

AR(U)X series

ALUMINIUM ELECTROLYTIC CAPACITORS

General Purpose

Series	Capacitance [μF]	Voltage	Temperature	Case Φ x H [mm]	Applications
AR(U)X	100-470000 μF	40-450V	-40°C,+85°C	35x59/76x147	High CV Long life Industrial applications

Table 1-General

Mechanical Outlines:

- Case: aluminium made
- Terminals: screw
- Sealing: hermetic by beading on an EPR gasket, housed on a resin cover
- Pressure Release Vent: made in silicone-rubber
- Sleeve: self-extinguishing thermoshrinkable sleeve
- Size: see enclosed drawings
- Mounting Hardware: see hardware section

Specifications	Temperature Range	Capacitance
CECC 30300 IEC 384-4 ("long life grade") MIL C62D DIN 41240/DIN45910	Operating: -40°C/+85°C Climatic category : 40/85/56	Standard tolerance X=10%+30% Upon request M=±20%

Table 2-General Specifications

Leakage Current

After the rated voltage has been applied to the capacitor for 5 minutes the leakage current must be within limits given in Table 3-Leakage Current limits:

Maximum limit	@25°C	$I_f \leq 0,004 \times C \times V$
Operating limit	@25°C	$I_f \leq 0,001 \times C \times V$

Table 3-Leakage Current limits

Where:

- I_f =leakage current [μ A]
- C=capacitance [μ F]
- V=rated voltage [V]

Important

When using high-capacitance and high-voltage electrolytic capacitors it is important to remember that the inner part (the rolled section) is not insulated from can: between the negative pole and the aluminium can there is a variable and not defined resistance essentially due to the electrolyte used in capacitor manufacture.

Surge Voltage

Surge Voltage limit for each working voltage is shown in Table 4-Surge Voltage values.

Working Voltage	40	50	63	75	100	160	200	250	350	400	420	450
Surge Voltage	46	58	73	86	115	185	230	290	385	440	460	495

Table 4-Surge Voltage values

Ripple Current

The allowable values of ripple current in Ampères, are related to the temperature and frequency by Equation 1:

$$I_{\text{Ripple}} = K_t \cdot K_f \cdot I_{\text{Ripple@85}^\circ\text{C}}$$

Equation 1

Where:

- $I_{\text{Ripple@85}^\circ\text{C}}$ is the limit given by tables, @ 85°C/100HZ
- K_t is the Temperature Correlation Factor, tabulated in Table 5-Kt Values
- K_f is the Frequency Correlation Factor, tabulated in Table 6-Kf Values

Note . Ripple current is function of the capacitance tolerance

°C	40	55	65	75	85
Kt	2.10	1.80	1.60	1.30	1.00

Table 5-Kt Values

Vn/Hz	Kf					
	V=50	50<V=30	V>300	V=50	50<V=300	V>300
	Diameter Code A,B			Diameter Code C,D		
50	0.82	0.79	0.76	0.86	0.78	0.72
100	1	1	1	1	1	1
120	1.03	1.04	1.04	1.01	1.02	1.03
300	1.12	1.16	1.28	1.03	1.08	1.24
500	1.15	1.22	1.39	1.03	1.09	1.32
>1000	1.18	1.25	1.45	1.03	1.09	1.37

Table 6-Kf Values

Dimensions

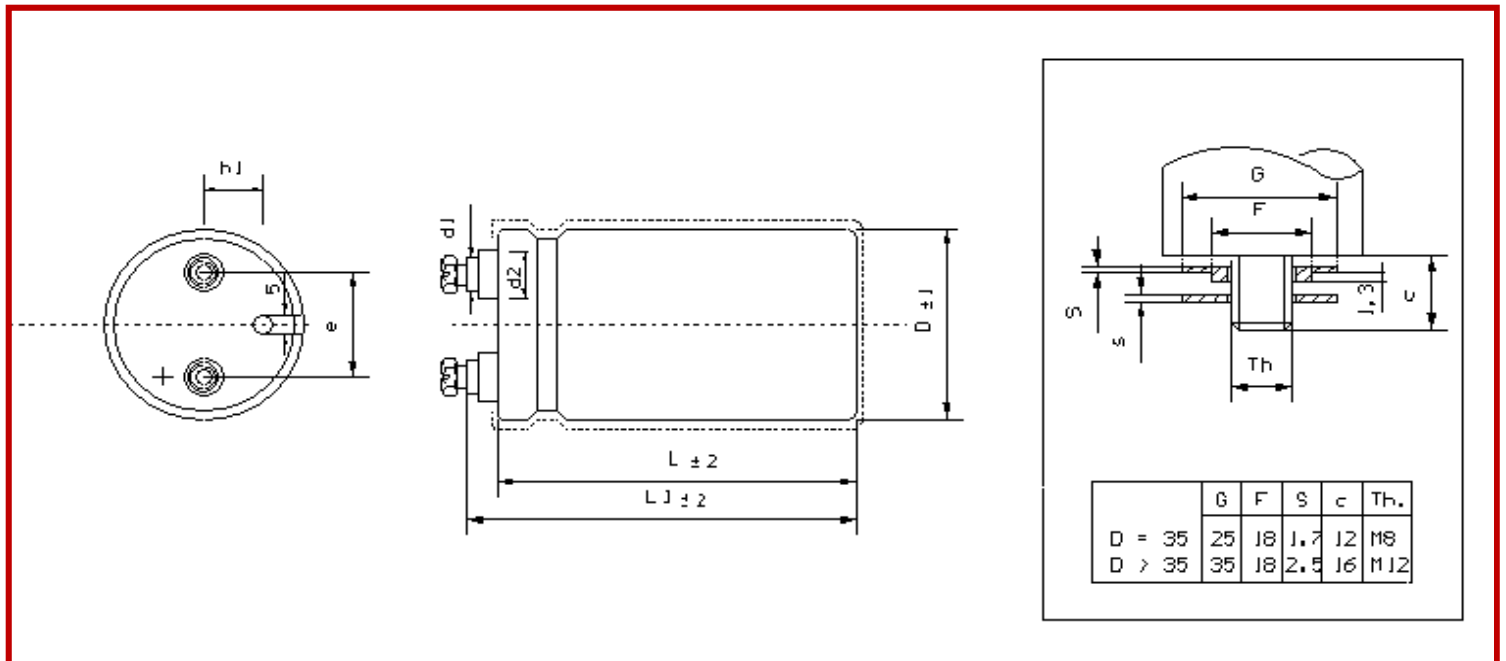


Table 7-General View

Insert screw thread= M5	Screw torque for hex nuts M8 =4Nm
Insert screw torque max. [M5] = 2,0Nm	Screw torque for hex nuts M12 =10Nm
Insert screw length (terminal code "-X")=10mm	

Table 8-Connections

Case Code	$\Phi \times L$	l1	d1	d2	h1	e	Case Code	$\Phi \times L$	l1	d1	d2	h1	e
All dimensions in [mm] general tolerance $\pm 0,5$ mm													
AA	35x59	65	8	12	8	12,7	BC	51x105	109	13	18	13	22,2
AB	35x83	89	8	12	8	12,7	CC	63x107	111	13	18	16	28.6
AC	35x105	109	8	12	8	12,7	DC	76x107	111	13	18	19	31.8
BB	51x83	89	13	18	13	22,2	DF	76x147	151	13	18	19	31.8

Table 9-Dimensions

Standard Mounting Stud Hardware: Insulating Plastic Washer And Metallic Nut

Expected Lifetime Vs Temperature and Ripple Current

Working Voltage <160V

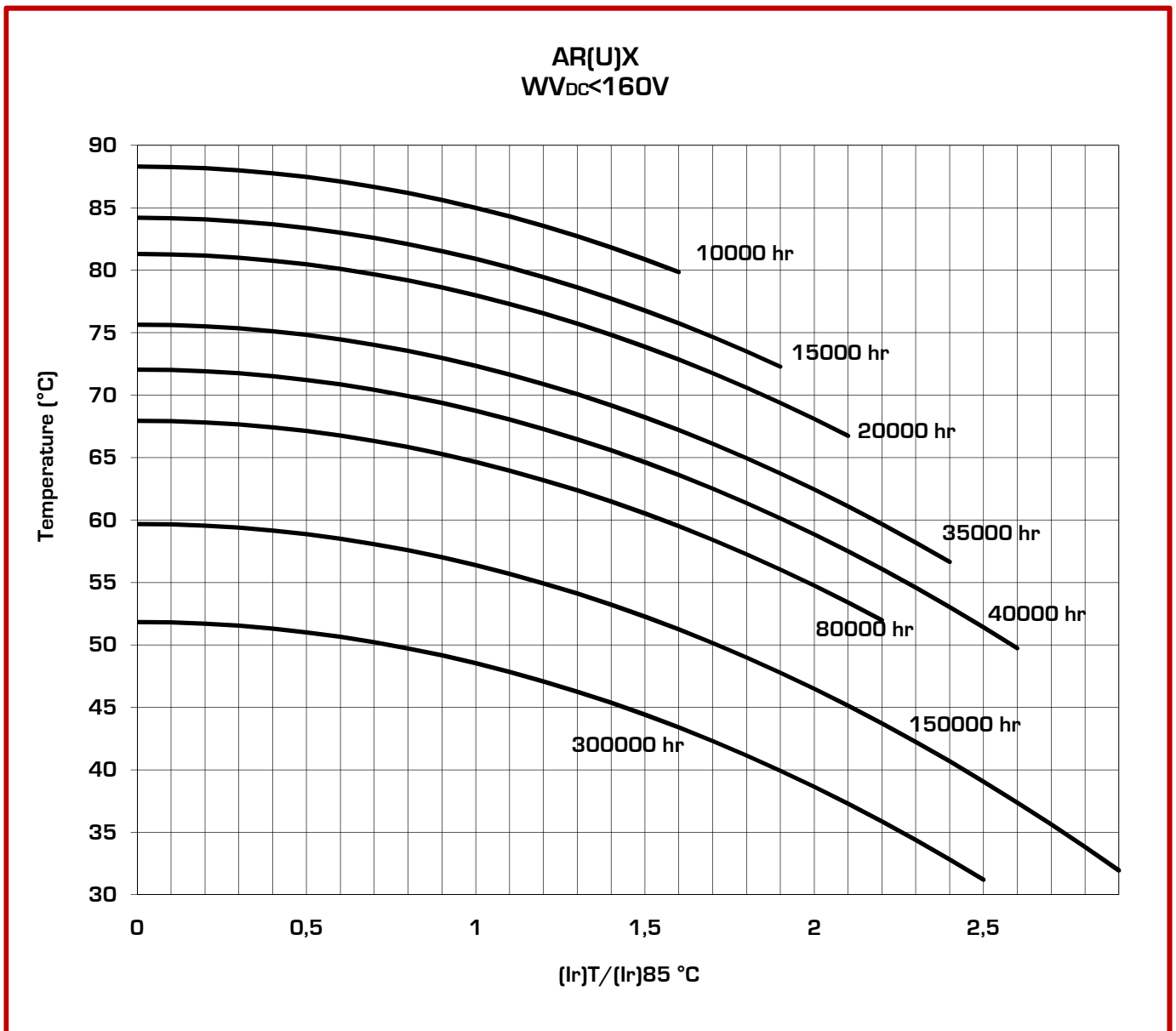


Table 10

Expected lifetime criteria: see introduction

Expected Lifetime Vs Temperature and Ripple Current

Working Voltage >160V

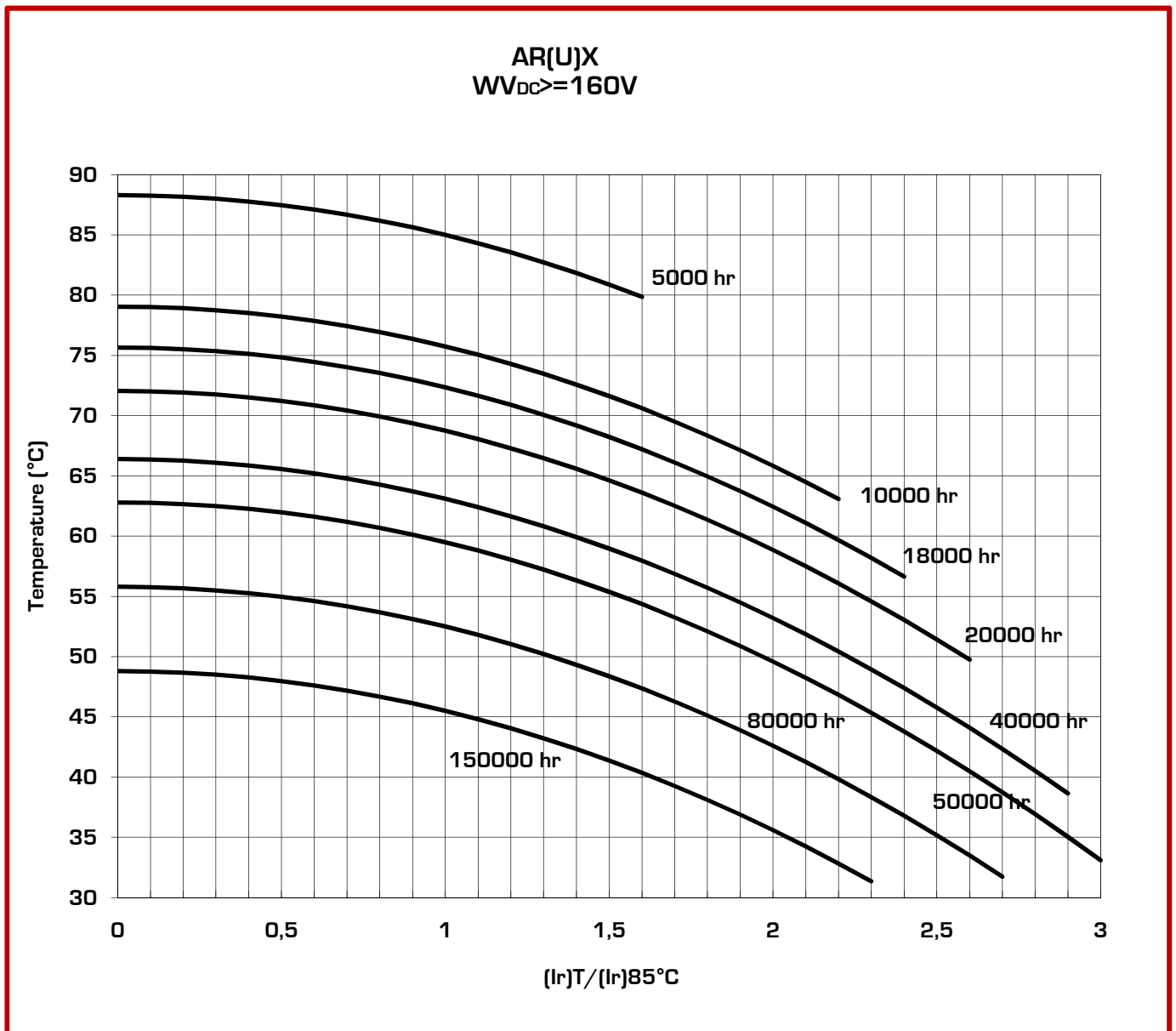


Table 11

Expected lifetime criteria: see introduction

VN=40V

Capacitance	Case	Tan δ	ESRmax/typ		Zmax	Iripple55°C/85°C		Part Number
			[μ F]@100Hz	[%]@100Hz		[m Ω]@100Hz	[m Ω]@10KHz	
10000	AA	0,27	39	31	30	8,0	4,6	AR(U)X103X40AA1
15000	AB	0,35	33	27	25	10,5	6,1	AR(U)X153X40AB1
22000	AC	0,42	27	22	18	13,2	7,7	AR(U)X223X40AC1
33000	BB	0,45	20	16	18	16,9	9,8	AR(U)X333X40BB1
47000	BB	0,48	15	12	18	16,9	11,4	AR(U)X473X40BB1
47000	BC	0,51	16	12	14	21,4	13,3	AR(U)X473X40BC1
100000	CC	0,70	10	8	9	30,0	17,5	AR(U)X104X40CC1
150000	DC	0,90	9	7	8	36,1	21,1	AR(U)X154X40DC1
220000	DF	1,30	8	7	7	41,6	24,3	AR(U)X224X40DF1

VN=63V

Capacitance	Case	Tan δ	ESRmax/typ		Zmax	Iripple55°C/85°C		Part Number
			[μ F]@100Hz	[%]@100Hz		[m Ω]@100Hz	[m Ω]@10KHz	
4700	AA	0,15	46	37	30	7,4	4,1	AR(U)X472X63AA1
6800	AB	0,20	42	34	27	9,3	5,2	AR(U)X682X63AB1
10000	AB	0,22	32	25	21	10,8	6,0	AR(U)X103X63AB1
15000	AC	0,25	24	19	18	14,1	7,8	AR(U)X153X63AC1
22000	BB	0,33	21	17	17	16,1	8,9	AR(U)X223X63BB1
33000	BC	0,38	17	13	14	20,8	11,6	AR(U)X333X63BC1
47000	CC	0,33	10	8	9	30,0	16,7	AR(U)X473X63CC1
68000	DC	0,39	8	7	7	36,9	20,5	AR(U)X683X63DC1
100000	DF	0,45	6	5	6	47,7	26,5	AR(U)X104X63DF1

Notes:

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VN=100V

Capacitance	Case	Tan δ	ESRmax/typ		Zmax	Iripple55°C/85°C		Part Number
			[μ F]@100Hz	[%]@100Hz		[m Ω]@100Hz	[m Ω]@10KHz	
2200	AA	0,12	78	63	47	5,6	3,1	AR(U)X222X100AA1
3300	AB	0,12	52	42	34	8,4	4,7	AR(U)X332X100AB1
4700	AB	0,12	37	29	27	9,7	5,4	AR(U)X472X100AB1
6800	AC	0,12	25	20	20	13,2	7,3	AR(U)X682X100AC1
10000	BB	0,12	17	14	17	15,6	8,7	AR(U)X103X100BB1
15000	BC	0,12	11	9	13	21,6	12	AR(U)X153X100BC1
22000	CC	0,12	8	6	9	27,8	15,4	AR(U)X223X100CC1
33000	DC	0,12	5	4	8	35,9	20	AR(U)X333X100DC1
47000	DF	0,12	4	3	7	46,7	26	AR(U)X473X100DF1

VN=160V

Capacitance	Case	Tan δ	ESRmax/typ		Zmax	Iripple55°C/85°C		Part Number
			[μ F]@100Hz	[%]@100Hz		[m Ω]@100Hz	[m Ω]@10KHz	
1000	AA	0,12	172	138	94	4,2	2,3	AR(U)X102X160AA1
1500	AB	0,12	115	92	62	6,2	3,4	AR(U)X152X160AB1
2200	AC	0,12	78	63	41	8,5	4,7	AR(U)X222X160AC1
3300	BB	0,12	52	42	29	11,3	6,3	AR(U)X332X160BB1
4700	BC	0,12	37	29	25	14,0	7,8	AR(U)X472X160BC1
6800	CC	0,12	25	20	20	18,9	10,5	AR(U)X682X160CC1
10000	CC	0,12	17	14	18	20,5	11,4	AR(U)X103X160CC1
12000	DC	0,12	14	11	15	25,0	13,9	AR(U)X123X160DC1
22000	DF	0,12	8	6	8	36,4	20,2	AR(U)X223X160DF1

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VN=200V

Capacitance	Case	Tan δ	ESRmax/typ		Zmax	Iripple55°C/85°C		Part Number
			[μ F]@100Hz	[%]@100Hz		[m Ω]@100Hz	[m Ω]@10KHz	
680	AA	0,12	253	202	111	3,8	2,1	AR(U)X681X200AA1
1000	AB	0,12	172	138	78	5,6	3,1	AR(U)X102X200AB1
1500	AC	0,12	115	92	51	7,9	4,4	AR(U)X152X200AC1
2200	BB	0,12	78	63	36	10,3	5,7	AR(U)X222X200BB1
3300	BC	0,12	52	42	30	12,8	7,1	AR(U)X332X200BC1
4700	CC	0,12	37	29	21	17,2	9,6	AR(U)X472X200CC1
10000	DC	0,12	17	14	14	25,5	14,2	AR(U)X103X200DC1
15000	DF	0,12	11	9	12	32,0	17,8	AR(U)X153X200DF1

VN=250V

Capacitance	Case	Tan δ	ESRmax/typ		Zmax	Iripple55°C/85°C		Part Number
			[μ F]@100Hz	[%]@100Hz		[m Ω]@100Hz	[m Ω]@10KHz	
470	AA	0,12	366	293	155	3,2	1,8	AR(U)X471X250AA1
680	AB	0,12	253	202	107	4,7	2,6	AR(U)X681X250AB1
1000	AC	0,12	172	138	86	6,1	3,4	AR(U)X102X250AC1
1500	BB	0,12	115	92	59	8,0	4,5	AR(U)X152X250BB1
2200	BC	0,12	78	63	44	10,5	5,8	AR(U)X222X250BC1
3300	BC	0,12	52	42	30	12,8	7,1	AR(U)X332X250BC1
4700	CC	0,12	37	29	23	17,2	9,6	AR(U)X472X250CC1
6800	DC	0,12	25	20	20	21,1	11,7	AR(U)X682X250DC1
10000	DF	0,12	17	14	17	26,1	14,5	AR(U)X103X250DF1

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VN=350V

Capacitance	Case	Tan δ	ESRmax/typ		Zmax	Iripple55°C/85°C		Part Number
			[μ F]@100Hz	[%]@100Hz		[m Ω]@100Hz	[m Ω]@10KHz	
330	AA	0,12	521	417	217	2,7	1,5	AR(U)X331X350AA1
470	AB	0,12	366	293	155	3,9	2,2	AR(U)X471X350AB1
680	AC	0,12	253	202	107	5,3	2,9	AR(U)X681X350AC1
1000	AC	0,12	172	138	78	6,4	3,6	AR(U)X102X350AC1
1500	BB	0,12	115	92	51	8,6	4,8	AR(U)X152X350BB1
2200	BC	0,12	78	63	35	11,7	6,5	AR(U)X222X350BC1
3300	CC	0,12	52	42	25	16,1	9	AR(U)X332X350CC1
4700	DC	0,12	37	29	22	19,2	10,7	AR(U)X472X350DC1
6800	DF	0,12	25	20	18	26,4	14,6	AR(U)X682X350DF1

VN=400V

Capacitance	Case	Tan δ	ESRmax/typ		Zmax	Iripple55°C/85°C		Part Number
			[μ F]@100Hz	[%]@100Hz		[m Ω]@100Hz	[m Ω]@10KHz	
330	AA	0,12	521	417	221	2,7	1,5	AR(U)X331X400AA1
470	AB	0,12	366	293	155	3,9	2,2	AR(U)X471X400AB1
680	AC	0,12	253	202	111	5,3	2,9	AR(U)X681X400AC1
1000	BB	0,12	172	138	78	7,0	3,9	AR(U)X102X400BB1
1500	BB	0,12	115	92	78	8,0	4,5	AR(U)X152X400BB1
1500	BC	0,12	115	92	50	9,7	5,4	AR(U)X152X400BC1
2200	CC	0,12	78	63	40	12,4	6,9	AR(U)X222X400CC1
3300	DC	0,12	52	42	29	16,5	9,2	AR(U)X332X400DC1
4700	DF	0,12	37	29	21	22,5	12,5	AR(U)X472X400DF1

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VN=450V

Capacitance	Case	Tan δ	ESRmax/typ		Zmax	Iripple55°C/85°C		Part Number
			[μ F]@100Hz	[%]@100Hz		[m Ω]@100Hz	[m Ω]@10KHz	
220	AA	0,12	782	625	480	1,8	1,0	AR(U)X221X450AA1
330	AB	0,12	521	417	323	2,6	1,5	AR(U)X331X450AB1
470	AC	0,12	366	293	237	4,6	2,5	AR(U)X471X450AC1
680	BB	0,12	253	202	166	4,7	2,6	AR(U)X681X450BB1
1000	BC	0,12	172	138	112	6,4	3,6	AR(U)X102X450BC1
1500	CC	0,12	115	92	75	8,9	4,9	AR(U)X152X450CC1
2200	DC	0,12	78	63	56	12,0	6,7	AR(U)X222X450DC1
3300	DF	0,12	52	39	32	16,0	8,9	AR(U)X332X450DC1
4700	DF	0,12	37	29	28	20,0	11,1	AR(U)X472X450DF1

Notes:

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Precautions

When using aluminium electrolytic capacitors a number of precautions must be taken :

- Operating temperature ,ripple current and working voltage must be within the specified limits
- Don't apply any reverse voltage or AC to the capacitors :there could be abnormal increase in temperature and even explosion of unit
- When protection against reverse voltage is required please contact our engineering.
- In any case AC cannot be applied
- Capacitors that undergo (occasionally or purposely) to reverse voltage cannot be used any longer
- DC voltage plus AC component cannot exceed the working voltage of the unit
- Capacitors to be used in areas where there are harmful gases will undergo to a life reduction due to damages that can occur to sealing rubber or to gasket : the damage of these parts can cause the gas enter into the capacitor with consequent corrosion of capacitor's body
- When capacitor is used a highly dusty area check that the level of powders on the top of the unit is not overpassing insert shoulder height to avoid possible short circuit between plus and minus pole
- Moisture or salt spray can penetrate into the capacitor and cause short circuit of the unit
- When mounting screw terminal capacitors see par. 16
- When mounting snap in capacitor with a solder iron the hot tip cannot come in contact with the can, cover material or insulating sleeve
- When units are mounted on series – parallel use homogeneous date codes
- Handling of capacitors must be done carefully : unit falling on the floor or bumping against object can be damaged even when no particular visible modification of unit can be seen; if it happens replace units
- Capacitors cannot be stored under direct sun light
- To avoid electrical shock read carefully par. 6
- When an unit operates for long time at voltage consistently low and then sees an high voltage an increase in temperature must be expected

- When a snap in unit is fixed to the pwb by means of fixing material be sure that the fixing compound do not contain chloride or chemicals that can deliver chlorine during polymerisation process
- Cleaning circuit must be done with safe chemicals (see par. 7)
- Harzadous voltage specially on very high capacitance units is present for up to 60 minutes after disconnection from power supply
- Do not use capacitors having standard design in circuits where charge and discharge cycles have an high repetition rate; specific capacitors can be designed for this application
- When safety vent operates a gas at high temperature is emitted : the gas is driving out from capacitor boby some electrolyte that could damage the PC board or connecting bars not properly insulated from chemical attack.
- When a capacitor in bank fails check all capacitors and replace them : don't replace failed unit only

Terms and Conditions

1. The general conditions presently in force are applicable to all purchases effected by the Client (Buyer) from Itelcond S.r.l. (Seller). These general conditions must not be exceeded, modified, deferred or, in any other way, altered, except if an official document is underwritten and signed by the Seller. Under no circumstances the general conditions adopted by the Buyer, printed on his purchase orders or any other document, will be deemed applicable to none of the purchase orders placed with the Seller. The execution, also partial, of the Buyer's order, or any other fulfilment from the Seller's side towards the Buyer, will not be valid and therefore not interpreted as tacit or implicit acceptance of any general condition decided by the Buyer, unless specifically agreed upon the Seller's legal representative.
2. The products manufactured or sold by the Seller are not designed to be used into devices or equipments to be inserted surgically into the human body or, in other words, suitable to examine or preserve the human life, or used in devices or systems for the nuclear applications. If the Buyer intends to utilise the Seller's products for its application in medical, nuclear, military and/or aerospace fields, he may do so only with prior request and receipt of a document signed by the Seller's managing director, certifying that these products are suitable to be applied in the above fields,
3. The Seller will accept purchase orders only after written confirmation of the order, sent to the Buyer.
4. Delivery dates shown in the confirmation order are only indicative and not binding. The Seller will do his utmost in order to respect the confirmed delivery date but, at the same time, does not take any responsibility for the eventual non-observance of the date. The delivery is linked to the payment of eventual amounts which are due and are related to previous supplies. Likewise also prices indicated in

the confirmation order might vary according to increases in the energy or raw materials prices or changes in currency rates.

5. In absence of written agreements, orders are considered fulfilled with a tolerance of plus/minus 3% or plus/minus 5 pieces.
6. The technical specifications of the Seller's products are those contained in his last "Data Book" and are also traceable on his Web Site: www.itelcond.it . The technical specifications may also be those agreed upon between Seller and Buyer.
7. Seller's products will be free from vices and will be guaranteed for a period of 12 months from delivery date to the Buyer. The law decree No.24 of 02,02,2002 will not be enforced as these products are not considered as consumer goods. The warranty is effective exclusively towards the Seller's direct Buyer. Damages claimed by third parties, although if requested by Seller's direct Buyer, will be turned down.
8. The warranty does not cover products which are used incorrectly. Certain types of electric products, designed and manufactured to be used as basic components to be inserted in other electric devices, are anyway such that their performance is widely related to the way they are integrated in the final product and by its general characteristics. In the range of these basic components are included both active and passive components and notably the electrolytic capacitors.
9. Eventual defects or vices of goods will be promptly notified in writing and anyhow not after 8 days from the date of receipt of goods. In case of hidden defects, the above timing will start from the date of the discovery of these defects. In case of vices ascertained and reported in due time, defects or lack in quantity or quality of products, the Seller is entitled to the sole substitution of such products, repair or writing back of such products at his choice. In line with the most ample applicability of the law, any different and further responsibility is excluded for damages occurring to the buyer or third parties with regard to the utilization of the Seller's products. Samples, prototypes and products in development, will be delivered as they are and uncovered from warranty.
10. In case of missed and damaged products and units considered not in line with the technical specifications, the Buyer is entitled to inform immediately the Seller, who will decide how to proceed about the matter. No rejected goods will be accepted, unless previously authorized by the Seller. If an authorization number for the rejection (RMA) has been notified to the Buyer, such a number must be reported both on packaging and on documents accompanying the units rejected to the Seller. Products, travelling at Buyer's risk and danger, must be returned complete, not tampered with, non welded, with their eventual accessories and adequately packed and delivered free factory of Seller. The assignment of the authorization number for rejection does not allow the Buyer to obtain the substitution of products, the credit of their value, and whatsoever responsibility on the Seller's side is not admitted. The Buyer is obliged to comply with the rules related to the re-exportation of the products to clients or countries, if the Italian law forbids export and sale towards them.
11. Goods are sold free factory of Seller and therefore the transportation risk is at total Buyer's charge. The delivery of products will be considered in every respect accomplished once the products are collected by the carrier or by the same Buyer at the Seller's warehouse.
12. The sold products will remain property of the Seller until totally paid by the Buyer. In case of delayed or missed payment the Seller may, at his discretion, request to re-enter into possession of unpaid products.
13. The Seller will not be liable if events, not due to his will, will prevent him to accomplish, partially or totally, the contractual obligations undertaken. The Seller will not assume responsibility for his products after the same are assembled on Buyer's equipments. The Seller will not be liable, no limitations admitted, for

damages caused by the loss of warranty, contracts, or other legal matters, including loss of value, profit, capital, or expenses for the substitution of equipments.

14. Any dispute will be submitted to the law-court of Milan (Italy). Under any circumstance the contract will be exclusively governed by the italian law.

