

**TAL 047**

## **Low Voltage Alternator - 4 pole**

410 to 660 kVA - 50 Hz / 510 to 825 kVA - 60 Hz  
Electrical and mechanical data

**LEROY-SOMER™**

***Nidec***  
All for dreams

## Adapted to needs

The TAL alternator range is designed to meet the needs of general applications such as prime power and stand-by.

## Standards

Nidec Leroy-Somer TAL 047 alternator meets all key international standards and regulations, including IEC 60034, NEMA MG 1.32-33, ISO 8528-3, CSA C22.2 n°100-14 and UL 1446 (UL 1004 on request).

Also compliant with IEC 61000-6-2, IEC 61000-6-3, IEC 61000-6-4, VDE 0875G, VDE 0875N and EN 55011, group 1 class A for European zone.

Nidec Leroy-Somer TAL 047 alternator can be integrated in EC marked generator set, and bears EC, EAC and CMIM markings.

It is designed, manufactured and marketed in an ISO 9001 and ISO 14001 quality assurance environment.

## Electrical design

- Class H insulation
- Shunt excitation
- Low voltage winding:
  - Three-phase 50 Hz: 380V - 400V - 415V - 440V / 220V - 230V - 240V
  - 60 Hz: 380V - 416V - 440V - 480V / 220V - 208V - 240V
- 6-terminal plates in 6-wire version or suitable for 12-wire option
- Optimized performance

## Robust design

- Compact and rugged assembly to withstand engine vibrations
- Steel frame
- Cast iron flanges and shields
- Single bearing design to be suitable with most diesel engines
- Sealed for life bearing
- Standard direction of rotation: clockwise when looking at the drive end view (for anti-clockwise, derate the machine by 5%)

## Excitation and regulation system suited to the application

	Excitation system				Regulation options		
	AVR	SHUNT	AREP (option)	PMG (option)	ULc/us	Remote voltage potentiometer	C.T. for paralleling
Three-phase 6-wire	R150	Standard				√	
	R180		Standard	Standard		√	√
	D350	Option	Option	Option	√	√	√
Three-phase 12-wire*	R150	Standard				√	
	R250	Option			√	√	
	R180		Standard	Standard		√	√
	D350	Option	Option	Option	√	√	√

√: Possible option      \*with larger terminal box

## Compact terminal box

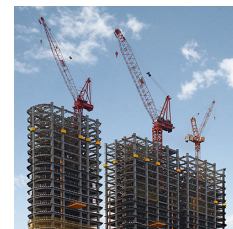
- Easy access to AVR and terminals
- Standard terminal box with possibility of mounting measurement CTs
- Possibility of current transformer for parallel operation

## Environment and protection

- Degree of protection: IP 23
- Standard winding protection for non-harsh environments with relative humidity ≤ 95%

## Available options

- Three-phase 12-wire with 9-terminal plates
- AREP or PMG excitation
- ULc/us
- Customized painting (unpainted machine as standard)
- Space heaters
- Droop kit for alternator paralleling
- Stator sensors
- Winding 8 optimized for three-phase 380V - 416 V / 60 Hz
- Winding protection for harsh environments and relative humidity greater than 95% (system 2 - 4): for TAL 047 F apply a derating coefficient of 0.97



# TAL 047 - 410 to 660 kVA - 50 Hz / 510 to 825 kVA - 60 Hz

## General characteristics

Insulation class	H	Excitation system 6-wire	SHUNT	AREP / PMG
Winding pitch	2/3 (wind.6S - 6-wire / wind.6 - 12-wire)	AVR type	R150	R180
Number of wires	6 (12 option)	Excitation system 12-wire (option)	SHUNT	AREP / PMG
Protection	IP 23	AVR type	R150	R180
Altitude	≤ 1000 m	Voltage regulation (*)	± 0.8 %	± 0.5 %
Overspeed	2250 R.P.M.	Total Harmonic Distortion THD (**) in no-load	< 1.5 %	
Air flow 50 Hz	0.9 m <sup>3</sup> /s	Total Harmonic Distortion THD (**) in linear load	< 5 %	
Air flow 60 Hz	1.1 m <sup>3</sup> /s	Waveform: NEMA = TIF (**)	< 50	
AREP/PMG Short-circuit current = 2.7 In : 5 second		Waveform: I.E.C. = THF (**)	< 2%	

(\*) Steady state (\*\*) Total harmonic distortion between phases, no-load or on-load (non-distorting)

## Ratings 50 Hz - 1500 R.P.M.

kVA / kW - P.F. = 0.8																
Duty / T° C	Continuous / 40 °C				Continuous / 40 °C				Stand-by / 40 °C				Stand-by / 27 °C			
Class / T° K	H / 125° K				F / 105° K				H / 150° K				H / 163° K			
Phase	3 ph.				3 ph.				3 ph.				3 ph.			
<b>Y</b>	380V	<b>400V</b>	415V	440V	380V	<b>400V</b>	415V	440V	380V	<b>400V</b>	415V	440V	380V	<b>400V</b>	415V	440V
<b>Δ</b>	220V	<b>230V</b>	240V		220V	<b>230V</b>	240V		220V	<b>230V</b>	240V		220V	<b>230V</b>	240V	
<b>YY (*)</b>		<b>200V</b>		220V		<b>200V</b>		220V		<b>200V</b>		220V		<b>200V</b>		220V
<b>TAL 047 A</b> kVA	390	<b>410</b>	410	385	355	<b>375</b>	375	350	415	<b>435</b>	435	410	430	<b>450</b>	450	425
kW	312	<b>328</b>	328	308	284	<b>300</b>	300	280	332	<b>348</b>	348	328	344	<b>360</b>	360	340
<b>TAL 047 B</b> kVA	430	<b>455</b>	455	430	390	<b>415</b>	415	390	455	<b>480</b>	480	455	475	<b>500</b>	500	475
kW	344	<b>364</b>	364	344	312	<b>332</b>	332	312	364	<b>384</b>	384	364	380	<b>400</b>	400	380
<b>TAL 047 C</b> kVA	475	<b>500</b>	500	460	430	<b>455</b>	455	420	505	<b>530</b>	530	490	525	<b>550</b>	550	505
kW	380	<b>400</b>	400	368	344	<b>364</b>	364	336	404	<b>424</b>	424	392	420	<b>440</b>	440	404
<b>TAL 047 D</b> kVA	525	<b>550</b>	550	535	480	<b>500</b>	500	485	555	<b>585</b>	585	565	580	<b>600</b>	600	590
kW	420	<b>440</b>	440	428	384	<b>400</b>	400	388	444	<b>468</b>	468	452	464	<b>480</b>	480	472
<b>TAL 047 E</b> kVA	585	<b>600</b>	600	570	530	<b>545</b>	545	520	620	<b>635</b>	635	605	645	<b>660</b>	660	625
kW	468	<b>480</b>	480	456	424	<b>436</b>	436	416	496	<b>508</b>	508	484	516	<b>528</b>	528	500
<b>TAL 047 F (**)</b> kVA	645	<b>660</b>	660	620	585	<b>600</b>	600	565	685	<b>700</b>	700	655	710	<b>730</b>	730	680
kW	516	<b>528</b>	528	496	468	<b>480</b>	480	452	548	<b>560</b>	560	524	568	<b>584</b>	584	544

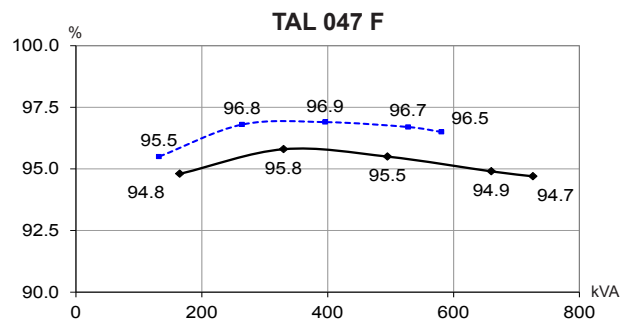
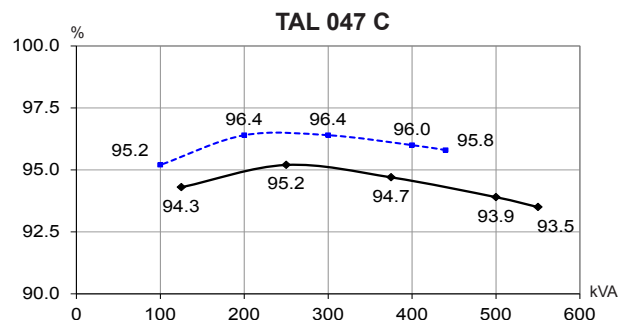
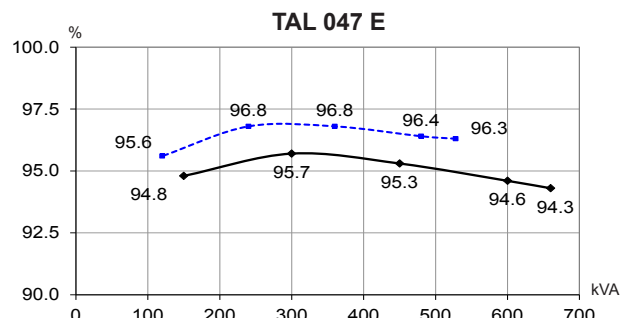
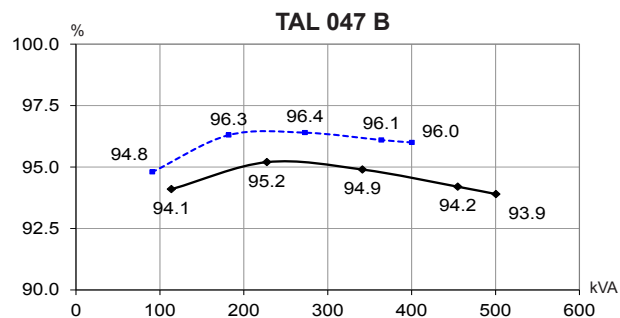
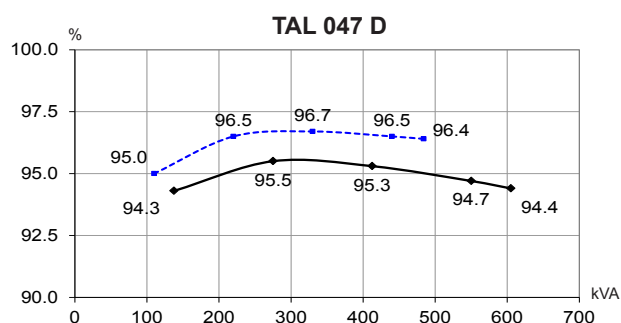
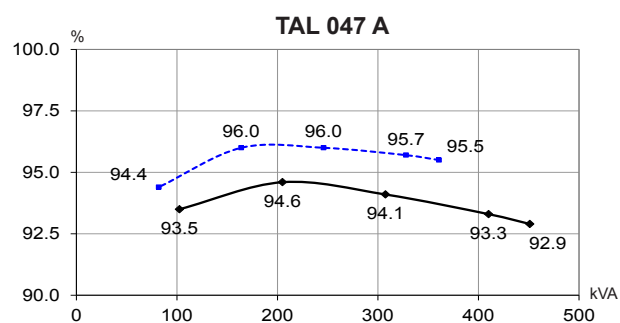
(\*) 12-wire option (\*\*) 6-wire only

## Ratings 60 Hz - 1800 R.P.M.

kVA / kW - P.F. = 0.8																
Duty / T° C	Continuous / 40 °C				Continuous / 40 °C				Stand-by / 40 °C				Stand-by / 27 °C			
Class / T° K	H / 125° K				F / 105° K				H / 150° K				H / 163° K			
Phase	3 ph.				3 ph.				3 ph.				3 ph.			
<b>Y</b>	380V	416V	440V	<b>480V</b>	380V	416V	440V	<b>480V</b>	380V	416V	440V	<b>480V</b>	380V	416V	440V	<b>480V</b>
<b>Δ</b>	220V	240V			220V	240V			220V	240V			220V	240V		
<b>YY (*)</b>		208V	220V	<b>240V</b>		208V	220V	<b>240V</b>		208V	220V	<b>240V</b>		208V	220V	<b>240V</b>
<b>TAL 047 A</b> kVA	450	480	500	<b>510</b>	410	435	455	<b>465</b>	475	510	530	<b>540</b>	495	530	550	<b>580</b>
kW	360	384	400	<b>408</b>	328	348	364	<b>372</b>	380	408	424	<b>432</b>	396	424	440	<b>464</b>
<b>TAL 047 B</b> kVA	475	510	530	<b>570</b>	430	465	480	<b>520</b>	505	540	560	<b>605</b>	525	560	585	<b>625</b>
kW	380	408	424	<b>456</b>	344	372	384	<b>416</b>	404	432	448	<b>484</b>	420	448	468	<b>500</b>
<b>TAL 047 C</b> kVA	520	555	590	<b>625</b>	475	505	535	<b>570</b>	550	590	625	<b>665</b>	570	610	650	<b>690</b>
kW	416	444	472	<b>500</b>	380	404	428	<b>456</b>	440	472	500	<b>532</b>	456	488	520	<b>552</b>
<b>TAL 047 D</b> kVA	560	610	630	<b>690</b>	510	555	575	<b>630</b>	595	645	670	<b>730</b>	615	670	695	<b>750</b>
kW	448	488	504	<b>552</b>	408	444	460	<b>504</b>	476	516	536	<b>584</b>	492	536	556	<b>600</b>
<b>TAL 047 E</b> kVA	600	660	685	<b>750</b>	545	600	625	<b>685</b>	635	700	725	<b>795</b>	660	725	755	<b>825</b>
kW	480	528	548	<b>600</b>	436	480	500	<b>548</b>	508	560	580	<b>636</b>	528	580	604	<b>660</b>
<b>TAL 047 F (**)</b> kVA	650	715	755	<b>825</b>	590	650	685	<b>750</b>	690	760	800	<b>875</b>	720	785	830	<b>910</b>
kW	520	572	604	<b>660</b>	472	520	548	<b>600</b>	552	608	640	<b>700</b>	576	628	664	<b>728</b>

(\*) 12-wire option (\*\*) 6-wire only

Efficiencies 400 V - 50 Hz (— P.F.: 0.8) (..... P.F.: 1)



Reactances (%). Time constants (ms) - Class H / 400 V

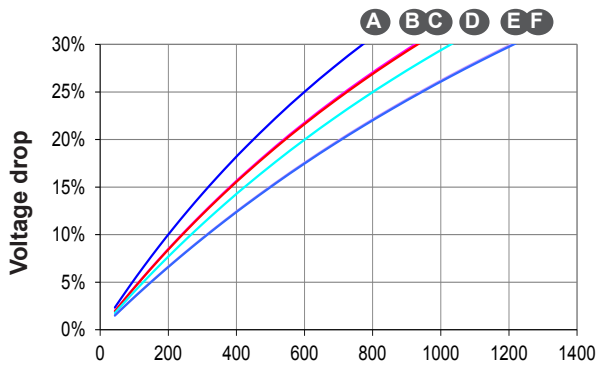
	A	B	C	D	E	F
<b>Kcc</b> Short-circuit ratio	0.35	0.34	0.31	0.39	0.32	0.36
<b>Xd</b> Direct-axis synchro. reactance unsaturated	347	338	372	310	361	328
<b>Xq</b> Quadrature-axis synchro. reactance unsaturated	177	172	189	158	184	167
<b>T'do</b> No-load transient time constant	1601	1705	1705	1773	1797	1832
<b>X'd</b> Direct-axis transient reactance saturated	21.6	19.8	21.8	17.5	20	17.9
<b>T'd</b> Short-circuit transient time constant	100	100	100	100	100	100
<b>X''d</b> Direct-axis subtransient reactance saturated	15.1	13.9	15.2	12.2	14	12.5
<b>T''d</b> Subtransient time constant	10	10	10	10	10	10
<b>X''q</b> Quadrature-axis subtransient reactance saturated	16.6	17.4	19.1	16.5	19.5	18
<b>Xo</b> Zero sequence reactance	0.9	0.82	0.9	0.72	0.83	0.74
<b>X2</b> Negative sequence reactance saturated	15.91	15.66	17.21	14.41	16.8	15.31
<b>Ta</b> Armature time constant	15	15	15	15	15	15

Other class H / 400 V data

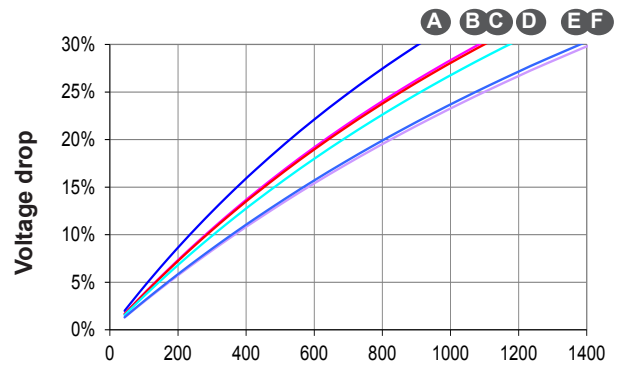
<b>io (A)</b> No-load excitation current SHUNT/AREP	0.97	0.87	0.87	0.97	0.85	0.93
<b>ic (A)</b> On-load excitation current SHUNT/AREP	4.24	3.72	4.06	3.79	3.89	3.87
<b>uc (V)</b> On-load excitation voltage SHUNT/AREP	44.2	38.7	42.2	39.4	40.3	40.1
<b>ms</b> Response time ( $\Delta U = 20\%$ transient)	500	500	500	500	500	500
<b>kVA</b> Start ( $\Delta U = 20\%$ cont. or $\Delta U = 30\%$ trans.) SHUNT*	612	743	742	947	970	1105
<b>kVA</b> Start ( $\Delta U = 20\%$ cont. or $\Delta U = 30\%$ trans.) AREP*	738	891	894	1135	1162	1324
<b>%</b> Transient $\Delta U$ (on-load 4/4) SHUNT - P.F.: 0.8 <sub>LAG</sub>	18.6	17.5	18.7	18.7	17.6	18.9
<b>%</b> Transient $\Delta U$ (on-load 4/4) AREP - P.F.: 0.8 <sub>LAG</sub>	16.3	15.3	16.4	16.8	15.4	17
<b>W</b> No-load losses	4261	4376	4376	5192	4831	5487
<b>W</b> Heat dissipation	23451	22295	25923	24391	27055	27875

\* P.F. = 0.6

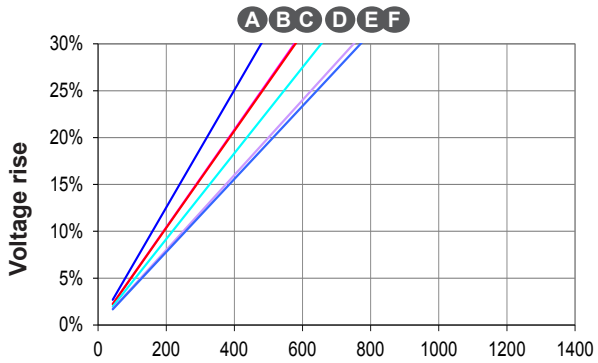
Transient voltage variation 400 V - 50 Hz



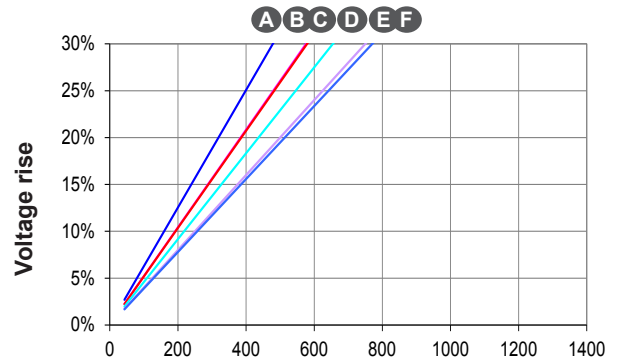
Phase loading (SHUNT) - kVA at P.F. = 0.8



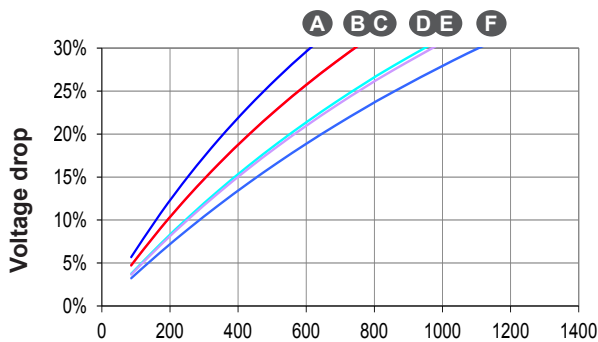
Phase loading (AREP/PMG) - kVA at P.F. = 0.8



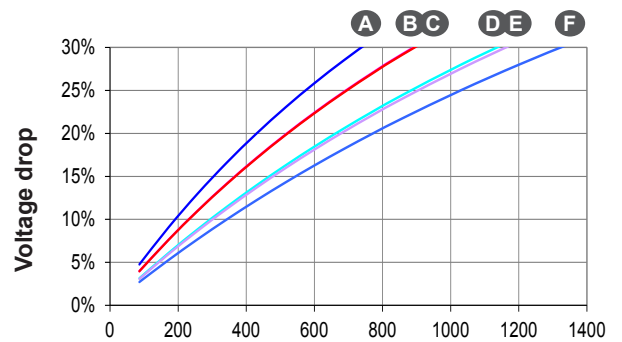
Load shedding (SHUNT) - kVA at P.F. = 0.8



Load shedding (AREP/PMG) - kVA at P.F. = 0.8



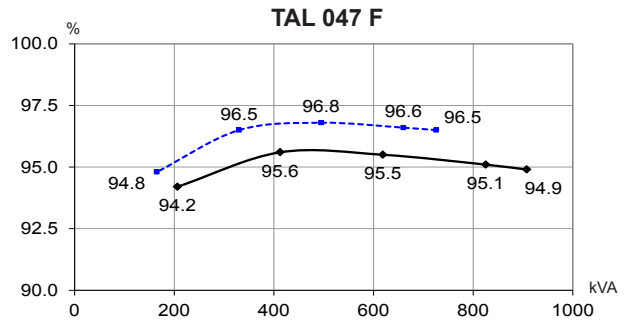
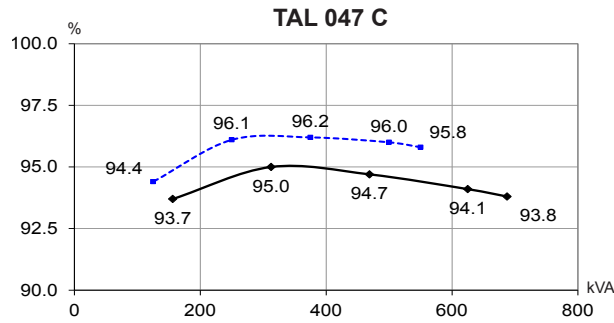
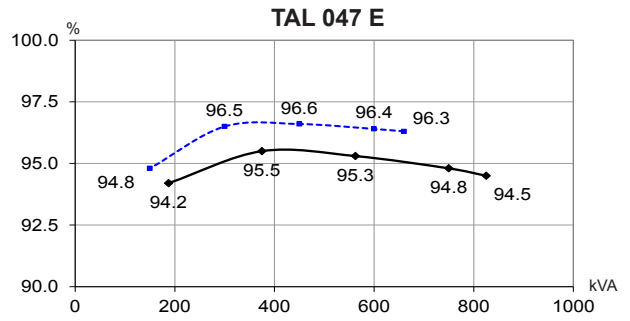
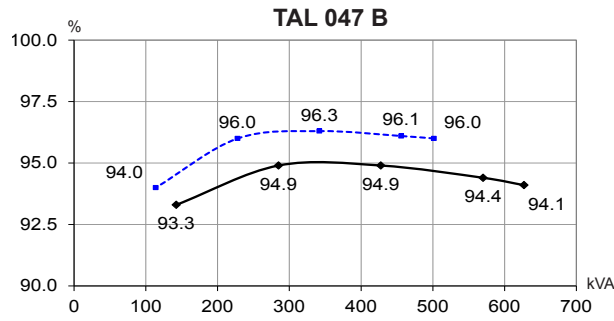
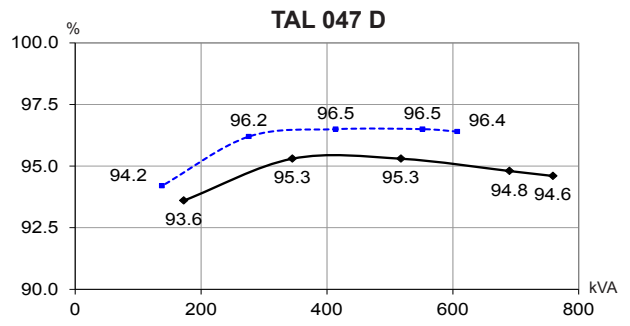
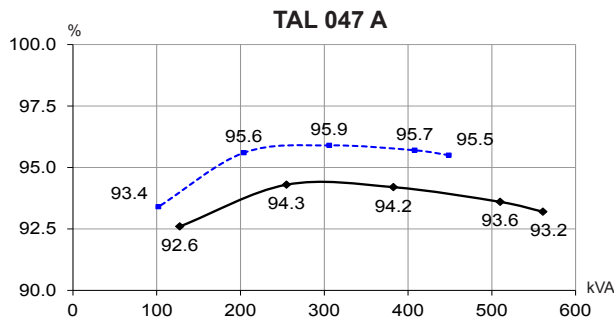
Motor starting (SHUNT)  
Locked rotor kVA at P.F. = 0.6



Motor starting (AREP/PMG)  
Locked rotor kVA at P.F. = 0.6

- 1) For a starting P.F. other than 0.6, the starting kVA must be multiplied by  $K = \text{Sine P.F.} / 0.8$
- 2) For voltages other than 400V (Y), 230V ( $\Delta$ ) at 50 Hz, then kVA must be multiplied by  $(400/U)^2$  or  $(230/U)^2$ .

Efficiencies 480 V - 60 Hz (— P.F.: 0.8) (..... P.F.: 1)



Reactances (%). Time constants (ms) - Class H / 480 V

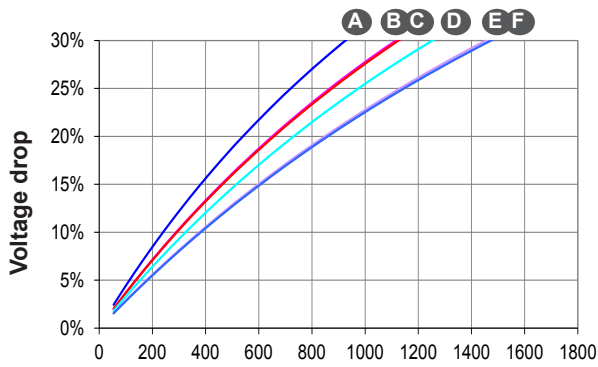
	A	B	C	D	E	F
<b>Kcc</b> Short-circuit ratio	0.34	0.32	0.3	0.37	0.3	0.35
<b>Xd</b> Direct-axis synchro. reactance unsaturated	359	353	387	324	376	342
<b>Xq</b> Quadrature-axis synchro. reactance unsaturated	183	180	197	165	191	174
<b>T'do</b> No-load transient time constant	1601	1705	1705	1773	1797	1832
<b>X'd</b> Direct-axis transient reactance saturated	22.4	20.7	22.7	18.3	20.9	18.6
<b>T'd</b> Short-circuit transient time constant	100	100	100	100	100	100
<b>X''d</b> Direct-axis subtransient reactance saturated	15.7	14.5	15.9	12.8	14.6	13
<b>T''d</b> Subtransient time constant	10	10	10	10	10	10
<b>X''q</b> Quadrature-axis subtransient reactance saturated	17.2	18.1	19.9	17.3	20.3	18.8
<b>Xo</b> Zero sequence reactance	0.93	0.86	0.94	0.76	0.87	0.77
<b>X2</b> Negative sequence reactance saturated	16.5	16.35	17.92	15.07	17.5	15.95
<b>Ta</b> Armature time constant	15	15	15	15	15	15

Other class H / 480 V data

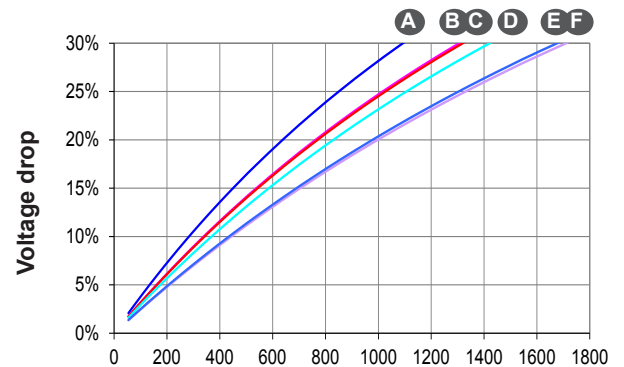
<b>io (A)</b> No-load excitation current SHUNT/AREP	0.97	0.87	0.87	0.97	0.85	0.93
<b>ic (A)</b> On-load excitation current SHUNT/AREP	4.31	3.81	4.15	3.88	3.97	3.94
<b>uc (V)</b> On-load excitation voltage SHUNT/AREP	45.1	39.8	43.3	40.5	41.3	41
<b>ms</b> Response time ( $\Delta U = 20\%$ transient)	500	500	500	500	500	500
<b>kVA</b> Start ( $\Delta U = 20\%$ cont. or $\Delta U = 30\%$ trans.) SHUNT*	738	890	889	1135	1162	1324
<b>kVA</b> Start ( $\Delta U = 20\%$ cont. or $\Delta U = 30\%$ trans.) AREP*	883	1074	1071	1360	1391	1597
<b>%</b> Transient $\Delta U$ (on-load 4/4) SHUNT - P.F.: 0.8 <sub>LAG</sub>	19.1	18	19.3	19.2	18.2	19.4
<b>%</b> Transient $\Delta U$ (on-load 4/4) AREP - P.F.: 0.8 <sub>LAG</sub>	16.7	15.8	16.9	17.2	15.9	17.4
<b>W</b> No-load losses	6583	6766	6766	7888	7408	8312
<b>W</b> Heat dissipation	27879	27031	31057	29695	32579	33674

\* P.F. = 0.6

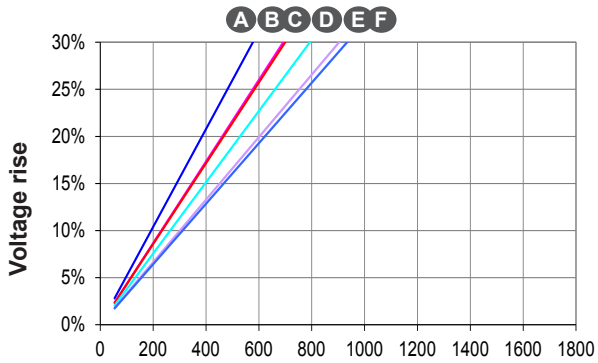
Transient voltage variation 480 V - 60 Hz



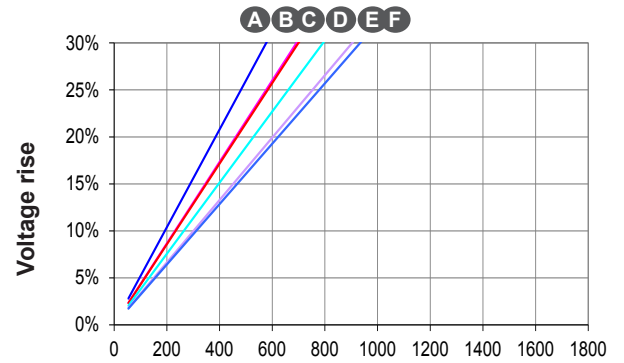
Phase loading (SHUNT) - kVA at P.F. = 0.8



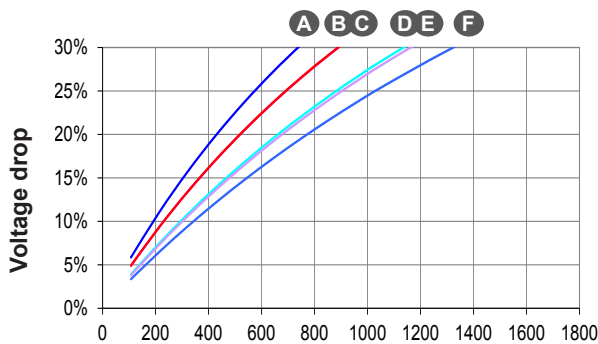
Phase loading (AREP/PMG) - kVA at P.F. = 0.8



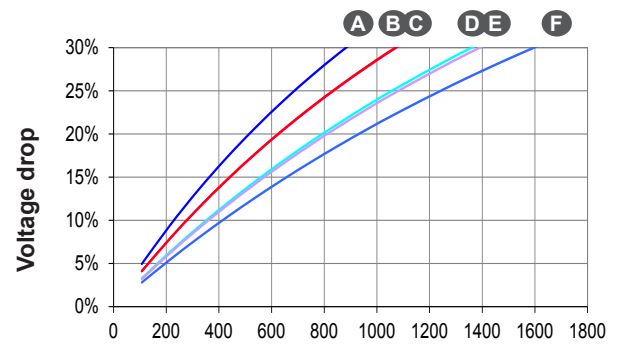
Load shedding (SHUNT) - kVA at P.F. = 0.8



Load shedding (AREP/PMG) - kVA at P.F. = 0.8



Motor starting (SHUNT)  
Locked rotor kVA at P.F. = 0.6



Motor starting (AREP/PMG)  
Locked rotor kVA at P.F. = 0.6

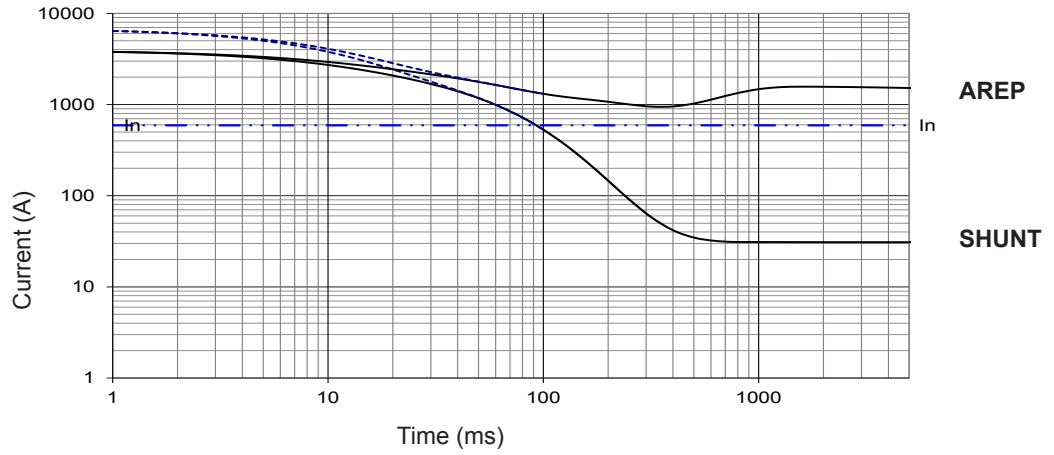
- 1) For a starting P.F. other than 0.6, the starting kVA must be multiplied by  $K = \text{Sine P.F.} / 0.8$
- 2) For voltages other than 480V (Y), 277V ( $\Delta$ ), 240V (YY) at 60 Hz, then kVA must be multiplied by  $(480/U)^2$  or  $(277/U)^2$  or  $(240/U)^2$ .



3-phase short-circuit curves at no load and rated speed (star connection Y)

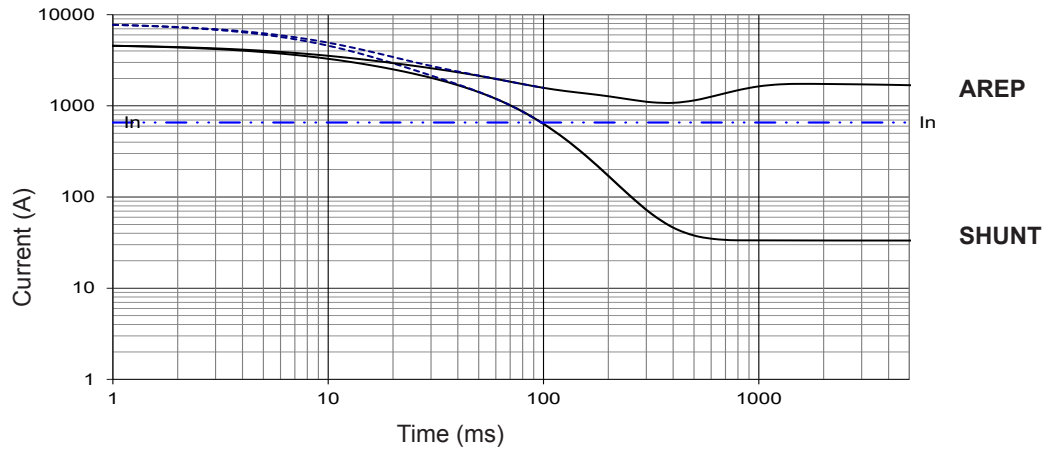
**TAL 047 A**

Symmetrical —  
Asymmetrical - - -



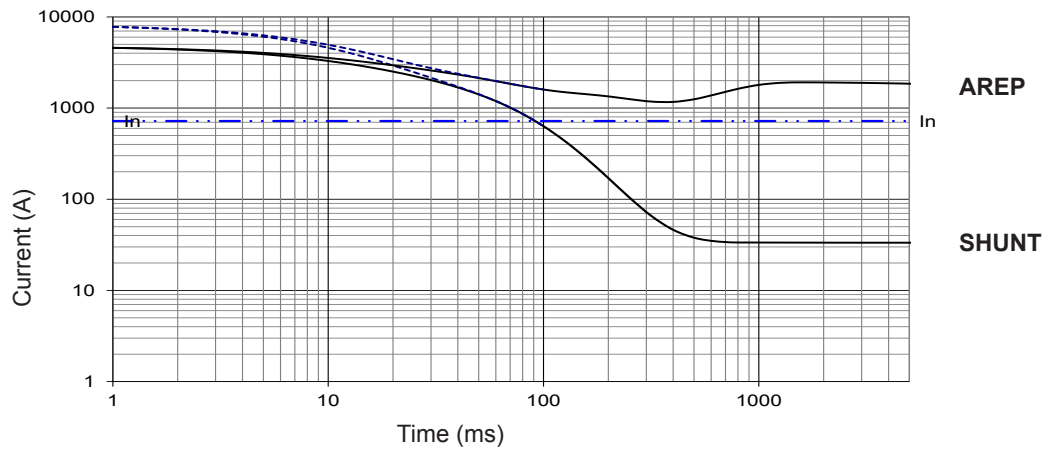
**TAL 047 B**

Symmetrical —  
Asymmetrical - - -



**TAL 047 C**

Symmetrical —  
Asymmetrical - - -



**Influence due to connection**

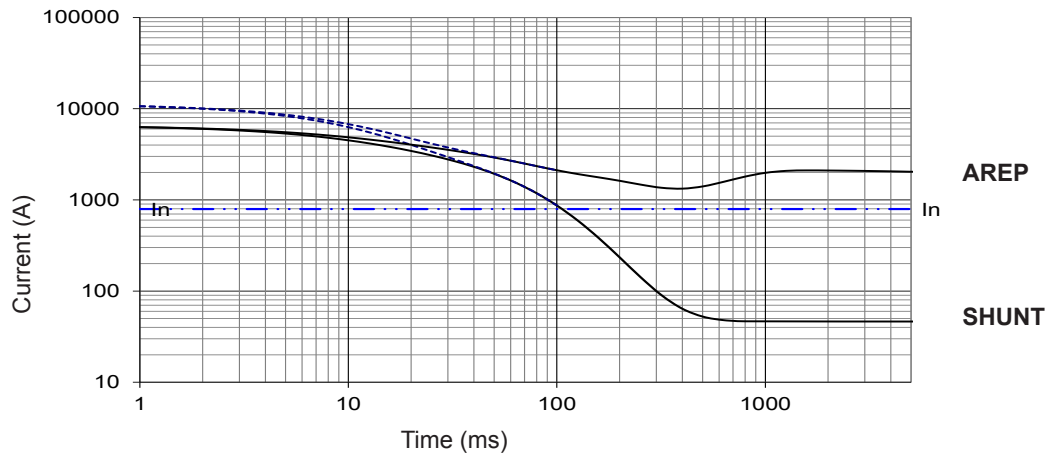
For (Δ) connection, use the following multiplication factor:  
- Current value x 1.732.



3-phase short-circuit curves at no load and rated speed (star connection Y)

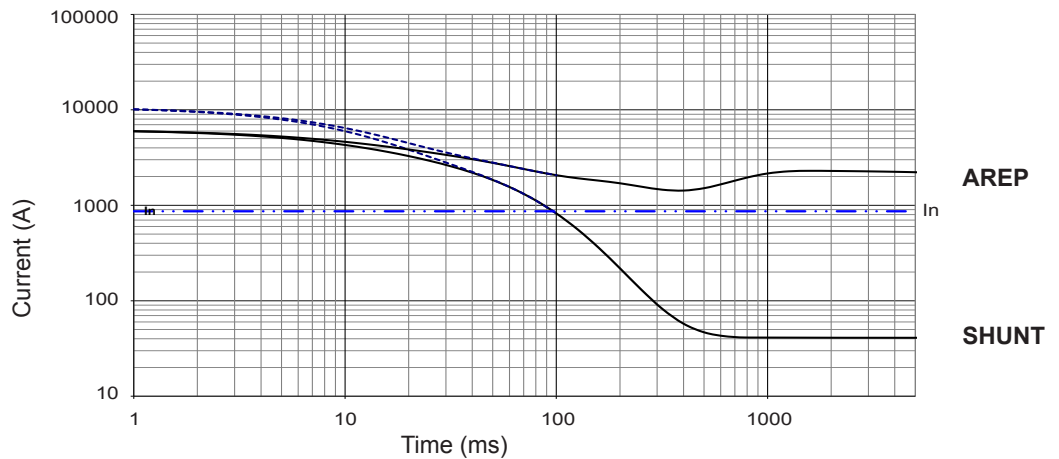
**TAL 047 D**

Symmetrical —  
Asymmetrical - - -



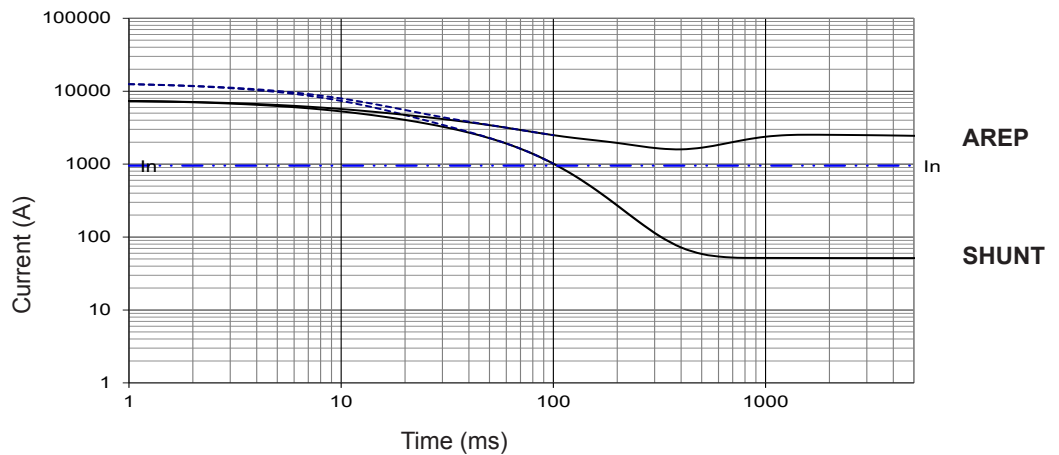
**TAL 047 E**

Symmetrical —  
Asymmetrical - - -



**TAL 047 F**

Symmetrical —  
Asymmetrical - - -

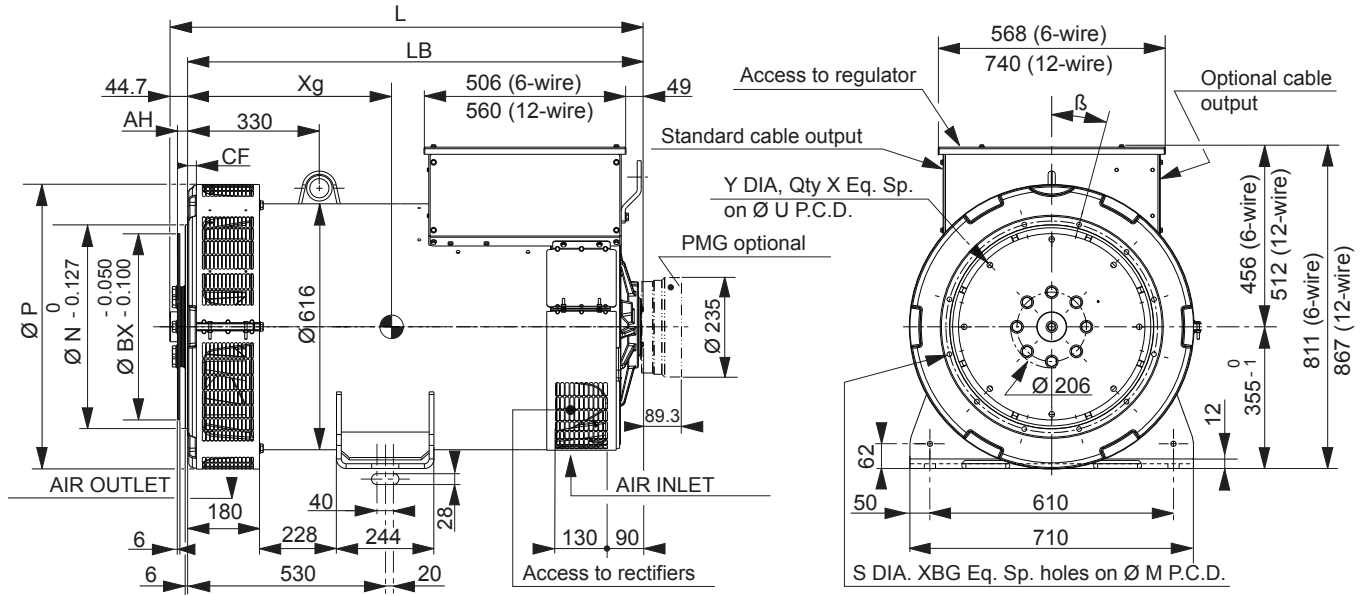


**Influence due to short-circuit**

Curves are based on a three-phase short-circuit. For other types of short-circuit, use the following multiplication factors.

	3 - phase	2 - phase L / L	1 - phase L / N
Instantaneous (max.)	1	0.87	1.3
Continuous	1	1.5	2.2
Maximum duration (AREP/PMG)		1.5	

Single bearing general arrangement

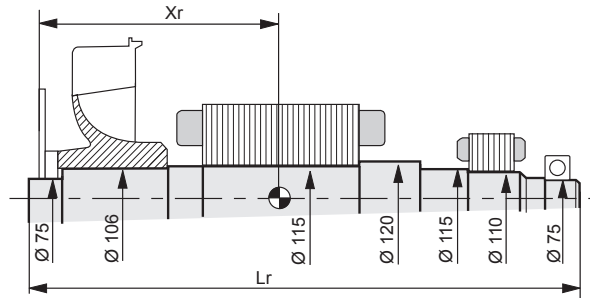


Dimensions (mm) and weight					Coupling		
Type	L without PMG maxi*	LB	Xg	Weight (kg)	Flex plate	14	18
TAL 047 A	1055	996	437	976	Flange S.A.E 1	X	
TAL 047 B	1115	1056	471	1113	Flange S.A.E 1/2	X	
TAL 047 C	1115	1056	471	1113	Flange S.A.E 0	X	X
TAL 047 D	1215	1156	511	1240			
TAL 047 E	1215	1156	520	1289			
TAL 047 F	1235	1176	545	1372			

\* L maxi = LB + AH maxi + 19

Flange (mm)								Flex plate (mm)					
S.A.E.	P	N	M	XBG	S	β°	CF	S.A.E.	BX	U	X	Y	AH
1	713	511.175	530.225	12	12	15°	15	11 1/2	352.42	333.38	8	11	39.6
1/2	713	584.2	619.125	12	14	15°	22	14	466.72	438.15	8	14	25.4
0	713	647.7	679.45	16	14	11° 15'	42	18	571.5	542.92	6	17	15.7

Torsional data



Centre of gravity: Xr (mm), Rotor length: Lr (mm), Weight: M (kg), Moment of inertia: J (kgm²): (4J = MD²)								
Flex plate	S.A.E. 14				S.A.E. 18			
	Xr	Lr	M	J	Xr	Lr	M	J
TAL 047 A	418.3	1020	374.9	5.92	408.5	1020	376	6.18
TAL 047 B	456	1080	426.6	6.77	446	1080	427.7	7.03
TAL 047 C	456	1080	426.6	6.77	446	1080	427.7	7.03
TAL 047 D	496	1180	477	7.5	486	1180	478.1	7.76
TAL 047 E	507	1180	493.8	7.8	497	1180	494.9	8.06
TAL 047 F	528	1200	525.2	8.32	518	1200	526.3	8.58

NOTE : Dimensions are for information only and may be subject to modifications. The torsional analysis of the transmission is imperative. All values are available upon request.



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