Esterline Power Systems

Featuring LEACH® Products

SHORT FORM CATALOG

COMPONENTS & SOLUTIONS

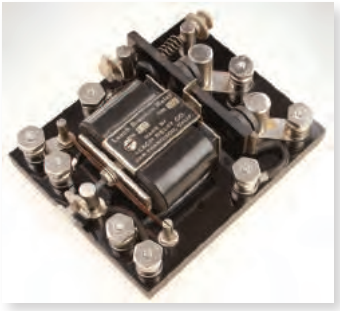
esterline.com/powersystems
(714) 736-7598

LEACH® Products are Recognized for their Design Excellence, Quality & Reliability

As one of the core capabilities of Esterline Technologies Corporation, Esterline Power Systems draws upon the rich aerospace and military heritage of LEACH®. The LEACH Relay Co. introduced the first "break-in" relay in 1919, and further developed the art of power switching technology throughout the 20th century.

Today, LEACH® products include: the balanced armature, balanced force relays, rotary & solenoid contactors, as well as control devices and power management systems, which have been used in the most severe environments in space, aerospace, military, rail, and other high-end applications worldwide.

With its extensive product line, advanced design and engineering processes, more than 1,800 dedicated employees, and representatives in more than 20 countries, Esterline Power Systems continues to maintain its hard-earned position as an industry leader.



First Break-in Relay -1919

CERTIFICATIONS & QUALIFICATIONS:

ISO9001/AS9100	ESA/ESCC	JAR 21	M83536
MIL-STD-790	D6-82479	JAR 45	M6106
FAA Certified Repair Station	CFR 21	QUALIFAS/A	M83726
EASA Part 145 Certification	CFR/JAR 145	IRIS (Rail)	M39016

GLOBAL OPERATION

Esterline Power Systems has manufacturing facilities in North America, Europe and Asia. Each facility offers unique engineering, manufacturing, sales & service capabilities, and each function has an integral part of the Esterline Power Systems team. With the industry's finest electrical testing laboratories, combined with state-of-the-art manufacturing, Esterline Power Systems is able to provide world-class service and an ever-expanding product line.

AMERICAS *Buena Park, CA • Tijuana, Mexico*

EUROPE *Sarralbe, France • Niort, France*

ASIA *Zunyi, China • Hong Kong, China • Bangalore, India*

TABLE OF CONTENTS

LEACH PRODUCT TYPES AND SPECIFICATIONS

PRODUCT TYPES:

Subminiature Relays *(Low level to 75 Amps)*

For decades, LEACH® subminiature relays have set the industry standard for technology and reliability. With their proven high performance in the most demanding applications, they are ideal for critical subsea, shipboard, ground-based, space, and aerospace applications.

Balanced Armature Relays *(10 Amps to 25 Amps)*

LEACH® balanced armature relays have been used in commercial and military aircraft, trucks, buses, ships, and tanks – applications that call for proven durability, high performance and long life. Several terminal mounting styles, dust-resistant, moisture-resistant and hermetically-sealed enclosures. A variety of operating ratings and characteristics are available.

Power Contactors *(25 Amps to 700 Amps)*

LEACH® power contactors are available with optional auxiliary contacts in sealed and unsealed models."Smart" programmable contactors and special mounting styles are also available.

Time Delay Relays *(150 mAmps to 25 Amps)*

LEACH® time delay devices combine the proven capability of industry standard relays with highly reliable hybrid microelectronics timing circuits.

Power Monitors and Sensors *(up to 10 Amps)*

Designed to meet the requirements of MIL-R-28894, LEACH® power monitors and sensors constantly monitor and protect critical AC or DC circuits.

Solid-state Power Controllers *(1 Amp to 220 Amps)*

Ideal for applications where reliability is key and size and weight are major concerns; LEACH® SSPCs employ a FET output stage and are constructed using thick-film technology, they are hermetically sealed, and mainly metal enclosures.

PRODUCT SPECIFICATIONS:

MIL-PRF-39016

This specification covers relays rated from low level to 2 Amps used primarily in electronic and communication equipment. All relays are Established Reliability (ER), and hermetically-sealed types.

MIL-PRF-6106

This specification establishes general requirements for electromechanical relays with contact ratings from 25 amperes resistive (unless otherwise specified) and upward for use in electrical applications. Auxiliary contacts may be rated at lower currents. Relays covered by this specification are capable of meeting the electrical and environmental requirements when mounted directly to the structure of aircraft, missile, spacecraft, ship, and other primary vehicles or in ground support and shipboard equipment. Other ratings may be as specified.

MIL-PRF-83536

This specification covers the general requirements for electromagnetic, hermetically sealed relays for use in aircraft, missile, spacecraft, ship, and other primary vehicles or in ground support equipment. These relays are designed to operate over the full range from low level to power switching with contact ratings up to 25 amperes alternating current (ac) or direct current (dc).

MIL-PRF-83726

This specification establishes the general requirements for time delay relays that are a combination of hybrid microcircuits, solid state electronics with an integral electromagnetic relay, or solid state output. Relays covered by this specification are intended for use in aerospace and associated ground support electrical and electronic systems and equipment

SUBMINIATURE RELAYS *(1 - 2 Amps)*




Leach Series:	E, D	GP2, GP2A, GP250	W260, F250	GP5
Rating:	1 Amp	2 Amps	2 Amps	2 Amps
Contact configuration:	2 PDT	2 PDT	2 PDT	2 PDT
Style:	Non-latch and Latch	Non-latch and Latch	Non-latch	Non-latch
Designed to:	MIL-PRF-39016	MIL-PRF-39016	MIL-PRF-39016	MIL-PRF-39016
Qualified to:	SCC3601/012 SCC3602/019 CECC16101-023 CECC16101-024	SCC3601/003 SCC3602/003 SCC3602/010 CECC1610/014	M39016/6 CECC16101/014 CECC16101/021	CECC16101/014 SCC3601/003
Electrical Data	**E, D**	**GP2, GP2A, GP250**	**W260, F250**	**GP5**
Contact load rating (voltage):	28 VDC	28 VDC 115 VAC	28 VDC 115 VAC	28 VDC 115 VAC
Current (Amps):	-	60-400 Hz	400 Hz	400 Hz
Load Type resistive:	1	2 0.3	2 0.3	2 -
Inductive:	0.2	0.75 -	0.75 -	- -
Motor:	-	- -	- -	- -
Lamp:	0.1	- -	0.4 -	- -
Nominal coil voltage(s):	6-28 VDC	6-26 VDC	5-60 VDC	6-26 VDC
Coil Power	-	-	-	-
Nominal:	0.5 W/0.25 W	1 W	1 W	1.4 W
At pick up:	0.13 W/0.06 W	0.28 W	0.28 W	0.28 W
Operate time, max. (ms):	5-6	4	4	4
Environmental Data	**E, D**	**GP2, GP2A, GP250**	**W260, F250**	**GP5**
Sinusoidal vibration (g):	30 @ 70-3000 Hz 70 @ 70-2000 Hz	30 @ 70-3000 Hz 20 @ 70-3000 Hz	30 @ 70-3000 Hz 20 @ 70-3000 Hz	30 @ 70-2000 Hz
Shock (g):	75-100	100	50-100	100
Temperature range	-65°C to +125°C	-65°C to +125°C	-65°C to +125°C	-65°C to +125°C
Mechanical Data	**E, D**	**GP2, GP2A, GP250**	**W260, F250**	**GP5**
Weight, max. (oz./grams):	<0.129 oz. (4 g.)	<0.354 oz. (11 g.)	<0.32 oz. (10 g.)	<0.354 oz. (11 g.)
Dimensions, max. (in.): (L x W x H)	0.504 x 0.236 x 0.409	0.811 x 0.413 x 0.409	1.32 x 0.90 x 0.41	0.803 x 0.409 x 40
Sockets available	-	SO508, SO510, SO501	SF250-R4, HRCW, SO9005	HRCW
Mounting styles:	4	8	8	12
Terminal types:	4	3	3	3

*ESA qualified products also available. Contact factory for details.

SUBMINIATURE RELAYS *(Low level to 10 Amps)*





Leach Series:	X, XL, XA	Y, YL, YA	XC, XCL	YC, YCL, YCA	F600, F601
Rating:	Low level to 5 Amps	Low level to 5 Amps	Low level to 10 Amps	Low level to 10 Amps	Low level to 10 Amps
Contact configuration:	2 PDT	4 PDT	1 PDT	3 PDT	6 PDT
Style:	Non-latch and Latch	Non-latch and Latch	Non-latch and Latch	Non-latch and Latch	Non-latch
Designed to:	XA, XL: MIL-PRF-6106 X: MIL-PRF-83536	YA, YL: MIL-PRF-6106 Y: MIL-PRF-83536	MIL-PRF-6106	YCL, YCA: MIL-PRF-6106 YC: MIL-PRF-83536	M83536/25, 26
Qualified to:	X: M83536/1, 2 XL: M6106/38	Y: M83536/5, 6 YL: M6106/39		YC: M83536/21, 22 YCL: M6106/40	CECC16101/020 CECC16303/806
Electrical Data	**X, XL, XA**	**Y, YL, YA**	**XC, XCL**	**YC, YCL, YCA**	**F600, F601**
Contact rating (Amps)	-	-	-	-	-
@ 28 VDC	-	-	-	-	-
Resistive:	5	5	10	10	10
Inductive:	3	3	6	6	8
Motor:	2	2	4	4	4
Lamp:	1	1	2	2	2
@115 VAC, 400 Hz, 3Ø (Case grounded)	Same as DC rating except inductive is 5 Amps and motor is 3 Amps	Same as DC rating except inductive is 5 Amps and motor is 3 Amps	Same as DC rating except inductive is 10 Amps	Same as DC rating except inductive is 8 Amps	Same as DC rating
Nominal coil voltage(s)	-	-	-	-	-
DC Non-latch::	6/12/28/48 VDC	6/12/28/48 VDC	6/12/28/48 VDC	6/12/28/48 VDC	12-110 VDC
DC Latch:	6/12/28 VDC	6/12/28 VDC	6/12/28 VDC	6/12/28 VDC	-
AC Coil:	28, 115/200 VAC 50-400 Hz	28, 115/200 VAC 50-400 Hz	- -	28, 115/200 VAC 50-400 Hz	28, 115 VAC 60-400 Hz
Coil resistance(s) (Ohms)	-	-	-	-	-
DC Non-latch::	30/125/500/1600	25/100/400/1275	25/125/500/1600	25/100/400/1275	40-3200
DC Latch:	43/182/730	37/148/600	730	600	-
AC Coil, Current, I max.	.100/.040/.024	.120/.040/.028	-	.120/.040/.028	-
Operate time, max. (ms)	-	-	-	-	-
DC Non-latch::	4	6	6	6	15
DC Latch:	4	6	6	15	-
AC Coil:	4	5	-	15	20
Release time, max. (ms)	-	-	-	-	-
DC Non-latch::	4	6	6	6	10
AC Coil:	4	25	-	25	50
Bounce time, max. (ms):	1.0	1.0	1.0	1.0	1.0
Environmental Data	**X, XL, XA**	**Y, YL, YA**	**XC, XCL**	**YC, YCL, YCA**	**F600, F601**
Sinusoidal vibration (g):	30 @ 70-3000 Hz	30 @ 70-3000 Hz	30 @ 70-3000 Hz	30 @ 70-3000 Hz	30 @ 75-3000 Hz
Shock (g):	200	200	200	200	50
Temperature range	-70°C to +125°C	-70°C to +125°C	-70°C to +125°C	-70°C to +125°C	-65°C to +125°C
Mechanical Data	**X, XL, XA**	**Y, YL, YA**	**XC, XCL**	**YC, YCL, YCA**	**F600, F601**
Weight, max. (oz./lbs.):	.56 oz (16 g.)	1.06 oz. (30 g.)	.56 oz. (16 g.)	1.09 oz. (31 g.)	<3.054 oz. (95 g.)
Dimensions, max. (in.):	0.810 x 0.410 x 0.640	0.810 x 0.810 x 0.640	0.810 x 0.410 x 0.640	0.810 x 0.810 x 0.640	1.484 x 1.024 x 1.012
(L x W x H)	-	-	-	-	-
Sockets available	-	-	-	-	-
Non-latch DC Coil:	SO-1064-001	SO-1066-001	SO-1064-10425	SO-1065-001	S600
Latch DC Coil:	SO-1064-003	SO-1066-003	SO-1064-10534	SO-1065-003	SF600
Non-latch AC Coil:	SO-1064-10444	SO-1066-10385	-	SO-1065-10392	S601
28 VAC Coil:	SO-1064-10445	SO-1066-10386	-	SO-1065-10393	S601
Mounting styles:	5	5	5	5	4
Terminal types:	4	3	4	3	4

SUBMINIATURE RELAYS *(Low level to 75 Amps)*






Leach Series:	J, JA, JL	K, KA, KL	JC, JCA, JCL, JS, JSA	KC, KCA, KCL	KD, KDA, KDL	KM, KX, KXD, KXL, KXDL
Rating:	Low level to 12 Amps ‡	Low level to 12 Amps ‡	Low level to 25 Amps	Low level to 25 Amps	Low level to 25 Amps	50-75 Amps
Contact configuration:	2 PDT	4 PDT	1 PDT	3 PDT	3 PST/NO, 2 Amps 1 PDT Aux.	1 PST/DM or DB, 2 Amps 1 PST
Style:	Non-latch and Latch	Non-latch and Latch	Non-latch and Latch	Non-latch and Latch	Non-latch and Latch †	Non-latch and Latch
Designed to:	MIL-PRF-83536	MIL-PRF-83536	MIL-PRF-6106	MIL-PRF-6106	MIL-PRF-6106	MIL-PRF-6106
Qualified to:	M83536/9, 10, 11, 12, 13	M83536/15, 16, 17, 18, 19	JC, JS: M6106/19 JCL: M6106/20	KC: M83536/32/33 KCL: MS27742	KD, KDA: M6106/13 KDL: M6106/12	
Electrical Data	**J, JA, JL**	**K, KA, KL**	**JC, JCA, JCL, JS, JSA**	**KC, KCA, KCL**	**KD, KDA, KDL**	**KM, KX, KXD, KXL, KXDL**
Contact rating (Amps):	-	-	-	-	-	-
@ 28 VDC	-	-	-	-	-	-
Resistive:	12	12	25 10	25	25	50 75
Inductive:	8	8	12 10	12	12	15 20
Motor:	4	4	10 4	10	10	30 20
Lamp:	2	2	5 4	5	5	15 10-16
@ 115/220 VAC, 400 Hz, 3Ø: (Case grounded)	Same as DC rating except resistive is 10 Amps	Same as DC rating except resistive is 10 Amps	Same as DC rating n/a See note **	Same as DC rating except inductive is 15 Amps	Same as DC rating except inductive is 15 Amps	See note †† n/a
Nominal coil voltage(s):	-	-	-	-	-	-
DC Non-latch:	6/12/28/48 VDC	6/12/28/48 VDC	6/12/28/48 VDC	6/12/28/48 VDC	6/12/28/48 VDC	6/12/28 VDC 28 VDC
DC Latch:	6/12/28/48 VDC	6/12/28/48 VDC	6/12/28/48 VDC	6/12/28/48 VDC	6/12/28/48 VDC	6/12/28 VDC 28 VDC
AC Coil:	28, 115/200 VAC 50-400 Hz	28, 115/200 VAC 50-400 Hz	28, 115/200 VAC 50-400 Hz	28, 115/200 VAC 50-400 Hz	28, 115/200 VAC 50-400 Hz	- -
Coil resistance(s) (Ohms)	-	-	-	-	-	-
DC Non-latch:	20/80/320/1000	18/70/290/890	20/80/320/1000	18/70/290/890	18/70/290/890	18/70/290 290
DC Latch:	38/150/600/1600	28/112/450/1500	38/150/600/1600	28/112/450/1500	28/112/450/1500	28/112/450 450
AC Coil, Current, I max.:	.240/.040/.024	.120/.040/.028	.100/.040/.024	.120/.040/.028	.120/.040/.028	- 120
Operate time, max. (ms)	-	-	-	-	-	-
DC Non-latch:	10	15	10	15	15	15
DC Latch:	10	15	10	15	15	15
AC Coil:	15	20	15	20	20	-
Release time, max. (ms)	-	-	-	-	-	-
DC Non-latch:	10	15	10	15	15	15
AC Coil:	50	50	50	50	50	-
Bounce time, max. (ms):	1.0	1.0	1.0	1.0	1.0 (Aux. 4)	1.0 1.0 (Aux. 4)
Environmental Data	**J, JA, JL**	**K, KA, KL**	**JC, JCA, JCL, JS, JSA**	**KC, KCA, KCL**	**KD, KDA, KDL**	**KM, KX, KXD, KXL**
Sinusoidal vibration (g):	30 @ 70-3000 Hz	30 @ 70-3000 Hz	30 @ 70-3000 Hz	30 @ 70-3000 Hz	30 @ 70-3000 Hz	30 @ 70-3000 Hz 20 @ 70-3000 Hz
Shock (g):	-	-	-	-	-	-
Temperature range	-70°C to +125°C	-70°C to +125°C	-70°C to +125°C	-70°C to +125°C	-70°C to +125°C	-70°C to +125°C
Mechanical Data	**J, JA, JL**	**K, KA, KL**	**JC, JCA, JCL, JS, JSA**	**KC, KCA, KCL**	**KD, KDA, KDL**	**KM, KX, KXD, KXL**
Weight, max. (oz./grams):	1.4 oz. (40 g.)	DC: 2.5 oz. (71 g.) AC: 2.7 oz. (77 g.)	1.6 oz. (45 g.)	3.0 oz. (85 g.)	3.0 oz. (85 g.)	3.0 oz. (85 g.)
Dimensions, max. (in.): (L x W x H)	DC:1.025 x 0.525 x 1.010 AC: 1.025 x 0.525 x 1.125	1.025 x 0.025 x 1.010	DC:1.015 x 0.515 x 1.000 AC:1.015 x 0.515 x 1.125	1.025 x 1.025 x 1.010	1.025 x 1.025 x 1.010	1.025 x 1.025 x 1.70
Sockets available	-	-	-	-	-	-
Non-latch DC Coil:	SO-1049-8309	SO-1048-8308	SO-1063-9033	SO-1057-8912	SO-1059-8914	-
Latch DC Coil:	SO-1055-8690	SO-1056-8691	SO-1063-9036	SO-1058-8913	SO-1060-8915	-
Non-latch AC Coil:	SO-1049-8772	SO-1048-8776	SO-1063-9034	SO-1062-8917	SO-1061-8916	-
28 VAC Coil:	SO-1055-8774	SO-1048-8779	-	-	-	-

* JC, JCA & JCL @ 50 ADC & 80 Amp 400 Hz overload.
† Same design as KC series with added auxiliary pole.
‡MIL-PRF-83536 rated at 10 Amps.

**JS/JSA only designed to switch 115 VAC, 60 Hz case grounded; JS has 20 amp overload capabilites.
†† Special models available; contact factory for auxiliary contacts and additional information.

BALANCED ARMATURE RELAYS *(10 - 25 Amps)*





Leach Series:	9330	9274	9324	9325	9339
Rating:	10 Amps	15 Amps	25 Amps	25 Amps	25 Amps
Contact configuration:	2 PDT	4 PDT	3 PST/NO	3 PST-CO/NO	3 PST/NO w/ 2 Amps, 1 PDT
Designed to:	MIL-PRF-6106	MIL-PRF-6106	MIL-PRF-6106	MIL-PRF-6106	MIL-PRF-6106
Qualified to:	MS24149	MS24568	MS27418	MS27706	MS6106/41
Electrical Data	**9330**	**9274**	**9324**	**9325**	**9339**
Contact rating (Amps)	-	-	-	-	-
@ 28 VDC	-	-	-	-	-
Resistive:	10	10	25 †	25 **	25
Inductive:	10	10	15 †	15	15
Motor:	6	6	20 †	20	20
Lamp:	2	3	10 †	10 **	10
@ 115 VAC, 400 Hz, 3Ø					
Resistive:	10	15	25 †	25 **	25
Inductive:	10	10	25 †	25 **	25
Motor:	6	8 **	20 †	20	20
Lamp:	2	4 **	10 †	10 ††	10 ‡‡
@ 115 VAC, 50/60 Hz, 3Ø					
Resistive:	6	10	25 †	25 **	25
Inductive:	4	6	25 †	25 **	25
Motor:	3	4	12 †	12	12
Lamp:	1.5	2	10 †	10 **	10
Nominal coil voltage(s):	28 VDC 115 VAC, 400 Hz 115 VAC, 60 Hz*	28 VDC 115 VAC, 400 Hz 115 VAC, 60 Hz	28 VDC 115 VAC, 400 Hz 115 VAC, 60 Hz	28 VDC 115 VAC, 400 Hz 115 VAC, 60 Hz	28 VDC 115 VAC, 400 Hz 115 VAC, 60 Hz
Resistance, Ohms ±10%:	160Ω	92Ω	160Ω	160Ω (each coil)	160Ω
@ 25° C for 28 VDC	-	-	-	-	-
Operate time, max. (ms)	-	-	-	-	-
DC Coil:	20	25	20	20	20
AC Coil:	20	25	20	20	25
Release time, max. (ms)					
DC Coil:	20	20	10	10	10
AC Coil:	50	50	50	50	50
Bounce time, max. (ms):	2	N/O 3, N/C 5	2	5	2 Aux. 4
Environmental Data	**9330**	**9274**	**9324**	**9325**	**9339**
Sinusoidal vibration (g):	10 @ 15-1500 Hz	10 @ 1000-2000 Hz	10 @ 55-1500 Hz	10 @ 55-1500 Hz	10 @ 55-1500 Hz
Shock (g):	25	50	50	25	50
Temperature range	-70°C to +125°C	-70°C to +125°C	-70°C to +125°C	-70°C to +125°C	-70°C to +125°C
Mechanical Data	**9330**	**9274**	**9324**	**9325**	**9339**
Weight, max. (oz./lbs.):	7.04 oz.	12.80 oz.	10.56 oz.	22.7 oz.	7.04 oz.
Dimensions, max. (in.):	2.50 x 1.625 x 2.60	2.062 x 2.062 x 1.807	1.531 x 1.531 x 1.680	3.54 x 3.00 x 3.20	1.531 x 1.531 x 1.680
(L x W x H)	-	-	-	-	-
Option(s) available:	Suppressed DC coil	Suppressed DC coil	Suppressed DC coil	Suppressed DC coil	Suppressed DC coil

* Max. temp. limited to +85° C.

** Value exceeds Mil-Spec.

† 440 VAC 60 Hz delta rating, 3.5 amp resistive.

†† 25 amp resistive load transfer rating.

‡‡ Aux. ratings 2 amp resistive, lamp inductive, 0.5 amp lamp.

* 1NO + 1NC auxiliary contact ** ± 20% @ 25°C † 2PDT auxiliary contact. May be associated with a Hall current sensor

POWER CONTACTORS *(25 - 100 Amps)*




Leach Series:	9123	9213	9207	9124
Rating:	25 Amps	25-100 Amps	25-100 Amps	50 Amps
Contact configuration:	3 PST/NO DM	3 PST/NO, 4 PST/NO 2 P/NO, 2 P/NC DB-DM	3 PST/NO DM, 2P/NO, 2P/NC DB-DM	3 PST/NO DB
Designed to:	MIL-PRF-6106	MIL-PRF-6106	MIL-PRF-6106	MIL-PRF-6106
Qualified to:	MS27997		DESC Spec 84192	MS27222
Electrical Data	**9123**	**9213**	**9207**	**9124**
Contact rating (Amps)	-	-	-	-
@ 28 VDC	-	-	-	-
Resistive:	25	25-100 *	25-100 *	50
Inductive:	25	25-100 *	25-100 *	50
Motor:	25	25-100 *	25-100 *	50
Lamp:	-	-	-	-
@ 115 VAC, 400 Hz, 3Ø	-	-	-	-
Resistive:	25	25-100 *	25-100 *	50
Inductive:	25	25-100 *	25-100 *	50
Motor:	25	25-100 *	25-100 *	50
Lamp:	-	-	-	-
@ 115 VAC, 50/60 Hz, 3Ø				
Resistive:	15	50 *	50 *	30
Inductive:	15	50 *	50 *	30
Motor:	7	50 *	50 *	15
Lamp:	-	-	-	-
Nominal coil voltage(s):	28 VDC 115 VAC, 400 Hz 115 VAC, 60 Hz	28 VDC 115 VAC, 400 Hz 115 VAC, 60 Hz	28 VDC 115 VAC, 400 Hz 115 VAC, 60 Hz	28 VDC 115 VAC, 400 Hz 115 VAC, 60 Hz
Resistance, Ohms ±10%:	50Ω	44.5Ω	44.5Ω	50Ω
@ 25° C for 28 VDC	-	-	-	-
Operate time, max. (ms)	-	-	-	-
DC Coil:	25	30	30	25
AC Coil:	30	40	40	30
Release time, max. (ms)	--	-	-	-
DC Coil:	10	20	20	10
AC Coil:	50	60	50	50
Bounce time, max. (ms):	2	10	10	2
Environmental Data	**9123**	**9213**	**9207**	**9124**
Sinusoidal vibration (g):	15 @ 55-1500 Hz	10 @ 55-1500 Hz	10 @ 55-1500 Hz	15 @ 55-1500 Hz
Shock (g):	50	50	50	50
Temperature range	-70°C to +125°C	-55°C to +71°C	-55°C to +85°C	-70°C to +125°C
Mechanical Data	**9123**	**9213**	**9207**	**9124**
Weight, max. (oz./lbs.):	20 oz.	44.8 oz.	28 oz.	20 oz.
Dimensions, max. (in.): (L x W x H)	3.73 x 3.305 x 2.50	4.22 x 4.23 x 4.53	3.63 x 3.62 x 2.875	3.73 x 3.305 x 2.50
Option(s) available:	Auxiliary 5 Amp contacts 440 VAC 60 Hz delta rating	Auxiliary 5-25 Amp contacts	Auxiliary 5-25 Amp contacts	Auxiliary 5 Amp contacts 440 VAC 60 Hz delta rating

* 440 VAC 60 Hz wye/delta rated. Sealed rotary, 1, 2, 3 and 4 pole.

* 1NO + 1NC auxiliary contact

** ± 20% @ 25°C † 2PDT auxiliary contact. May be associated with a Hall current sensor

POWER CONTACTORS *(50 - 400 Amps)*




Leach Series:	HC Center-off	7064, 7264, 7401	H, HD, HP, HT, HTD, HPT ††	HL, HLT ‡
Rating:	50 Amps	50-400 Amps	60 Amps	60 Amps
Contact configuration:	3 PST-NO 1 PST-NO DM	1 PST/NO	3 PST, 3 PDT, 1 PDT-DB-DM	3 PST, 3 PDT, 1 PDT-DB-DM
Style:			Magnetic latch	Magnetic latch
Designed to:	MIL-PRF-6106	MIL-PRF-6106	MIL-PRF-6106	MIL-PRF-6106
Qualified to:	MS27750	MS24166 MS24171/72 MS24178/79 MS24185	MS27751 M6106/26 and 43	MS27749
Electrical Data	**HC Center-off**	**7064, 7264, 7401**	**H, HD, HP, HT, HTD, HPT ††**	**HL, HLT ‡**
Contact rating (Amps)	-	-	-	-
@ 28 VDC	-	-	-	-
Resistive:	25	50-400	50	50
Inductive:	15	50-100	20	20
Motor:	15	50-400	20	20
Lamp:	10	-	10	10
@ 115 VAC, 400 Hz, 3Ø		-		-
Resistive:	50	-	60	60
Inductive:	50 **	-	60	60
Motor:	30	-	40	40
Lamp:	15	-	15	15
@ 115 VAC, 50/60 Hz, 3Ø		-		-
Resistive:	30	-	30	30
Inductive:	30	-	30	30
Motor:	30	-	30	30
Lamp:	-	-	-	-
Nominal coil voltage(s):	6, 12, 28 VDC 115 VAC, 400 Hz 115 VAC, 60 Hz	28 VDC	6, 12, 28 VDC 115 VAC, 400 Hz 115 VAC, 60 Hz	6, 12, 28 VDC 115 VAC, 400 Hz 115 VAC, 60 Hz
Resistance, Ohms ±10% @ 25° C for 28 VDC:	6 VDC, 12Ω; 12 VDC, 50Ω; 28 VDC, 200Ω † 115 VAC, .100 Amp	6 VDC, 12Ω; 12 VDC, 50Ω;	6 VDC, 12Ω; 12 VDC, 50Ω; 28 VDC, 200Ω; 115 VAC, .090 Amp	6 VDC, 12Ω; 12 VDC, 50Ω; 28 VDC, 200Ω
Operate time, max. (ms)	-	-	-	-
DC Coil:	35		50	35
AC Coil:	35	40	50	35
Release time, max. (ms)		-	-	-
DC Coil:	25	-	25	-
AC Coil:	80	15	80	-
Bounce time, max. (ms):	3	-	3	3
Environmental Data	**HC Center-off**	**7064, 7264, 7401**	**H, HD, HP, HT, HTD, HPT ††**	**HL, HLT ‡**
Sinusoidal vibration (g):	10 @ 70-1000 Hz	2 @ 55-500 Hz	10 @ 70-1000 Hz	10 @ 70-1000 Hz
Shock (g):	50	25	50	50
Temperature range	-55°C to +71°C	-55°C to +71°C	-55°C to +71°C	-55°C to +71°C
Mechanical Data	**HC Center-off**	**7064, 7264, 7401**	**H, HD, HP, HT, HTD, HPT ††**	**HL, HLT ‡**
Weight, max. (oz./lbs.):	15 oz.	.59-2.6 lbs.	14 oz.	15 oz.
Dimensions, max. (in.): (L x W x H)	2.50 diameter x 3.13 4.41 x 2.0 x 3.75	2.76 x 2.1 x 2.56	2.50 diameter x 3.13	2.50 diameter x 3.13
Option(s) available:	Gasket sealed models	Special units upon request	Auxiliary 5 Amp contacts	Auxiliary 5 Amp contacts

**30 Amps for AC coil † ±20% @ 25°C †† HT (power transfer model) ‡ HLT (power transfer model)

POWER CONTACTORS *(50 - 700 Amps)*





Leach Series:	79, 109, 209, 309, 509* 707	ZC, ZCD Center-off	Z, ZG, ZJ	ZL, ZLD	CCO20 *, CC040 *, CC050 †
Rating:	80-700 Amps	100 Amps	120-180 Amps	Up to 120 Amps	200-400 Amps
Contact configuration:	1 PST/NO DM	3 PDT-NO, 1 PDT/NO DM-DB	3 PDT, 3 PST/NO, SPDT-DB-DM	3 PDT	1 PST/NO DM
Style:	Permanent duty		SPST/NO-DM, SPST/NC-DB	1 PDT-DB-DM (latch)	Permanent duty bus bar mounting
Designed to:	MIL-PRF-6106	MIL-PRF-6106	MIL-PRF-6106	MIL-PRF-6106	MIL-PRF-6106
Qualified to:	AIR 7304 AIR 8456 B				AIR 7304 AIR 8456 B
Electrical Data	**79, 109, 209, 309, 509* 707**	**ZC, ZCD Center-off**	**Z, ZG, ZJ**	**ZL, ZLD**	**CCO20 *, CC040 *, CC050 †**
Contact rating (Amps)	-	-	-	-	-
@ 28 VDC	-	-	-	-	-
Resistive:	80-700	50	50	50	200-400
Inductive:	700	30	30	30	125-200
Motor:	40-250	30	30	30	125-200
Lamp:	-	-	-	-	-
@ 115 VAC, 400 Hz, 3Ø	-	-	-	-	-
Resistive:	-	100	120-180	120	-
Inductive:	-	100	120-180	120	-
Motor:	-	60	80-120	80	-
Lamp:	-	-	-	-	-
@ 115 VAC, 50/60 Hz, 3Ø	-	-	-	-	-
Resistive:	-	60	60	60	-
Inductive:	-	60	60	60	-
Motor:	-	40	60	60	-
Lamp:	-	-	-	-	-
Nominal coil voltage(s):	28 VDC	6, 12, 28 VDC 115 VAC, 400 Hz 115 VAC, 60 Hz	6, 12, 28 VDC 115 VAC, 400 Hz 115 VAC, 60 Hz	6, 12, 28 VDC 115 VAC, 400 Hz 115 VAC, 60 Hz	28 VDC
Resistance, Ohms ±10% @ 25° C for 28 VDC:	7.2/280 to 5/200	6 VDC, 9.3Ω; 12 VDC, 38Ω; 28 VDC, 150Ω **; 115 VAC, 0.9 Amp	6 VDC, 7Ω; 12 VDC, 28Ω; 28 VDC, 113Ω; 115 VAC, .12 Amp	6 VDC, 10Ω; 12 VDC, 40Ω; 28 VDC, 163Ω **	7.2/200, 4.4/152
Operate time, max. (ms)	-	-	-	-	-
DC Coil:	30	60	60	60	30
AC Coil:	-	60	60	60	-
Release time, max. (ms)	-	-	-	-	-
DC Coil:	20	40	40	-	20
AC Coil:	-	80	40	-	-
Bounce time, max. (ms):	-	4	4	4	-
Environmental Data	**79, 109, 209, 309, 509* 707**	**ZC, ZCD Center-off**	**Z, ZG, ZJ**	**ZL, ZLD**	**CCO20 *, CC040 *, CC050 †**
Sinusoidal vibration (g):	10 @ 5-2000 Hz	5 @ 70-500 Hz	10 @ 70-1000 Hz	10 @ 55-500 Hz	10 @ 5-2000 Hz
Shock (g):	30	15	50	15	30
Temperature range	-	-55°C to +71°C	-55°C to +71°C	-55°C to +71°C	-
Mechanical Data	**79, 109, 209, 309, 509* 707**	**ZC, ZCD Center-off**	**Z, ZG, ZJ**	**ZL, ZLD**	**CCO20 *, CC040 *, CC050 †**
Weight, max. (oz./lbs.):	7.2-38 oz.	32-43.2 oz.	32-43.2 oz.	2.0-2.75 lbs.	9 oz.
Dimensions, max. (in.): (L x W x H)	3.26 x 1.9 x 1.42 to 4.76 x 2.75 x 2.46	3.65 diameter x 4.28	3.65 diameter x 4.28	3.65 diameter x 4.28	3.1 x 1.42 x 3.13
Option(s) available:	Auxiliary 5 Amp contacts Dust poor enclosure	Gasket sealed models Magnetically latched models	Auxiliary 5 Amp contacts, GFI (Z) Gasket sealed models	Auxiliary 5 Amp contacts	Auxiliary 2 Amp contacts Low level contacts Dust proof enclosure

*1NO + 1NC auxiliary contact ** ± 20% @ 25°C † 2PDT auxiliary contact. May be associated with a Hall current sensor

POWER CONTACTORS *(50 - 400 Amps)*





Leach Series:	W, WC, WL	A, AJ	Busbar Series - HB, ZB, WB	Plug-in Series	Modcon Series
Rating:	250-275 Amps	300-400 Amps	60-275 Amps	60 Amps	50, 90, 175, 350*** Amps
Contact configuration:	1 PDT-DM-DB, 3 PST/NO 1 PST/NO-DM, 1 PST/NC-DB	1 PST/NO DM	3 PST/NO	3 PST/NO	3 PST/NO
Style:	Non-latch, latch	Non-latch	Non-latch	Non-latch	Non-latch
Designed to:	MIL-PRF-6106	MIL-PRF-6106	MIL-PRF-6106	MIL-PRF-6106	MIL-PRF-6106
Qualified to:	-	M6106/33	-	-	-
Electrical Data	**W, WC, WL**	**A, AJ**	**Busbar Series**	**Plug-in Series**	**Modcon Series**
Contact rating (Amps)	-	-	-	-	-
@ 28 VDC	-	-	-	-	-
Resistive:	125	300/400	-	-	-
Inductive:	75	100/150	-	-	-
Motor:	75	250/250	-	-	-
Lamp:	-	-	-	-	-
@ 115 VAC, 400 Hz, 3Ø	-	-	-	-	-
Resistive:	275	-	50 to 275	60	50 to 90
Inductive:	275	-	50 to 275	-	-
Motor:	175	-	-	-	-
Lamp:	-	-	-	-	-
@ 115 VAC, 50/60 Hz, Δ	-	-	-	-	-
Resistive:	-	-	-	-	-
Inductive:	-	-	-	-	-
Motor:	-	-	-	-	-
Lamp:	-	-	-	-	-
Nominal coil voltage(s):	28 VDC 115 VAC, 400 Hz (W/WC) 28 VDC Suppressed (W/WC)	6, 12, 28 VDC	28 VDC	28 VDC	28 VDC
Resistance, Ohms ±10% @ 25° C for 28 VDC:	(W) 90Ω; (WL) 9.8Ω (WC) 100Ω*	6 VDC, 4Ω; 12 VDC, 15Ω; 28 VDC, 60Ω	-	-	-
Operate time, max. (ms)	-	-	-	-	-
DC Coil:	60	35	12 to 30	50	up to 10
AC Coil:	60	-	-	-	-
Release time, max. (ms)	-	-	-	-	-
DC Coil:	40	15	10 to 15	20	up to 10
AC Coil:	125	-	-	-	-
Bounce time, max. (ms):	4	4	4	3	2
Environmental Data	**W, WC, WL**	**A, AJ**	**Busbar Series**	**Plug-in Series**	**Modcon Series**
Sinusoidal vibration (g):	10 @ 60-2000 Hz	10 @ 70-500 Hz 5 @ 500-2000 Hz	10@ 5-2000 Hz	‡‡‡‡	‡‡‡‡
Shock (g):	20	25	20	30	15
Temperature range	-55°C to 85°C	-55°C to +71°C	-54°C to +85°C	-15°C to +65°C	-40°C to + 85°C
Mechanical Data	**W, WC, WL**	**A, AJ**	**Busbar Series**	**Plug-in Series**	**Modcon Series**
Weight, max. (oz./lbs.):	4.5 lbs.	1.75 lbs.	Up to 2.0lbs	Up to 4.37 lbs.	Up to 0.71 lbs.
Dimensions, max. (in.): (L x W x H)	4.625 x 5.56 x 4.10	3.90 x 3.64 x 2.80	4.50in x 3.67in x2.94in Max	4.43 x 4.43 x 5.0 Max	3.51 x 2.46 x 2.36 Max
Option(s) available:	Auxiliary 8 Amp contacts Magnetic latch ** Center-off versions †, GFI (W)	Auxiliary 5 Amp contacts	Auxiliary 2 Amp contact Dust proof enclosure Gasket Sealed	Auxiliary 5 Amp contacts Smart electronics Dust proof enclosure Gasket Sealed	Dust proof enclosure Gasket Sealed

*±20% @ 25°C **WL model ***Available in 2017 † WC model †† Z model ‡ Current sensing with remote control capability ‡‡Short-time rated for starting loads. ‡‡‡‡Contact factory for detailed information

TIME DELAY RELAY DATA

SPECIFYING A FIXED TIME DELAY PERIOD

Esterline Power Systems - Leach International and the military identify the time delay period in the same manner. A four-digit dash number specifies the delay period in milliseconds. The first three numbers are significant figures while the fourth indicates the number of zeros to follow the first three.

Examples: -1001 = 1,000 milliseconds (1 second)
-2502 = 25,000 milliseconds (25 seconds)
-5000 = 500 milliseconds (0.5 second)

In the case of a repeat cycle timer (flasher), a similar method is used. The dash number indicates length of each cycle. (Note: each cycle is 50% on, 50% off).

Examples: -2500 = 250 milliseconds cycle or 4 cycles/sec.
-1001 = 1,000 milliseconds cycle or 1 cycle/sec.
-6002 = 60,000 milliseconds cycle or 1 cycle/min.

USE AND SELECTION OF ADJUSTABLE TIMERS

Adjustable timers are useful in system prototyping or breadboard circuits where the precise time delay period is unknown. By the use of an external resistor, these devices are adjustable over a specific "decade range." Although any decade range within the overall timing range can be supplied, the following ranges are offered as standards:

0.1 to 1 second (Specify -1001)
1.0 to 10 seconds (Specify -1002)
5 to 50 seconds (Specify -5002)
50 to 500 seconds (Specify -5003)

Note from above that in specifying a decade range, the four-digit dash number indicates the high or upper limit of the desired decade range. The formula below provides the proper resistance value to achieve the desired time delay:

$$R_{ext} = \left(\frac{T_1}{T_0} - 1\right) \text{ 100,000 Ohms}$$

Where: R_{ext} = External resistance value (Ohms)
T_1 = Desired time in seconds
T_0 = Minimum time (low end of the decade range) in seconds

For example, if a 30-second delay is desired and a 5- to 50-second adjustable timer is being used, the calculation is:

$$R_{ext} = \left(\frac{30}{5} - 1\right) \text{ 100,000 Ohms or } R_{ext} = 500 \text{ K Ohms}$$

Recommended resistors IAW MIL-R-55182 ⅛ WATT, 1% (RNC6OHXXXXFS).

MILITARY PART NUMBERING METHOD

M83726 / XX - XXXX X X

1. Basic military specification
2. Specific "slash sheet"
3. Time range designation (see tables above)
4. Terminal and/or quality level designator

QPL CROSS REFERENCE - MILITARY PART NUMBER TO LEACH PART NUMBER

Military Part Number	Leach Part Number	Operation Mode	Output	Time Range (seconds)
M83726/20	TD-1435	Delay on operate - fixed time	250MA, SPST	0.05-500
M83726/21	TD-1436	Delay on operate - adjustable**	250MA, SPST	0.05-500
M83726/22	TD-1412	Repeat cycle timer (flasher)	250MA, SPST	1-600 cycles/min.††
M83726/23	TD-1505	"True" delay on release - fixed †	10A, 4PDT	0.1-75
M83726/24	TDH-1609	Delay on operate - fixed time	150MA, SPST	0.05-500
M83726/25	TDH-1610	Delay on release - fixed time	150MA, SPST	0.05-500
M83726/28	TDH-8050/8051	Delay on operate - fixed time	10A, 2PDT	0.1-600 ‡
M83726/29	TDH-8070/8071	Delay on release - fixed time	10A, 2PDT	0.1-600 ‡
M83726/30	TDH-8060/8061	Delay on operate - adjustable	10A, 2PDT	0.1-600 ‡
M83726/31	TDH-8080/8081	Delay on release - adjustable	10A, 2PDT	0.1-600 ‡

** All adjustable timers use external resistor (not supplied) to adjust timing range.

† "True" time delay on release requires no external power during timing period.

†† Each cycle is 50% on, 50% off.

‡ Timing ranges above 500 seconds are not MIL qualified.

TIME DELAY RELAYS *(10-25 Amps)*




Leach Series:	TDH-6000	TDH-8000	TDH-7000	T531
On operate, fixed time:	TDH-6050/51	TDH-8050/51	TDH-7050/51	T531
On operate, adjustable:	TDH-6060/61	TDH-8060/61	TDH-7060/61	T531
On release, fixed time:	TDH-6070/71	TDH-8070/71	TDH-7070/71	T531
On release, adjustable:	-	TDH-8080/81	-	T531
Repeat cycle timer (flasher):	-	-	-	-
Designed to:	-	MIL-PRF-83726	MIL-PRF-83726	-
Qualified to:	-	M83726/28, 29, 30, 31	-	-
Electrical Data	**TDH-6000**	**TDH-8000**	**TDH-7000**	**T531**
Contact rating (resistive):	10 Amps	10 Amps	10 Amps	25 Amps
Contact form:	2 PDT	2 PDT	4 PDT	3 PDT
Timing range (seconds):	0.1-600	0.1-600	0.1-600	0.1-1000
Accuracy (percentage) *:	±10	±10	±10	±3 to ±10
Recycle time, max. (ms) **:	50	50	50	≤ 50
Input & control voltage:	20-30 VDC	20-30 VDC	20-30 VDC	18-32 VDC
Operating current, max.:	150 mAmps	150 mAmps	150 mAmps	-
Control current, max.:	-	-	-	-
EMI per MIL-STD-461 †:	Class 1D	Class 1D	Class 1D	-
Dielectric strength, Vrms	-	-	-	-
Sea level:	1000/60 Hz	1000/60 Hz	1000/60 Hz	500/50 Hz
80,000 ft.:	350/60 Hz	350/60 Hz	350/60 Hz	250/50 Hz
Insulation resistance megohms:	1000 @ 500 VDC ‡	1000 @ 500 VDC ‡	1000 @ 500 VDC ‡	≥ 500 @ 500 VDC
Environmental Data	**TDH-6000**	**TDH-8000**	**TDH-7000**	**T531**
Operating temperature (°C):	-55 to +125	-55 to +125	-55 to +125	-55 to +125
Vibration	-	-	-	-
Sine (G):	20	30	20	20/10-2000 Hz
Random (G^2/Hz):	0.2	0.4	0.2	-
Shock (g):	100	100	100	100/6 ms
Acceleration (g):	20	15	20	-
Seal:	Hermetic	Hermetic	Hermetic	Hermetic
Mechanical Data	**TDH-6000**	**TDH-8000**	**TDH-7000**	**T531**
Weight, max. (oz./lbs.):	1.9 oz. (54 g.)	2.5 oz. (71 g.)	3.0 oz. (85 g.)	4.233 oz. (120 g.)
Dimensions, max. (in.): (L x W x H)	1.025 x 5.25 x 1.520	1.025 x 1.025 x 1.010	1.025 x 1.025 x 1.50	1.73 x 1.54 x 1.02
Mating socket P/N:	SO-1055-8693	SO-1043-8308	SO-1056-8691	S502, SF502
Terminal types ††:	TDH-60X0=PI TDH-60X1=SH	TDH-80X0=PI TDH-80X1=SH	TDH-70X0=PI TDH-70X1=SH	PI, SH

* The accuracy specification applies to any combination of temperature and voltage. For units with a timing range less than 1 second, add ±10 milliseconds to the ±10% tolerance.

** Recycle time is that action which must occur to assure a new timing cycle can be completed within tolerance:

A. TD on operate—Remove power from input terminals for the period specified.

B. TD on release—Apply power to the control terminal for the period specified.

C. "True" TD on release—Apply power to the input terminals for the period specified.

† EMI test limits will not be exceeded during the timing interval or when continuously energized under steady state conditions, per paragraph 3.23, MIL-PRF-83726A.

†† Definition of terminal type codes:

PI = Plug-in type for use with mating relay socket.

SH = Tinned solder hook terminals for direct hard wiring.

PC = Tinned straight pins for printed circuit board insertion.

TM = Compatible with M12883/52 socket module and M12883/53 mounting track.

‡ Terminals X1 and X2 must be connected together during the test. Dielectric withstanding voltage and insulation resistance are measured between all mutually insulated terminals and between all terminals and case.

‡‡ Not available for new design; commercially available.

SOLID-STATE TIME DELAY RELAYS *(150-250 mAmps)*

Programmable

Leach Series:	TDH-1609, TDH-1610	TD-1435, TD-1436	TD-1412‡‡‡	FLSH402
On operate, fixed time:	TDH-1609	TD-1435	-	FLSH402
On operate, adjustable:	-	TD-1436	-	FLSH402
On release, fixed time:	TDH-1610	-	-	FLSH402
On release, adjustable:	-	-	-	FLSH402
Repeat cycle timer (flasher):	-	-	TD-1412	FLSH402
Designed to:	MIL-PRF-83726	MIL-PRF-83726	MIL-PRF-83726	-
Qualified to:	M83726/24, 25	M83726/20, 21	M83726/22	-
Electrical Data	**TDH-1609, TDH-1610**	**TD-1435, TD-1436**	**TD-1412**	**FLSH402**
Contact rating (resistive):	150 mAmps	250 mAmps	250 mAmps ‡‡	250 mAmps
Contact form:	SPST	SPST	SPST	2 SSO
Timing range (seconds):	0.05-500	0.05-500	1 cycle/min. to 10 cycles/second	0.1-625
Accuracy (percentage) *:	±10	±10	±10	±3 to ±10
Recycle time, max. (ms) **:	10	10	10	≤20
Input & control voltage:	20-32 VDC	18-32 VDC	18-32 VDC	18-32 VDC
Operating current, max.:	10 mAmps	5 mAmps + load	5 mAmps + load	-
Control current, max.:	-	-	-	5 mAmps @ 28 VDC
EMI per MIL-STD-461 †:	Class 1D	Class 1D	Class 1D	-
Dielectric strength, Vrms	-	-	-	-
Sea level:	1000/60 Hz	1000/60 Hz	1000/60 Hz	750/50 Hz
80,000 ft.:	-	350/60 Hz	350/60 Hz	-
Insulation resistance megohms:	1000 @ 500 VDC ‡	1000 @ 500 VDC ‡	1000 @ 500 VDC ‡	≥ 100 @ 100 VDC
Environmental Data	**TDH-1609, TDH-1610**	**TD-1435, TD-1436**	**TD-1412**	**FLSH402**
Operating temperature (°C):	-55 to +125	-55 to +125	-55 to +125	-55 to +125
Vibration	-	-	-	-
Sine (G):	20	30	30	30/70-2000 Hz
Random (G^2/Hz):	-	-	-	-
Shock (g):	1100	1100	1100	50/11 ms
Acceleration (g):	100	100	100	-
Seal:	Hermetic	Hermetic	Hermetic	Hermetic
Mechanical Data	**TDH-1609, TDH-1610**	**TD-1435, TD-1436**	**TD-1412**	**FLSH402**
Weight, max. (oz./lbs.):	.56 oz. (16g.)	0.5 oz. (14 g.)	0.5 oz. (14 g.)	0.353 oz. (10 g.)
Dimensions, max. (in.): (L x W x H)	.810 x .410 x .640	.810 x .410 x .310	.810 x .410 x .310	0.91 x 0.91 x 0.24
Mating socket P/N:	See note ††	-	-	-
Terminal types ††:	TM	SH, PC	SH, PC	PI

* The accuracy specification applies to any combination of temperature and voltage. For units with a timing range less than 1 second, add ±10 milliseconds to the ±10% tolerance.

** Recycle time is that action which must occur to assure a new timing cycle can be completed within tolerance:

A. TD on operate—Remove power from input terminals for the period specified.

B. TD on release—Apply power to the control terminal for the period specified.

C. "True" TD on release—Apply power to the input terminals for the period specified.

† EMI test limits will not be exceeded during the timing interval or when continuously energized under steady state conditions, per paragraph 3.23, MIL-PRF-83726A.

†† Definition of terminal type codes:

PI = Plug-in type for use with mating relay socket.

SH = Tinned solder hook terminals for direct hard wiring.

PC = Tinned straight pins for printed circuit board insertion.

TM = Compatible with M12883/52 socket module and M12883/53 mounting track.

‡ Terminals X1 and X2 must be connected together during the test. Dielectric withstanding voltage and insulation resistance are measured between all mutually insulated terminals and between all terminals and case.

‡‡ Output rating equivalent of two MS25237-387 lAmps in parallel.

‡‡‡ Not available for new design; commercially available.

POWER MONITORS AND SENSORS *(2-10 Amps)*






Leach Series:	V 610	V 110	V 210, V 310	F410	P510	CS 400, CS 500
Description:	AC Power Monitor	DC Voltage Sensor	AC Under or Over Voltage Sensor	Frequency Sensor	Phase Sequence Sensor	Current Sensing Relay
Operational Data	**V 610**	**V 110**	**V 210, V 310**	**F410**	**P510**	**CS 400, CS 500**
Input Supply:	90-150 VRMS 180-240 VRMS 44-450 Hz 3Ø, 4 wire	19.5-30 VDC	90-150 VRMS 180-240 VRMS 50-450 Hz 3Ø, 4 wire	80-150 VRMS 160-240 VRMS 40-480 Hz 3Ø, 4 wire	90-150 VRMS 180-240 VRMS 44-450 Hz 3Ø, 4 wire	18-32 VDC
Sensed voltage:	-	1-50 VDC	-	-	-	-
Sensing Functions:	Trip point ranges Under voltage: 90-130 VRMS, ± 2% 180-220 VRMS, ± 2% Over voltage: 110-150 VRMS, ±2% 200-240 VRMS, ±2% Under frequency: 44-58 Hz, ±2% 350-390 Hz, ±2% Over frequency: 55-62 Hz, ±2% 410-450 Hz, ±2% Phase rotation ABC Time delay: .05-10 sec., ±10%	Energize above, de-energize below selected trip point: 1-50 VDC, ±2%	Selected trip point within: 90-130 VRMS or 180-230 VRMS, ±2%	Energize above, de-energize below selected trip point: 320-480 Hz, ±2% Senses any one line to neutral	Energize when phase sequence is ABC. De-energize for all other sequences, open neutral or loss of voltage	Sensing range: 0.8-49 Amps Min. pickup: — Max. pickup: 5.5-49 Amps Min. dropout: 0.08-.8 Amps Min. delta: 0.16-1.6 Amps Max. delta: 4-31 Amps
Output contacts: *	2 PDT, 10 Amps or 3 PDT, 10 Amps	10 Amps 2 PDT or 4 PDT	10 Amps 2 PDT or 4 PDT	10 Amps 2 PDT or 4 PDT	10 Amps 2 PDT or 4 PDT	2 Amps 2 PDT
Environmental Data	**V 610**	**V 110**	**V 210, V 310**	**F410**	**P510**	**CS 400, CS 500**
Operating temperature (°C):	-55 to +125	-55 to +125	-55 to +125	-55 to +125	-55 to +125	-55 to +125
Thermal shock (MIL-STD-202):	Method 107	Method 107	Method 107	Method 107	Method 107	-
Vibration (MIL-STD-202):	Method 204 **	Method 204 **	Method 204 **	Method 204 **	Method 204 **	15 g./70-3000 Hz
Random:	Method 214 †	Method 214 †	Method 214 †	Method 214 †	Method 214 †	-
Shock (MIL-STD-202):	Method 213 ††	Method 213 ††	Method 213 ††	Method 213 ††	Method 213 ††	50G/11 ms
Acceleration (MIL-STD-202):	Method 212	Method 212	Method 212	Method 212	Method 212	-
Seal:	Hermetic (potted)	Potted	Potted	Potted	Potted	Hermetic
Mechanical Data	**V 610**	**V 110**	**V 210, V 310**	**F410**	**P510**	**CS 400, CS 500**
Weight, max. (oz./grams):	27 oz. (767 g.)	10 oz. (284 g.)	10 oz. (284 g.)	10 oz. (284 g.)	10 oz. (284 g.)	2.469 oz. (70 g.)
Dimensions, max. (in.): (L x W x H)	2.31 x 2.18 x 3.2 ‡	1.531 x 1.531 x 2.34	1.531 x 1.531 x 2.34	1.531 x 1.531 x 2.34	1.531 x 1.531 x 2.34	1.73 x 1.01 x 1.02
Finish:	Electro tin, type 1 ‡‡	Electro tin, type 1 ‡‡	Electro tin, type 1 ‡‡	Electro tin, type 1 ‡‡	Electro tin, type 1 ‡‡	Corrosion resistant
Engineering Data	**V 610**	**V 110**	**V 210, V 310**	**F410**	**P510**	**CS 400, CS 500**
Insulation resistance:	100 M Ohms ♦	100 M Ohms ♦	100 M Ohms ♦	100 M Ohms ♦	100 M Ohms ♦	>100 M Ohms @ 50VDC
Dielectric strength (MIL-STD-202):	Method 301	Method 301	Method 301	Method 301	Method 301	1000 VRMS/50 Hz.
Voltage strength (MIL-STD-202):	Method 301	Method 301	Method 301	Method 301	Method 301	-
Voltage transients (MIL-STD-704):	Category B	Category B	Category B	Category B	Category B	-
Operating current						-
AC sensors, max. (mAmps):	75 per phase	75 per phase	75 per phase	75 per phase	75 per phase	-
DC sensors, max. (mAmps):	175	175	175	175	175	-
EMI (MIL-STD-461):	Class 1D	Class 1D	Class 1D	Class 1D	Class 1D	-
Life test	-	-	-	-	-	-
High level (cycles, min.):	100,000	100,000	100,000	100,000	100,000	-
Low level (cycles, min.):	100,000 ♦♦	100,000 ♦♦	100,000 ♦♦	100,000 ♦♦	100,000 ♦♦	-

*Ratings shown are resistive loads @ 28 VDC, 115 VAC 400 Hz and 115/200 VAC 400 Hz. **Condition D, except 5-2000 Hz frequency. †Test condition IG; 15 min./plane.
†† Test condition A (50G) ‡ Solder hook or circular MIL connector. ‡‡ Per MIL-T-10727. ♦ Minimum intial test; 50 M Ohms after test. ♦♦Plus 400,000 cycles mechanical life.

SOLID STATE POWER CONTROLLERS





Leach Series:	P110	P140	P150	P600-Air	P800
Rating:	2 Amps	1, 2, 4, 5, 7.5 and 10 Amps	2, 7, 10, 15, 20, 25 and 30 Amps	80 Amps	150 Amps
Style/Voltage:	PCB Mounted/28 VDC	PCB Mounted/28 VDC	PCB Mounted/28 VDC	Stand Alone/28 VDC	Stand Alone/28VDC
Designed to:	MIL-P-81653**	MIL-P-81653**	MIL-P-81653**	MIL-P-81653**	-
Electrical Data	**P110**	**P140**	**P150**	**P600-Air**	**P800**
Bias on (voltage):	—	4.5-5.5 or 18-32	4.5-5.5	4.5-5.5 or 16-33.5	16 - 33.5
Control on (voltage):	4.5-32	2.4-32	2.4 min. (TTL)	16-32	16 - 33.5
Statue Output Type:	—	Load Current, Voltage	Load Current + Trip	Load Current + Trip + RCCB	Gate, LVD + RCCB
Typical Operate Time (ms):	0.15	0.1	0.2	1	5
Full Load Voltage Drop (mV):	150	100	100	100	300
Environmental Data	**P110**	**P140**	**P150**	**P600-Air**	**P800**
Operating temperature (°C):	-55 to +110 (Derated from +105)	-55 to +125*	-55 to +125* (Derated from +105)	-40 to +70	-40 to +71
Vibration (g):	20 (20-2000 Hz)	20 (96-2000 Hz)	20	5 (5-500 Hz)	13.3 (10 - 2000 Hz)
Shock (g):	1500	1500	1500	30	6
Acceleration (g):	5000	5000	5000	10	6.75
Seal:	Hermetic	Hermetic	Hermetic	Hermetic	-
Mechanical Data	**P110**	**P140**	**P150**	**P600-Air**	**P800**
Weight, max. (grams):	5	20	65	500	500
Dimensions, max. (mm): (L x W x H)	20.6 x 10.4 x 6.35	25.7 x 25.7 x 9.5	69.6 x 34 x 9.7	95 x 84.5 x 75	80 x 96 x 45




Leach Series:	EPM-109	EPM-110	EPM-111	EPM-112 (WHCU)
Rating:	7.5 and 12 Amps	40 Amps	60 Amps	40 Amps (Dual Channel)
Style/Voltage:				28 Vdc
Designed to:				
Electrical Data	**EPM-109**	**EPM-110**	**EPM-111**	**EPM-112 (WHCU)**
Bias on (voltage):	4.5-5.5	4.5-5.5	4.5-5.5	28 Vdc
Control on (voltage):				Temperature Controlled
Statue Output Type:				ARINC 429
Typical Operate Time (ms):				
Full Load Voltage Drop (mV):				100 mV
Environmental Data	**EPM-109**	**EPM-110**	**EPM-111**	**EPM-112 (WHCU)**
Operating temperature (°C):	-40 to +75	-40 to +75	-40 to +75	-40 to +71
Vibration (g):	20 (20-2000 Hz)	20 (20-2000 Hz)	20 (20-2000 Hz)	4.12 (10-2000 Hz)
Shock (g):	500	500	500	20
Acceleration (g):	500	500	500	18
Seal:				
Mechanical Data	**EPM-109**	**EPM-110**	**EPM-111**	**EPM-112 (WHCU)**
Weight, max. (grams):	150	150	500	650
Dimensions, max. (mm): (L x W x H)	91 x 91 x 23	91 x 91 x 23	80 x 96 x 41	80 x 96 x 62.3

*1NO + 1NC auxiliary contact ** ± 20% @ 25°C † 2PDT auxiliary contact. May be associated with a Hall current sensor † † Refer to document RTCA/DO-160

SPECIAL CATEGORY

Esterline Power Systems offers a comprehensive LEACH® product line and extensive experience in developing component products for electrical systems. Most LEACH® component products feature lightweight, compact, rugged construction, and many are hermetically sealed and qualified to the appropriate military specification. Their use provides our customer with major design advantages coupled with significant cost savings.

Ground Fault Interrupter Series

Leach Ground Fault Interrupt (GFI) relays sense fuel pump ground faults, while Leach Fault Current Detection (FCD) relays sense fuel pump ground faults and phase-to-phase shorts in the fuel pump and up-stream wiring. Through the use of a proprietary electronic circuit design, Leach GFI and FCD relays detect these faults and open the circuit within milliseconds, thereby minimizing the potential for fuel-system combustion.

DC Current Sensor Series

The Hall Effect current sensor, with a galvanic insulation, is designed to measure DC current and is fully certified to DO-160. The output provides an accurate linear voltage signal versus measured current and has a full bidirectional scale range.

Battery Management System

This Battery Control Unit, using Ideal Diode technology (patented), is a battery management system, designed for 28 Vdc lithium-ion batteries. It is specifically designed to meet the requirements of managing and protecting battery packs for both commercial, military aerospace, and ground vehicles.

AC Smart Module

The AC Smart Module is fit for commercial and military aerospace power distribution systems. It can be used as a remote control circuit breaker when interfaced with an external contactor. It also has a dedicated load monitoring and protection function, and can be paired to provide precision differential protection.

Solid-State Power Controller (SSPC)

In response to customers' expanding needs, we have developed the next g eneration of Solid-State Power Controllers. This new model will be ideal for a variety of aerospace, military and transportation applications where advanced communications features and a "system friendly" interface are desired. Like Leach's standard SSPCs, these devices will feature a rugged design and a high MTBF.

CRITICAL APPLICATION

Power Management Systems

Esterline Power Systems offers a variety of power distribution configurations from electro-mechanical power management to fully integrated SSPC power management, including control logic and protection. Designed with LEACH® components, these assemblies satisfy all specific customer program conditions and requirements for both primary and secondary distribution systems.

Features:

- Multi-channel Solid State Power Controllers (SSPCs)
- Microprocessor-based technology
- Solid state switching up to 100 Amps per channel
- Automatic load shedding
- Programmable operating modes and trip curves
- Built-in-test at power-up, during continuous operation, or in manual mode
- CAN J1939, MIL-STD-1553B, ARINC-485, ARINC-429 and Ethernet.

Benefits:

- Configurable
- IP-67 ready (Waterproof)
- MIL-Spec connectivity
- Optimized heat dissipation
- Small footprint & lightweight
- Field replaceable
- Electro-mechanical option

High Reliability Components

The LEACH® name is synonymous with high reliability relays since the first space launch and Leach products are on virtually all major space programs. Today, Esterline Power Systems produces more Leach relays for space applications than all of our competitors combined. Our heritage in aerospace led to the development of our hi-rel product line to support our customer's critical space applications.

KL Series

KCL Series

JL Series

Contact your local Esterline Power Systems sales representative for product details.
http://www.esterline.com/powersystems/Contact/TheAmericas.aspx

U.S. PART NUMBERING SYSTEM

X - A 1 A - XXX

Basic series designation

1. **Mounting styles** (A, D, E, G, J)
2. **Terminal types** (1, 2, 4, 7)
3. **Coil voltage, see coil characteristics** (A, B, C, M, N, R, V)
4. **XXX Designators**

Example : X-A1A-XXX
X-A1A (Commercial)
X-A1A-300 L,M (MIL)
X-A1A-123 (Customer Part)

DISTRIBUTION

For a list of authorized distributors please go on our website under the Contact page.
www.esterline.com/powersystems/Contact/TheAmericas

Esterline
Power Systems

North America
6900 Orangethorpe Ave.
Buena Park, CA 90620
USA

(714) 736-7598

Europe S.A.
2, Rue Goethe
F-57430 Sarralbe
France

+33 3 87 97 98 97

Asia-Pacific Ltd.
Units 602-603 6/F Lakeside 1
No.8 Science Park West Avenue
Phase Two, Hong Kong Science Park
Pak Shek Kok, Tai Po, N.T.
Hong Kong

852 2-191-3830

www.esterline.com/powersystems

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