (mH)	L/R (μ H/ Ω)	C (μ F)	L (mH)	L/R (μ H/ Ω)	C (μ F)	L (mH)	L/R (μ H/ Ω)
MTL7756	ac	c	600	0.88	177	1000	3.55	711	1000	7.11	1422
		a1	1000	0.88	355	1000	3.55	1422	1000	7.11	2844
		a2	1000	0.88	355	1000	3.55	1422	1000	7.11	2844
		a3	1000	0.88	355	1000	3.55	1422	1000	7.11	2844
		b1	1000	0.22	177	1000	0.88	711	1000	1.77	1422
		b2	1000	0.09	118	1000	0.39	474	1000	0.79	948
		c1	600	0.88	177	1000	3.55	711	1000	7.11	1422
MTL7758	+/-	a1	100	0.13	56	1000	0.56	227	1000	1.13	455
		a2	100	0.13	56	1000	0.56	227	1000	1.13	455
MTL7760	ac*	b	100	0.03	28	1000	0.14	113	1000	0.28	227
		a1	20	2.00	160	450	8.00	640	1000	16	1280
		a2	20	2.00	160	450	8.00	640	1000	16	1280
MTL7761	ac	b	20	0.50	80	450	2.00	320	1000	4.00	640
		a1	40	8.00	355	1000	32	1422	1000	64	2844
		a2	40	8.00	355	1000	32	1422	1000	64	2844
		b	40	2.00	177	1000	8.00	711	1000	16	1422
MTL7761P	ac	c	1.41	8.00	177	9	32	711	36	64	1422
		a1	40	118	1388	1000	473	5554	1000	946	11109
		a2	40	118	1388	1000	473	5554	1000	946	11109
		b	40	29.5	693	1000	118	2773	1000	236	5546
MTL7764	+/-	c	1.41	118	694	9	473	2776	36	946	5553
		a1	8.4	555	2222	100	1000	8888	1000	1000	17777
		a2	8.4	555	2222	100	1000	8888	1000	1000	17777
		b	8.4	138	1111	100	555	4444	1000	1000	8888
MTL7764	ac	a1	8.4	555	2222	100	1000	8888	1000	1000	17777
		a2	8.4	555	2222	100	1000	8888	1000	1000	17777
		b	8.4	138	1111	100	555	4444	1000	1000	8888
		c	0.46	555	1111	2.75	1000	4444	11.0	1000	8888
MTL7765	ac*	a1	3.0	3.55	142	20.2	14.2	568	100	28.44	1137
		a2	3.0	3.55	142	20.2	14.2	568	100	28.44	1137
		b	3.0	0.88	71	20.2	3.55	284	100	7.11	568
MTL7766	ac	a1	8.4	12.5	333	100	50	1333	1000	100	2666
		a2	8.4	12.5	333	100	50	1333	1000	100	2666
		b	8.4	3.12	166	100	12.5	666	1000	25	1333
		c	0.46	12.5	166	2.75	50	666	11.0	100	1333
MTL7766P	ac	a1	8.4	3.24	169	100	12.9	679	1000	25.9	1358
		a2	8.4	3.24	169	100	12.9	679	1000	25.9	1358
		b	8.4	0.81	84	100	3.24	339	1000	6.49	679
		c	0.46	3.24	84	2.75	12.9	339	11.0	25.9	679
MTL7767	+/-	a1	3.0	3.55	142	20.2	14.2	568	100	28.4	1137
		a2	3.0	3.55	142	20.2	14.2	568	100	28.4	1137
		b	3.0	0.88	71	20.2	3.55	284	100	7.11	568
MTL7768	+	a1	0.63	3.7	96	3.9	14.8	393	15.0	29.61	789
		a2	0.63	3.7	96	3.9	14.8	393	15.0	29.61	789
		b	0.63	0.92	47	3.9	3.7	195	15.0	7.4	393
MTL7772	ac	a	0.63	15.01	198	3.9	60.0	794	15.0	120	1590

MTL7778	ac*	a1	0.272	36.2	244	1.65	144	979	6.60	289	1959
		a2	0.272	36.2	244	1.65	144	979	6.60	289	1959
		b	0.272	9.24	122	1.65	36.9	489	6.60	73.9	979

Type	ac/ dc		IIC			IIB**			IIA		
			C (μF)	L (mH)	L/R ($\mu\text{H}/\Omega$)	C (μF)	L (mH)	L/R ($\mu\text{H}/\Omega$)	C (μF)	L (mH)	L/R ($\mu\text{H}/\Omega$)
MTL7779	+/-	a1	0.272	9.24	122	1.65	36.9	489	6.60	73.9	979
		a2	0.272	9.24	122	1.65	36.9	489	6.60	73.9	979
		b	Not permitted								
MTL7787	+/-	a1	0.272	9.24	122	1.65	36.9	489	6.60	73.9	979
		a2	0.272	-	-	1.65	-	-	6.60	-	-
		b	0.272	9.24	122	1.65	36.9	489	6.60	73.9	979
MTL7787P	+/-	a1	0.272	5.64	96	1.65	22.5	384	6.60	45.1	768
		a2	0.272	-	-	1.65	-	-	6.60	-	-
		b	0.272	5.64	96	1.65	22.5	384	6.60	45.1	768
MTL7788	+/-	a1	0.272	9.24	122	1.65	36.9	489	6.60	73.9	979
		a2	20	2.00	160	450	8.00	640	1000	16	1280
		b	0.272	0.92	86	1.65	3.70	347	6.60	7.40	694
MTL7788R	+/-	a1	0.272	9.24	122	1.65	36.9	489	6.60	73.9	979
		a2	20	2.00	160	450	8.00	640	1000	16	1280
		b	0.272	0.92	86	1.65	3.70	347	6.60	7.40	694
MTL7789	+/-	a1	0.272	36.9	244	1.65	147	979	6.60	295	1959
		a2	0.272	-	-	1.65	-	-	6.60	-	-
		a3	0.272	36.9	244	1.65	147	979	6.60	295	1959
		a4	0.272	-	-	1.65	-	-	6.60	-	-
		b3	0.272	9.24	122	1.65	36.9	489	6.60	73.9	979
		c	0.272	36.9	244	1.65	147	979	6.60	295	1959
MTL7796	+/-	a1	0.35	10.5	142	2.05	42.2	568	8.5	84.5	1136
		a2	0.90	30.7	312	5.6	123	1248	20	246	2496
		b	0.35	4.20	99	2.05	16.8	396	8.5	33.6	792

** Group IIB parameters also applicable for associated apparatus [Ex ic Dc] IIIC

Notes:

- 1) The above load parameters apply when one of the two conditions below is given:
 - the total L_i of the external circuit (excluding the cable) is $< 1\%$ of the L_o value or
 - the total C_i of the external circuit (excluding the cable) is $< 1\%$ of the C_o value.
- 2) The above parameters are reduced to 50% when both of the two conditions below are given:
 - the total L_i of the external circuit (excluding the cable) is $\geq 1\%$ of the L_o value and
 - the total C_i of the external circuit (excluding the cable) is $\geq 1\%$ of the C_o value.

The reduced capacitance of the external circuit (including cable) shall not be greater than $1\mu\text{F}$ for Groups IIIC, IIB & IIA and 600nF for Group IIC.

The values of L_o and C_o determined by this method shall not be exceeded by the sum of all of the L_i plus cable inductance in the circuit and the sum of all C_i plus cable capacitances respectively.

When connected to Ex ic circuits, the capacitance or either the inductance or the inductance to resistance ratio (L/R) of the load connected to the output terminals must not exceed the following values.

Type	ac/dc		IIC			IIB**			IIA		
			C (μF)	L (mH)	L/R ($\mu\text{H}/\Omega$)	C (μF)	L (mH)	L/R ($\mu\text{H}/\Omega$)	C (μF)	L (mH)	L/R ($\mu\text{H}/\Omega$)
MTL7741	+	b	19.86	221	3,789	449.8	846	6,736	1,000	1,000	13,473
MTL7742	+	b	19.86	221	3,789	449.8	846	6,736	1,000	1,000	13,473
MTL7743	+	b4	19.86	221	3,789	449.8	846	6,736	1,000	1,000	13,473
		b4	19.86	221	3,789	449.8	846	6,736	1,000	1,000	13,473
		b3	19.73	55.4	842	449.7	210	3,368	1,000	413	6,736
MTL7744	+	b4	19.86	221	3,789	449.8	846	6,736	1,000	1,000	13,473
		b4	19.86	221	3,789	449.8	846	6,736	1,000	1,000	13,473
		b3	19.73	55.4	842	449.7	210	3,368	1,000	413	6,736
MTL7745	+	b	19.86	221	3,789	449.8	846	6,736	1,000	1,000	13,473

** Group IIB parameters also applicable for associated apparatus [Ex ic Dc] IIIC

Notes:

- The above load parameters apply when one of the two conditions below is given:
 - the total L_i of the external circuit (excluding the cable) is $< 1\%$ of the L_o value or
 - the total C_i of the external circuit (excluding the cable) is $< 1\%$ of the C_o value.
- The above parameters are reduced to 50% when both of the two conditions below are given:
 - the total L_i of the external circuit (excluding the cable) is $\geq 1\%$ of the L_o value and
 - the total C_i of the external circuit (excluding the cable) is $\geq 1\%$ of the C_o value.

The reduced capacitance of the external circuit (including cable) shall not be greater than $1\mu\text{F}$ for Groups IIIC, IIB & IIA and 600nF for Group IIC.

The values of L_o and C_o determined by this method shall not be exceeded by the sum of all of the L_i plus cable inductance in the circuit and the sum of all C_i plus cable capacitances respectively

16 Report Number

21(C)0386/01

17 Specific Conditions of Use

None.

18 Essential Health and Safety Requirements

In addition to the Essential Health and Safety Requirements (EHSRs) covered by the standards listed at item 9, the following are considered relevant to this product, and conformity is demonstrated in the report:

Clause	Subject	Compliance
13	Protection against other hazards (LVD type requirements, etc.)	Manufacturer responsibility
14	Overloading of equipment (protection relays, etc.)	User/Installer responsibility
22(1)	External effects	User/Installer responsibility
22(2)	Aggressive substances, etc.	User/Installer responsibility

19 Drawings and Documents

Number	Sheet	Issue	Date	Description
CI7706-1	4 of 4	6	8.21	MTL7706+ Certification Label
CI7707-1	4 of 4	5	8.21	MTL7707+ Shunt Diode Safety Barrier Certification Label
CI7710-1	4 of 4	5	8.21	MTL7710+, MTL7710- Shunt Diode Safety Barrier Certification Label
CI7710P+ -1	5 of 5	2	8.21	MTL7710P+ MTL7710P+ SHUNT DIODE SAFETY BARRIER
CI7715-1	4 of 4	5	8.21	MTL7715+, MTL7715- Shunt Diode Safety Barrier Certification Label
CI7715-2	4 of 4	5	8.21	MTL7715P+, MTL7715P- Shunt Diode Safety Barrier Certification Label
CI7722-1	4 of 4	5	8.21	MTL7722+, MTL7722- Shunt Diode Safety Barrier Certification Label
CI7728-1	4 of 4	5	8.21	MTL7728+, MTL7728- Shunt Diode Safety Barrier Certification Label
CI7728-2	4 of 4	5	8.21	MTL7728ac Shunt Diode Safety Barrier Certification Label
CI7728-3	4 of 4	5	8.21	MTL7728P+, MTL7728P- Shunt Diode Safety Barrier Certification Label
CI7741-1	4 of 4	4	8.21	MTL7741 Switch / Proximity Safety Barrier Certification Label
CI7742-1	4 of 4	4	8.21	MTL7742 Switch / Proximity Safety Barrier Certification Label
CI7743-1	4 of 4	4	8.21	MTL7743 Switch / Proximity Safety Barrier Certification Label
CI7744-1	4 of 4	4	8.21	MTL7744 Switch / Proximity Safety Barrier Certification Label
CI7745-1	4 of 4	4	8.21	MTL7745 Switch / Proximity Safety Barrier Certification Label
CI7751-1	4 of 4	2	8.21	MTL7751AC Shunt Diode Safety Barrier Certification Label.
CI7755-1	4 of 4	5	8.21	MTL7755ac Shunt Diode Safety Barrier Certification Label
CI7756-1	4 of 4	6	8.21	MTL7756ac Shunt Diode Safety Barrier Certification Label
CI7758-1	4 of 4	5	8.21	MTL7758+, MTL7758- Shunt Diode Safety Barrier Certification Label
CI7760-1	4 of 4	5	8.21	MTL7760ac, MTL7765ac Shunt Diode Safety Barrier Certification Labels
CI7761-1	4 of 4	5	8.21	MTL7761ac Shunt Diode Safety Barrier Certification Label
CI7761-2	4 of 4	6	8.21	MTL7761Pac, MTL7764ac, MTL7766ac Shunt Diode Safety Barrier Certification Label
CI7764-1	4 of 4	5	8.21	MTL7764+, MTL7764- Shunt Diode Safety Barrier Certification Label
CI7766-1	4 of 4	5	8.21	MTL7766Pac Shunt Diode Safety Barrier Certification Label
CI7767-1	4 of 4	5	8.21	MTL7767+, MTL7767- Shunt Diode Safety Barrier Certification Label
CI7768+ -1	5 of 5	2	8.21	MTL7768+ Shunt Zener diode Safety Barrier Certification Label.
CI7772ac -1	4 of 4	2	8.21	MTL7772ac Shunt Zener diode Safety Barrier Certification Label.
CI7778-1	4 of 4	4	8.21	MTL7778ac Shunt Diode Safety Barrier Certification Label
CI7779-1	4 of 4	5	8.21	MTL7779+, MTL7779- Shunt Diode Safety Barrier Certification Label
CI7787-1	4 of 4	5	8.21	MTL7787+, MTL7787- Shunt Diode Safety Barrier Certification Label
CI7787-2	4 of 4	5	8.21	MTL7787P+, MTL7787- Shunt Diode Safety Barrier Certification Label
CI7788-1	4 of 4	5	8.21	MTL7788+, MTL7788-, MTL7788R+ and MTL7788R- Shunt Diode Safety Barrier Certification Label
CI7789-1	4 of 4	5	8.21	MTL7789+, MTL7789- Shunt Diode Safety Barrier Certification Label
CI7796-1	4 of 4	5	8.21	MTL7796+, MTL7796- Shunt Diode Safety Barrier Certification Label

For all other drawings see BAS01ATEX7217 Issue 10.