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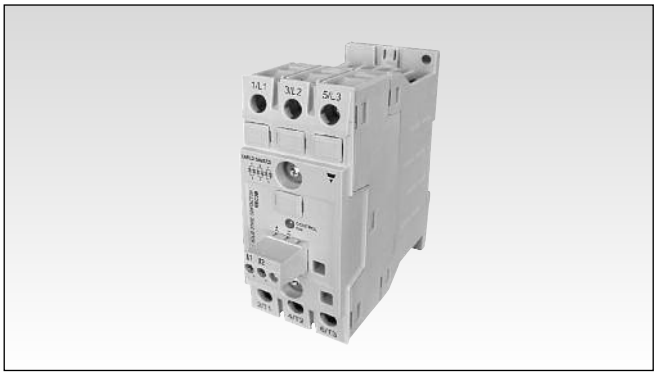
Solid State Motor Contactor 3-Phase Types REC2B, REC3B



- **AC electronic motor contactor**
- **Instantaneous Switching**
- **Three-pole with two-phase and three phase switching options**
- **Control status LED indication**
- **Two control input ranges: 15-32 VDC, 90-253 VAC**
- **Motor rating up to 4kW / 5.5hp**
- **Rated Operational Voltage up to 600 VAC**
- **Opto-isolation at 4kVrms**
- **Mechanical Contactor resemblance with covered heatsink**
- **DIN-rail and panel mounting**

Product Description

REC is an electronic contactor intended to replace the traditional mechanical counterpart used to switch three phase motors. The range includes 2 and 3 phase switching versions up to 4kW and 600Vrms. Options with high surge current and I^2t for fusing purposes are also available.
The relay switches instantaneously upon application of the control voltage to emulate mechanical relay operation. A covered heatsink resolves any issues with regards to cables running close to the heatsink and eliminates the need for protective earth cabling. The product can be mounted on DIN-rail or on a panel. Note: Specifications stated at 25°C unless specified.

Ordering Key

REC 3 B 48 A 3 0 G K E

- **Electronic Contactor**
- **Number of switched poles**
- **Switching mode**
- **Rated Operational Voltage**
- **Control voltage**
- **Motor Power rating**
- **High ITSM option**
- **Connection type for control**
- **Connection type for power**
- **Connection configuration**

Ordering Key

Switching poles	Switching mode	Rated operational voltage	Control voltage	Motor power rating	Itsm control	Connection control	Connection power	Configuration
REC2: 2 poles REC3: 3 poles	B: Instant ON	48: 48-530 VAC	D: 24 VDC, -15%, + 20%	2: 2.2kW 3: 3.0kW	0: Standard Itsm	G: Clamp R: Spring*	K: Screws	E: Contactor
		60: 48-600 VAC	A: 90 - 253 VAC	4: 4.0kW	1: High Itsm			

* Available on request

Selection Guide

Rated Voltage	No of Poles	Control voltage	Power Rating			
			2.2kW	2.2kW*	3.0kW	4.0kW
48-530Vrms	2	24Vdc, -15%, +20%**	REC2B48D20GKE	-	REC2B48D30GKE	REC2B48D40GKE
		90-253 VAC	REC2B48A20GKE	-	REC2B48A30GKE	REC2B48A40GKE
	3	24Vdc, -15%, +20%	REC3B48D20GKE	REC3B48D21GKE	REC3B48D30GKE	-
		90-253 VAC	REC3B48A20GKE	-	REC3B48A30GKE	-
48-600Vrms	2	24Vdc, -15%, +20%	-	-	REC2B60D30GKE	-
		90-253 VAC	-	-	REC2B60A30GKE	-
	3	24Vdc, -15%, +20%	REC3B60D20GKE	-	-	-
		90-253 VAC	REC3B60A20GKE	-	-	-

* higher ITSM rating

** according to EN61131-2

General Specifications

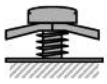
	REC..48...	REC..60...
Rated Operational voltage	480 VAC	600 VAC
Operational voltage Range	48-530 VAC +10%, -15%	48-600 VAC +10%, -15%
Blocking voltage	1200 Vp	1600 Vp
Operational frequency range	45 - 65 Hz	45 - 65 Hz
Power factor	>0.5 @ rated voltage	>0.5 @ rated voltage

Control Specifications

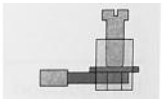
	REC...D..	REC...A..
Rated Control input voltage	24 VDC	230 VAC
Control voltage range	15-32 VDC (according to EN61131-2)	90 - 253 VAC
Maximum Input current	10 mA	15 mA
Pick-up voltage	15 VDC	40 VAC
Maximum Reverse voltage	32 VDC	N/A
Drop-out voltage	1 VDC	10 VAC
Response time pick-up	1 ms	1.5 ms
Response time drop-out	10 ms	45 ms
Operational frequency range	N/A	45 - 65Hz
LEDs	Control ON: Green	Control ON: Green

Connection Specifications

POWER CONNECTIONS (75°C,Copper Cables)

Connection Type	Screw terminal
Illustration of terminal	
Rigid (Solid & Stranded)	2 x 1.5..2.5mm² (2 x AWG16..14) 2 x 2.5..6mm² (2 x AWG14..10)
Flexible (Finely stranded with end sleeve	2 x 1..2.5mm² (2 x AWG17..14) 2 x 2.5..6mm² (2 x AWG14..10) 1 x 10mm² (1 x AWG8)
Flexible w/o end sleeves	2 x 1.5..2.5mm² (2 x AWG16..14) 2 x 2.5..6mm² (2 x AWG14..10)
Stripping length	10mm
Tightening torque	2Nm (Pozidriv 2 bit)
Screw size	M4
Aperture for termination lug (fork type)	Max 11mm

CONTROL CONNECTIONS (75°C,Copper Cables)

Connection Type	Spring loaded*	Captive Clamp
Illustration of terminal		
Type	Pluggable	Pluggable
Stranded	-	1 x 0.05..1.5mm² (1 x AWG30..16)
Solid	1 x 0.05..2.5mm² (1 x AWG 24..14)	1 x 0.05..2.5mm² (1 x AWG30..14)
Stripping length	10mm	6 - 7.5mm
Tightening torque	N/A	0.5Nm (Philips bit)
Screw Size	N/A	M3
Withdrawal Force	1.5N	1.5N
Insertion Force	3N	3N
Max Contact Resistance	15mΩ	15mΩ

* Available on request

Load Specifications (45mm space between adjacent units)

	REC2B…..					REC3B…..				
	@ 40°	@ 50°	@ 60°	Imin	Itsm *	@ 40°	@ 50°	@ 60°	Imin	Itsm*
Rated Operational Current AC-53a @ 400Vrms, to IEC, for trip Classes 10, 20, 30										
REC..48..20	6.2A	5.8A	5.3A	150mA	325Ap	5.8A	5.3A	4.3A	150mA	325Ap
REC..60..20	-	-	-	-	-	5.8A	5.8A	4.9A	250mA	600Ap
REC…21	-	-	-	-	-	5.8A	5.3A	4.3A	250mA	600Ap
REC..48..30	7.6A	6.8A	5.8A	250mA	600Ap	7.6A	6.2A	5.3A	400mA	800Ap
REC..60..30	7.6A	6.8A	6.2A	250mA	600Ap	-	-	-	-	-
REC…40	9.2A	7.6A	6.2A	400mA	800Ap	-	-	-	-	-
No of poles	2					3				
Maximum On-state voltage drop @rated current	1.6 Vrms					1.6 Vrms				
Off-state leakage current @rated voltage and frequency	< 3 mArms					< 3 mArms				
Critical dv/dt (@ Tj init = 25°C)	1000 V/µs					1000 V/µs				

Load Specifications (0mm space between adjacent units)

	REC2B…..			REC3B…..		
	@ 40°	@ 50°	@ 60°	@ 40°	@ 50°	@ 60°
Rated Operational Current AC-53a @ 400Vrms, to IEC, for trip Classes 10, 20, 30						
REC..48..20	6.2A	5.8A	5.3A	5.3A	4.9A	4.3A
REC..60..20	-	-	-	5.8A	4.9A	4.3A
REC…21	-	-	-	5.3A	4.9A	4.3A
REC..48..30	6.8A	6.2A	5.3A	6.2A	5.3A	4.3A
REC..60..30	6.8A	6.2A	5.3A	-	-	-
REC…40	7.6A	6.2A	5.3A	-	-	-

Motor Rating (45mm space between adjacent units)

	HP @ 40 / 50 / 60°C, according to UL508				kW @ 40 / 50 / 60°C, according to IEC60947-4-2			
	230V	400V	480V	600V	230V	400V	480V	600V
REC2…20	1½ / 1 / 1	3 / 2 / 2	3 / 3 / 3	-	1.5 / 1.1 / 1.1	2.2 / 2.2 / 2.2	3.0 / 3.0 / 2.2	-
REC2..48..30	2 / 2 / 1	3 / 3 / 2	5 / 3 / 3	-	1.5 / 1.5 / 1.1	3.0 / 2. 2 / 2.2	4.0 / 3.0 / 3.0	-
REC2..60..30	2 / 2 / 1½	3 / 3 / 3	5 / 3 / 3	5 / 5 / 5	1.5 / 1.5 / 1.5	3.0 / 2. 2 / 2.2	4.0 / 3.0 / 3.0	5.5 / 4.0 / 4.0
REC2…40	2 / 2 / 1½	3 / 3 / 3	5 / 5 / 3	-	2.2 / 1.5 / 1.5	4.0 / 3.0 / 2.2	4.0 / 4.0 / 3.0	-

	HP @ 40 / 50 / 60°C, according to UL508				kW @ 40 / 50 / 60°C, according to IEC60947-4-2			
	230V	400V	480V	600V	230V	400V	480V	600V
REC3..48..20	1 / 1 / 1	2 / 2 / 2	3 / 3 / 2	-	1.1 / 1.1 / 0.75	2.2 / 2.2 / 1.5	3.0 / 2.2 / 2.2	-
REC3…21	1 / 1 / 1	2 / 2 / 2	3 / 3 / 2	-	1.1 / 1.1 / 0.75	2.2 / 2.2 / 1.5	3.0 / 2.2 / 2.2	-
REC3..60..20	1 / 1 / 1	2 / 2 / 2	3 / 3 / 3	3 / 3 / 3	1.1 / 1.1 / 1.1	2.2 / 2.2 / 1.5	3.0 / 3.0 / 2.2	4.0 / 4.0 / 3.0
REC3...30	2 / 1½ / 1	3 / 3 / 2	5 / 3 / 3	-	1.5 / 1.5 / 1.1	3.0 / 2.2 / 2.2	4.0 / 3.0 / 2.2	

Environmental Specifications

Operating Temperature	-25°C to 60°C
Storage Temperature	-40°C to 100°C
RoHS compliant	Yes
Impact resistance	15/11 g/ms
Vibration resistance	2g
Relative humidity	< 95% non-condensing @ 40 °C
Pollution degree	2
Installation category	III
Degree of finger protection	IP20
Installation altitude	0- 1000m. Above 1000m derate linearly by 1% of FLC per 100m up to a maximum of 2000m

Housing Specifications

Weight	approx 380g
Housing Material	Nylon PA66
Flame class	UL94-V0
Housing Colour	RAL7035
Dimensions (h x w x d) (without input plug)	105 x 45 x 99.4 mm

Isolation

Dielectric withstand voltage input to output	≥ 4000V AC rms

Short Circuit Protection (according to EN/IEC 60947-4-2 and UL508)

	REC2B48.20 REC3B…..20	**REC2B...30 REC3B48...30**	**REC2B48..40**
Short Circuit Current Rating	5kA	5kA	5kA
Type of coordination: 1 UL rated short circuit current RK5 fuse	12A	15A	20A
	REC2B48.20 REC3B48.20	**REC2B...30 REC3B60.20 REC3B48.21**	**REC2B....40 REC3B48.30**
Type of coordination: 2 Rated short circuit Semiconductor fuse	J093802 6.6 CP URD 22.58 40	Y220913 6.9 CP GRC 22.58 50	X220912 6.9 CP GRC 22.58 63

Agency Approvals & EMC

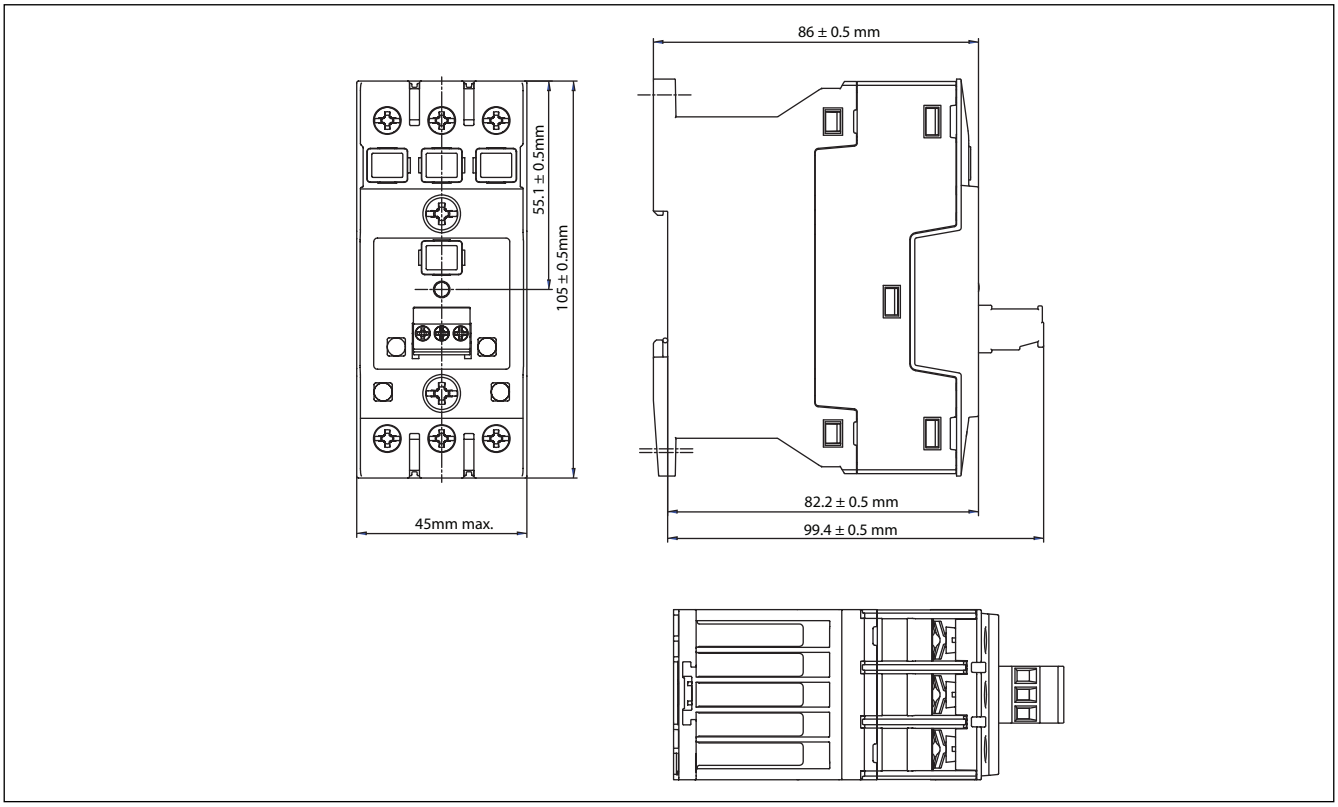
CE marking	
Low Voltage Directive	IEC / EN 60947-4-2
EMC Immunity	IEC / EN 61000-6-2
EMC Emission	IEC / EN 61000-6-4
Electrostatic Discharge (ESD) Immunity	IEC / EN 61000-4-2
	8kV, PC2 Air discharge
	4kV, PC2 Contact
Electrical Fast Transient Burst Immunity	IEC / EN 61000-4-4
Output: 4kV / 5kHz	Performance criteria 1
Output: 4kV / 100kHz	Performance criteria 2
Output: 2kV / 100kHz	Performance criteria 1*
Input: 4kV / 5kHz	Performance criteria 1
Input: 2kV / 100kHz	Performance criteria 1
Input: 4kV / 100kHz	Performance criteria 2
Voltage Interruptions Immunity	IEC / EN 61000-4-11
0% for 5000ms	Performance criteria 2
Radio Interference voltage emissions (conducted)	EC / EN 55011
30 -1000MHz	Class A (industrial)**

UL Approval	cULus listed (E172877)
Restrictions of hazardous substances	RoHS
Radiated Radio Frequency Immunity	EN 61000-4-3
10 V/m, 80 - 1000 MHz, 1.4 - 2.0 GHz	Performance criteria 1
1 V/m, 2.0 - 2.7 GHz	Performance criteria 1
Electrical Surge Immunity	IEC / EN 61000-4-5
Output, line to line	1kV, performance criteria 1
Output, line to earth	2kV, performance criteria 2
Input, line to line	1kV, performance criteria 2
Intput, line to earth	2kV, performance criteria 2
Conducted Radio Frequency Immunity	IEC / EN 61000-4-6
10V/m, 0.15 - 80 MHz	Performance criteria 1
Voltage Dips Immunity	IEC / EN 61000-4-11
0% for 10ms/20ms, 70% for 500ms	Performance criteria 2
40% for 200ms	Performance criteria 2
Radio Interference field emissions (radiated)	IEC / EN 55011 Class B (light industry)

* For DC Controlled versions. AC controlled version pass with performance criteria 2

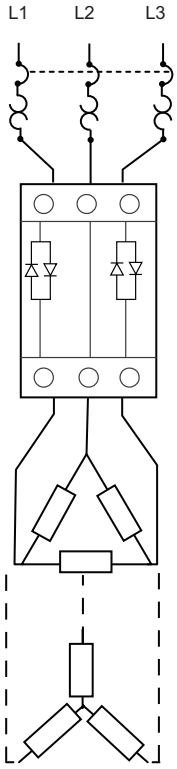
** This product is designed and constructed as an EMC Class A device. The use of this product in residential applications could lead to radio interferences. In such applications, additional external filtering may be required.

Dimensions

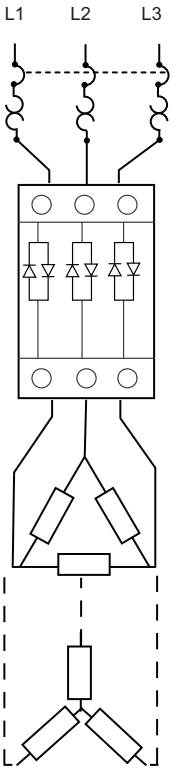


All dimensions in mm

Connection Diagrams

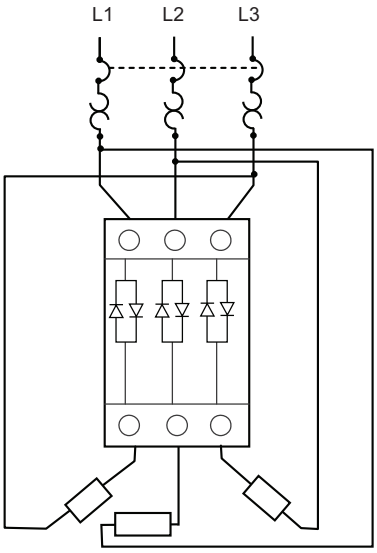


REC2B ...
for star (wye) and delta



REC3B ...
for star (wye) and delta

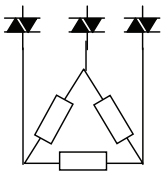
Inside Delta Connection



REC3B ...
inside-delta connection

Going from Inside-Delta connection

Outside delta



motor power (P): 4kW
Line voltage (V):400Vrms
Power factor (cos ϕ): 0.9
Motor efficiency: 0.8

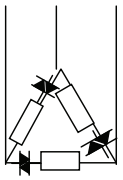
Motor current (I) through REC :

$$\frac{P}{\sqrt{3} \times V \times \cos\phi \times \text{motor eff.}}$$

= 8.1Arms

For 4kW, 480V use REC..40

Inside-Delta



motor power (P): 4kW
Line voltage (V):400Vrms
Power factor (cos ϕ): 0.9
Motor efficiency : 0.8

Motor current (I) through REC:

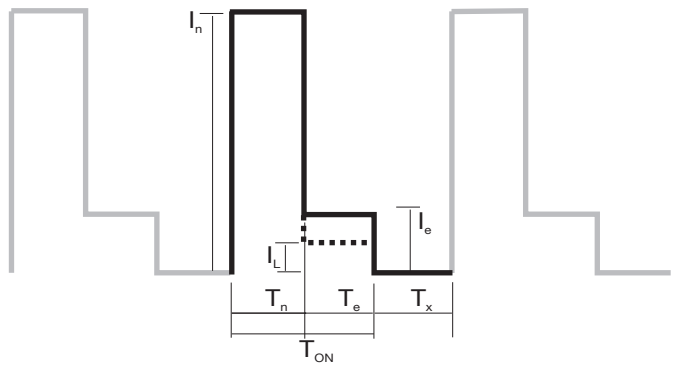
$$\frac{1}{\sqrt{3}} \times \frac{P}{\sqrt{3} \times V \times \cos\phi \times \text{motor eff.}}$$

= 4.7Arms

REC..20 may be used to switch the same motor.

Characteristic Curves and Operating Cycles

Maximum allowable number of starts depending on the T_n and T_{on}



In: Inrush current for direct on line starting
Ie: Rated full load current
IL: Load Current
Tn: Time during inrush current In
Te: Time during full load current Ie or IL
Tx: Off time
TON = $T_n + T_e$

Curves: No. of switching cycles per hour versus t_{ON}

Chart No. 1

$\frac{I_n}{I_e} = 7.2, \frac{I_L}{I_e} = 1$

t_{ON} (s)	Number of Switches per Hour						
	T_n = 0.05s	T_n = 0.1s	T_n = 0.2s	T_n = 0.4s	T_n = 0.8s	T_n = 1.6s	T_n = 3.2s
0.1	1800	910	-	-	-	-	-
1	1500	800	420	220	102	-	-
10	280	300	25	160	90	40	15
100	38	38	38	35	35	25	6
1000	-	-	-	-	-	-	-

Chart No. 2

$\frac{I_n}{I_e} = 7.2, \frac{I_L}{I_e} = 0.6$

t_{ON} (s)	Number of Switches per Hour						
	T_n = 0.05s	T_n = 0.1s	T_n = 0.2s	T_n = 0.4s	T_n = 0.8s	T_n = 1.6s	T_n = 3.2s
0.1	1900	900	-	-	-	-	-
1	1800	850	440	120	110	-	-
10	390	390	350	190	100	50	25
100	38	38	38	38	25	25	20
1000	-	-	-	-	-	-	-

Chart No. 3

$\frac{I_n}{I_e} = 4, \frac{I_L}{I_e} = 1$

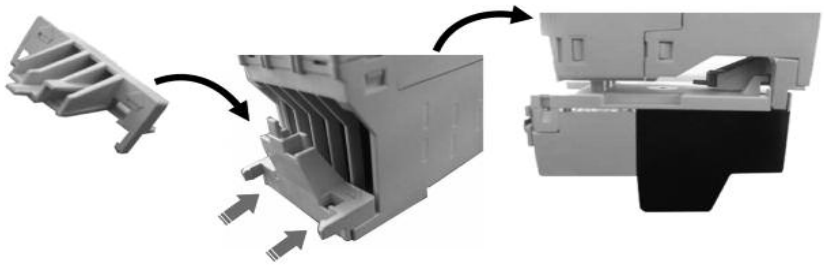
t_{ON} (s)	Number of Switches per Hour						
	T_n = 0.05s	T_n = 0.1s	T_n = 0.2s	T_n = 0.4s	T_n = 0.8s	T_n = 1.6s	T_n = 3.2s
0.1	5100	2800	-	-	-	-	-
1	2700	1900	1100	650	350	-	-
10	250	250	250	290	200	140	75
100	36	36	36	36	36	36	30
1000	-	-	-	-	-	-	-

Chart No. 4

$\frac{I_n}{I_e} = 4, \frac{I_L}{I_e} = 0.6$

t_{ON} (s)	Number of Switches per Hour						
	T_n = 0.05s	T_n = 0.1s	T_n = 0.2s	T_n = 0.4s	T_n = 0.8s	T_n = 1.6s	T_n = 3.2s
0.1	5500	2900	-	-	-	-	-
1	3400	2300	1400	700	350	-	-
10	350	350	350	350	280	170	80
100	36	36	36	36	36	36	36
1000	-	-	-	-	-	-	-

Accessories



Motor overload Relay adapter*.
Part Number: REC3ADAPTOR
Pack qty: 5pcs

Compatible with:

Manufacturer	Series	Example
ABB	TA	TA25DU-8.5
Siemens	3RU11	3RU1126-1FB0

* 1 adaptor is shipped with every REC unit.