Nidec Power



TAL 040

Low Voltage Alternator - 4 poles

10 to 20 kVA - 50 Hz / 11.5 to 25 kVA - 60 Hz

Electrical and mechanical data

LEROY-SOMER™

The best of performance

The Leroy-Somer™ TAL 040 alternator has been designed to offer you the best power generation performances. With its meticulous design and optimized architecture, the TAL 040 strikes the perfect balance between compactness, reliability, performance and longevity.
Whatever your application, the Leroy-Somer™ TAL 040 alternator will meet your needs and will adapt to all situations.







Standards

The Leroy-Somer™ TAL 040 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.
The Leroy-Somer™ TAL 040 alternator can be integrated in EC marked generator set, and bears EC, UKCA and CMIM markings.
It is designed, manufactured and marketed in an ISO 9001 and ISO 14001 quality assurance environment.

Electrical characteristics and performances

- Class H insulation
- Shunt excitation
- Low voltage winding:
  - Three-phase 50 Hz: 220V - 240V and 380V - 415V (440V)
    60 Hz: 208V - 240V and 380V - 480V
  - Single-phase 50 Hz: 115V - 230V
    60 Hz: 120V - 240V
- 4-terminal plates in 6-wire version
- Optimized performance

Excitation and regulation system

	Excitation system			Regulation options	
	AVR	**SHUNT**	**AREP+** (option)	**ULc/us**	**Remote voltage potentiometer**
Three-phase 6-wire	**R120**	Standard			
	R150	Option			√
	R180		Standard		√
	D350	Option	Option	√	√
Three-phase 12-wire	**R120**	Standard			
	R220	Option		√	√
	R180		Standard		√
	D350	Option	Option	√	√
Single-phase	**R121**	Standard			√
	R221	Option		√	√

Protection system and options

- Degree of protection: IP 23
- Complete winding protection for non-harsh environment with relative humidity ≤ 95%
- Options:
  - Three-phase 12-wire with 8-terminal plates
  - AREP+ excitation
  - ULc/us
  - Customized painting (unpainted machine as standard)
  - Space heater
  - Flying leads
  - Dedicated single-phase
  - Winding 8 optimized for three-phase 380V / 416V - 60Hz
  - Reinforced winding protection for harsh environments and relative humidity greater than 95% (system 2 - 4 without derating)

Mechanical construction

- Compact and rugged assembly to withstand engine vibrations
- Steel frame
- Aluminum flanges and shields
- Single-bearing design compatible with most diesel engines
- Greased for life bearings
- Direction of rotation: clockwise and counterclockwise without derating

Terminal box design

- Easy access to AVR and terminals

General characteristics

Insulation class	H
Winding pitch	2/3 (wind.6S - 6-wire / wind.6 - 12-wire)
Number of wires	6 (12 option)
Protection	IP 23
Altitude	≤ 1000 m
Overspeed	2250 R.P.M.
Air flow 50 Hz	0.06 m³/s
Air flow 60 Hz	0.07 m³/s
AREP+ Short-circuit current = 2.7 In: 5 seconds (*)	

Excitation system 6-wire	SHUNT	AREP+
AVR type	R120	R180
Excitation system 12-wire (option)	SHUNT	AREP+
AVR type	R120	R180
Voltage regulation (**)	± 1 %	± 0.5 %
Total Harmonic Distortion THD (***) in no-load	< 3.5 %	
Total Harmonic Distortion THD (***) in linear load	< 5 %	
Waveform: NEMA = TIF (***)	< 50	
Waveform: I.E.C. = FHT (***)	< 2%	

(*) D350: 10 seconds (**) 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.				1 ph.	3 ph.				1 ph.	3 ph.				1 ph.	3 ph.				1 ph.
Y		380V	**400V**	415V	440V		380V	**400V**	415V	440V		380V	**400V**	415V	440V		380V	**400V**	415V	440V	
Δ		220V	**230V**	240V		230V	220V	**230V**	240V		230V	220V	**230V**	240V		230V	220V	**230V**	240V		230V
YY (*)			**200V**		220V			**200V**		220V			**200V**		220V			**200V**		220V	
ΔΔ (*)						230V					230V					230V					230V
TAL 040 B	kVA	10	**10**	10	9	7	9	**9**	9	8	6.5	10.5	**10.5**	10.5	9.5	7.5	11	**11**	11	10	7.5
	kW	*8*	***8***	*8*	*7*	*5.5*	*7*	***7***	*7*	*6.5*	*5*	*8.5*	***8.5***	*8.5*	*7.5*	*6*	*9*	***9***	*9*	*8*	*6*
TAL 040 C	kVA	12.5	**12.5**	12.5	11	9	11.5	**11.5**	11.5	10	8	13.5	**13.5**	13.5	11.5	9.5	14	**14**	14	12	10
	kW	*10*	***10***	*10*	*9*	*7*	*9*	***9***	*9*	*8*	*6.5*	*11*	***11***	*11*	*9*	*7.5*	*11*	***11***	*11*	*9.5*	*8*
TAL 040 D	kVA	15	**15**	15	13	10.5	14	**14**	14	12	9.5	16	**16**	16	14	11	16.5	**16.5**	16.5	14.5	11.5
	kW	*12*	***12***	*12*	*10.5*	*8.5*	*11*	***11***	*11*	*9.5*	*7.5*	*13*	***13***	*13*	*11*	*9*	*13*	***13***	*13*	*11.5*	*9*
TAL 040 E	kVA	17.5	**17.5**	17.5	16	12.5	16	**16**	16	14.5	11.5	18.5	**18.5**	18.5	17	13.5	19.5	**19.5**	19.5	17.5	14
	kW	*14*	***14***	*14*	*13*	*10*	*13*	***13***	*13*	*11.5*	*9*	*15*	***15***	*15*	*13.5*	*11*	*15.5*	***15.5***	*15.5*	*14*	*11*
TAL 040 F	kVA	20	**20**	20	18	14	18	**18**	18	16.5	13	21	**21**	21	19	15	22	**22**	22	20	15.5
	kW	*16*	***16***	*16*	*14.5*	*11*	*14.5*	***14.5***	*14.5*	*13*	*10.5*	*17*	***17***	*17*	*15*	*12*	*17.5*	***17.5***	*17.5*	*16*	*12.5*

(*) 12-wire option

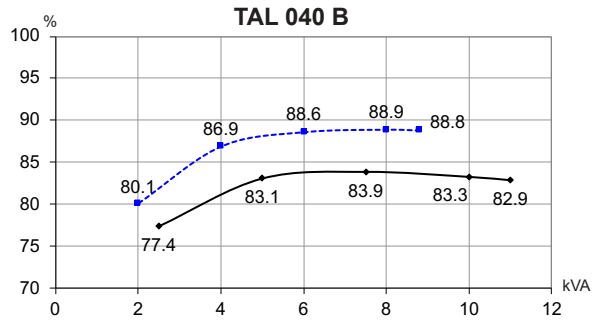
Ratings 60 Hz - 1800 R.P.M.

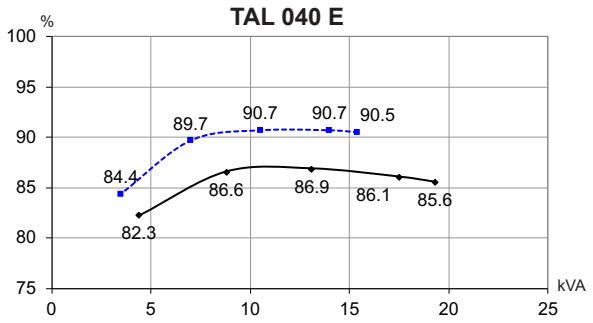
kVA / kW - P.F. = 0.8

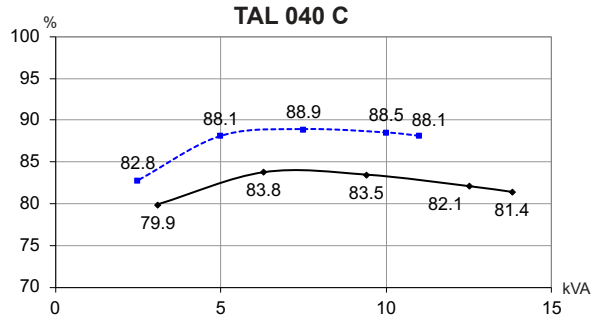
Duty / T° C		Continuous / 40 °C					Continuous / 40 °C					Stand-by / 40 °C					Stand-by / 27 °C				
Class / T° K		H / 125° K					F / 105° K					H / 150° K					H / 163° K				
Phase		3 ph.				1 ph.	3 ph.				1 ph.	3 ph.				1 ph.	3 ph.				1 ph.
Y		380V	416V	440V	**480V**		380V	416V	440V	**480V**		380V	416V	440V	**480V**		380V	416V	440V	**480V**	
Δ		220V	240V			240V	220V	240V			240V	220V	240V			240V	220V	240V			240V
YY (*)			208V	220V	**240V**			208V	220V	**240V**			208V	220V	**240V**			208V	220V	**240V**	
ΔΔ (*)						240V					240V					240V					240V
TAL 040 B	kVA	10	11	11.5	**12.5**	9	9	10	10.5	**11.5**	8	10.5	11.5	12	**13.5**	9.5	11	12	12.5	**14**	10
	kW	*8*	*9*	*9*	***10***	*7*	*7*	*8*	*8.5*	***9***	*6.5*	*8.5*	*9*	*9.5*	***11***	*7.5*	*9*	*9.5*	*10*	***11***	*8*
TAL 040 C	kVA	12.5	13.5	14.5	**15.5**	11.5	11.5	12.5	13	**14**	10.5	13.5	14.5	15.5	**16.5**	12	14	15	16	**17**	12.5
	kW	*10*	*11*	*11.5*	***12.5***	*9*	*9*	*10*	*10.5*	***11***	*8.5*	*11*	*11.5*	*12.5*	***13***	*9.5*	*11*	*12*	*13*	***13.5***	*10*
TAL 040 D	kVA	15	16.5	17.5	**19**	13	13.5	15	16	**17.5**	12	16	17.5	18.5	**20**	14	16.5	18	19.5	**21**	14.5
	kW	*12*	*13*	*14*	***15***	*10.5*	*11*	*12*	*13*	***14***	*9.5*	*13*	*14*	*15*	***16***	*11*	*13*	*14.5*	*15.5*	***17***	*11.5*
TAL 040 E	kVA	17.5	19	20	**22**	14.5	16	17.5	18	**20**	13	18.5	20	21	**23.5**	15.5	19.5	21	22	**24**	16
	kW	*14*	*15*	*16*	***17.5***	*11.5*	*13*	*14*	*14.5*	***16***	*10.5*	*15*	*16*	*17*	***19***	*12.5*	*15.5*	*17*	*17.5*	***19***	*13*
TAL 040 F	kVA	20	22	23	**25**	16	18	20	21	**23**	14.5	21	23.5	24.5	**26.5**	17	22	24	25.5	**27.5**	17.5
	kW	*16*	*17.5*	*18.5*	***20***	*13*	*14.5*	*16*	*17*	***18.5***	*11.5*	*17*	*19*	*19.5*	***21***	*13.5*	*17.5*	*19*	*20.5*	***22***	*14*

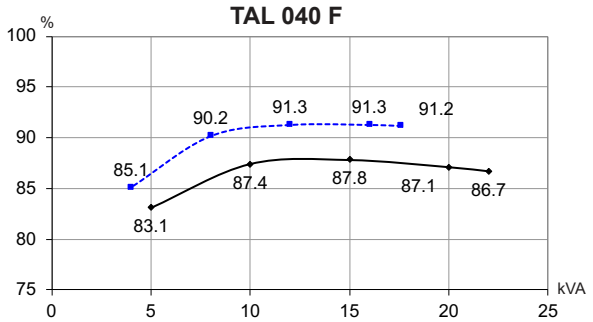
(*) 12-wire option

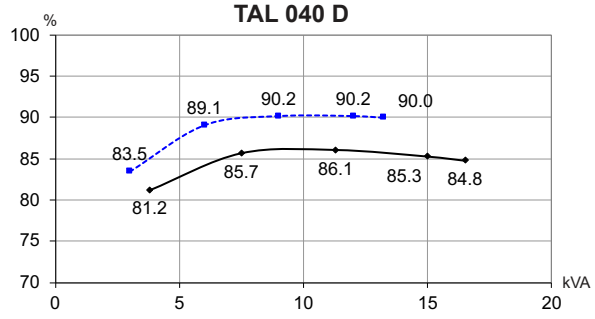
Efficiencies 400 V - 50 Hz (— P.F.: 0.8) (--- P.F.: 1)











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

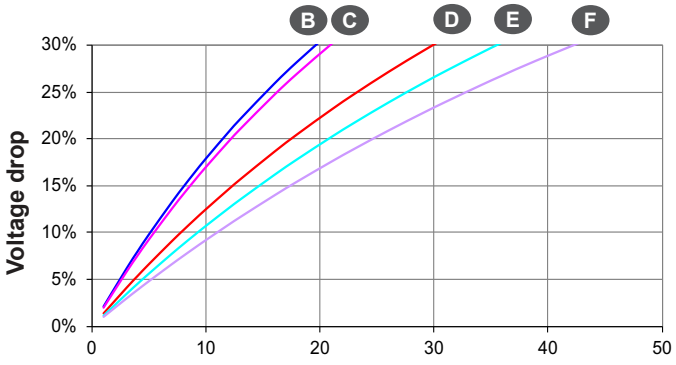
		B	C	D	E	F
Kcc	Short-circuit ratio	0.7	0.56	0.6	0.6	0.61
Xd	Direct-axis synchronous reactance unsaturated	167	209	190	195	193
Xq	Quadrature-axis synchronous reactance unsaturated	85	106	97	99	98
T'do	No-load transient time constant	719	719	837	878	926
X'd	Direct-axis transient reactance saturated	17.2	21.5	16.8	16.4	15.4
T'd	Short-circuit transient time constant	74	74	74	74	74
X"d	Direct-axis subtransient reactance saturated	8.6	10.7	8.4	8.2	7.7
T"d	Subtransient time constant	7	7	7.4	7	7
X"q	Quadrature-axis subtransient reactance saturated	16.1	20.1	16.8	16.8	16.2
Xo	Zero sequence reactance	0.71	0.89	0.7	0.68	0.64
X2	Negative sequence reactance saturated	12.36	15.45	12.66	12.55	12.01
Ta	Armature time constant	11	11	11	11	11

Other class H / 400 V data

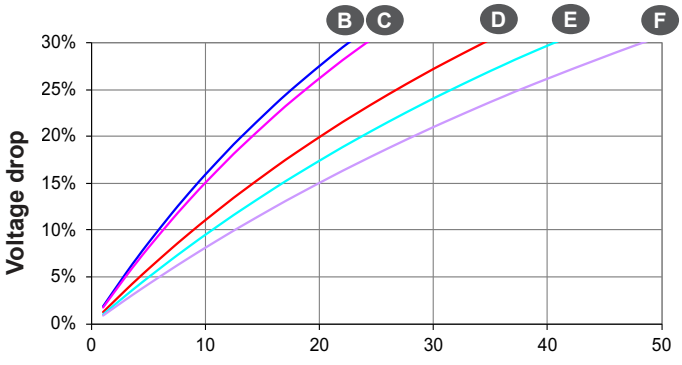
io (A)	No-load excitation current SHUNT/AREP+	0.77 / 1.06	0.77 /1.06	0.76 / 1.03	0.75 / 1.03	0.72 / 0.98
ic (A)	On-load excitation current SHUNT/AREP+	1.94 / 2.65	2.30 / 3.14	2.05 / 2.79	2.06 / 2.80	1.95 / 2.66
uc (V)	On-load excitation voltage SHUNT/AREP+	23.7 / 17.1	28 / 20.2	24.9 / 17.9	24.9 / 18	23.6 / 17
ms	Response time (ΔU = 20% transient)	500	500	500	500	500
kVA	Start (ΔU = 20% cont. or ΔU = 30% trans.) SHUNT*	18.3	18.3	28	33.6	40.8
kVA	Start (ΔU = 20% cont. or ΔU = 30% trans.) AREP+*	22	22	34	41	50
%	Transient ΔU (on-load 4/4) SHUNT - P.F.: 0.8 $_{LAG}$	18	20.5	17.8	17.5	16.9
%	Transient ΔU (on-load 4/4) AREP+ - P.F.: 0.8 $_{LAG}$	16	18.2	15.8	15.6	15.1
W	No-load losses	461	461	540	590	645
W	Heat dissipation	1597	2172	2063	2255	2352

* P.F. = 0.6

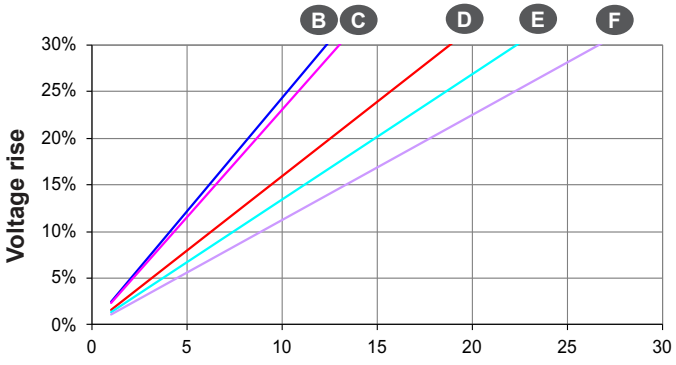
Transient voltage variation 400V - 50 Hz



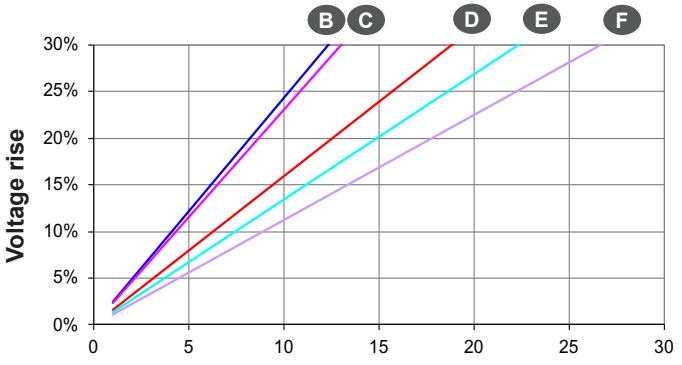
Phase loading (SHUNT) - kVA at P.F. = 0.8



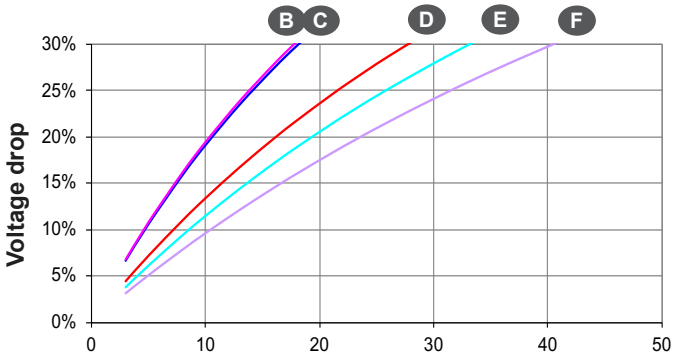
Phase loading (AREP+) - kVA at P.F. = 0.8



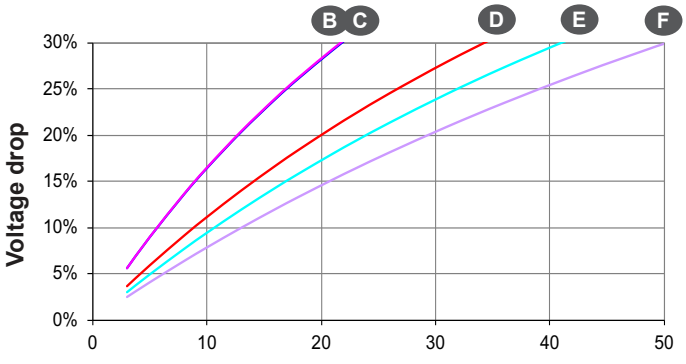
Load shedding (SHUNT) - kVA at P.F. = 0.8



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



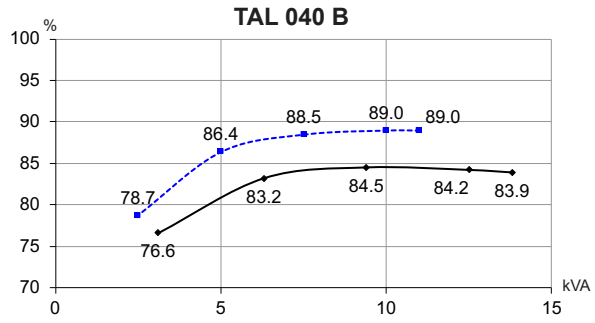
Motor starting (SHUNT)
Locked rotor kVA at P.F. = 0.6

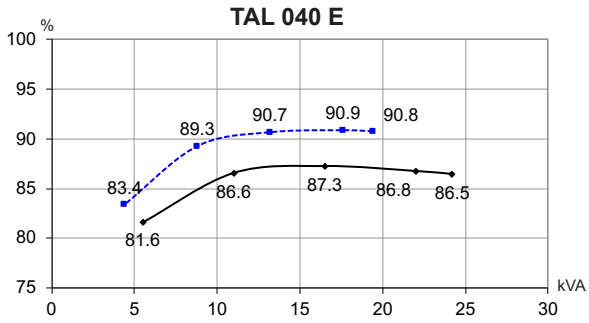


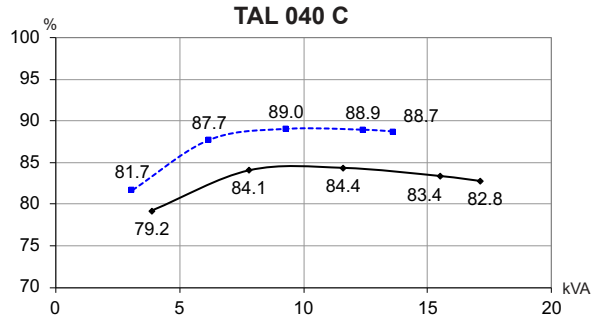
Motor starting (AREP+)
Locked rotor kVA at P.F. = 0.6

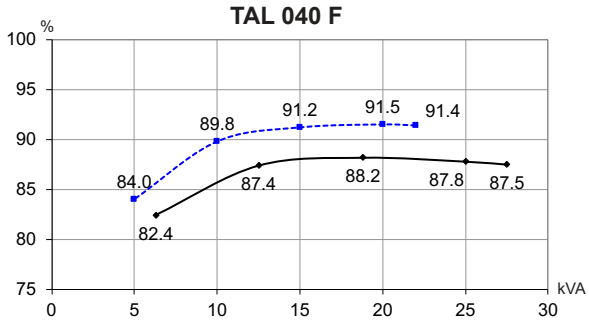
- For a starting P.F. other than 0.6, the starting kVA must be multiplied by K = Sine P.F. / 0.8
- For voltages other than 400V (Y), 230V (Δ) at 50 Hz, then kVA must be multiplied by $(400/U)^2$ or $(230/U)^2$.

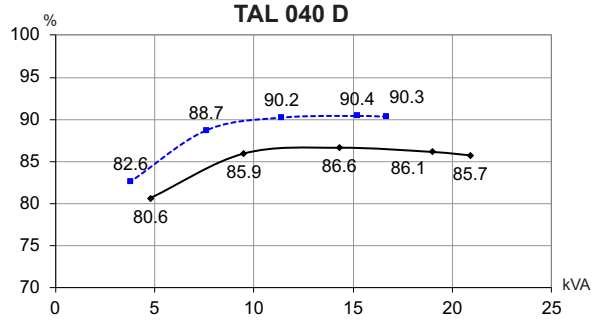
Efficiencies 480 V - 60 Hz (— P.F.: 0.8) (--- P.F.: 1)











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

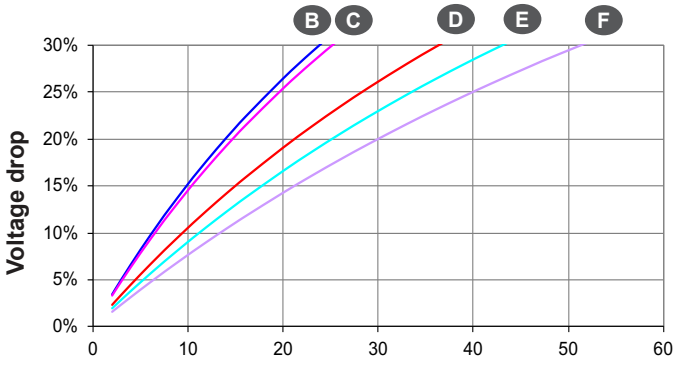
		B	C	D	E	F
Kcc	Short-circuit ratio	0.67	0.54	0.57	0.57	0.58
Xd	Direct-axis synchronous reactance unsaturated	174	216	201	204	201
Xq	Quadrature-axis synchronous reactance unsaturated	88	110	102	104	102
T'do	No-load transient time constant	719	719	837	878	926
X'd	Direct-axis transient reactance saturated	17.9	22.2	17.8	17.2	16.1
T'd	Short-circuit transient time constant	74	74	74	74	74
X"d	Direct-axis subtransient reactance saturated	8.9	11.1	8.9	8.6	8
T"d	Subtransient time constant	7	7	7.4	7	7
X"q	Quadrature-axis subtransient reactance saturated	16.7	20.7	17.8	17.6	16.9
Xo	Zero sequence reactance	0.74	0.92	0.74	0.71	0.67
X2	Negative sequence reactance saturated	12.87	15.96	13.36	13.15	12.51
Ta	Armature time constant	11	11	11	11	11

Other class H / 480 V data

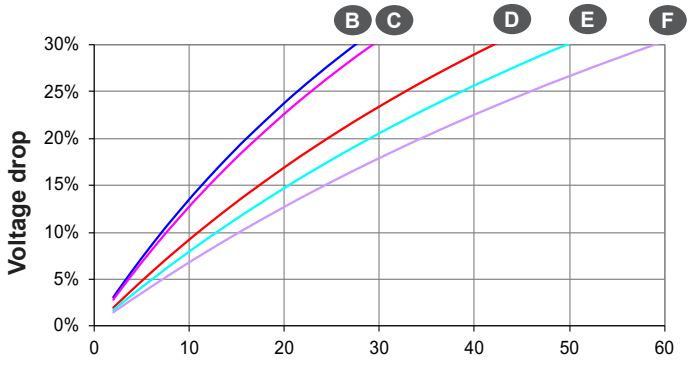
io (A)	No-load excitation current SHUNT/AREP+	0.77 / 1.06	0.77 / 1.06	0.76 / 1.03	0.75 / 1.02	0.72 / 0.98
ic (A)	On-load excitation current SHUNT/AREP+	1.97 / 2.69	2.33 / 3.17	2.10 / 2.86	2.10 / 2.86	1.97 / 2.69
uc (V)	On-load excitation voltage SHUNT/AREP+	24.1 / 17.4	28.4 / 20.5	25.6 / 18.5	25.5 / 18.4	24 / 17.3
ms	Response time (ΔU = 20% transient)	500	500	500	500	500
kVA	Start (ΔU = 20% cont. or ΔU = 30% trans.) SHUNT*	21.9	22	33.6	40.3	48.9
kVA	Start (ΔU = 20% cont. or ΔU = 30% trans.) AREP+*	27	27	41	49	60
%	Transient ΔU (on-load 4/4) SHUNT - P.F.: 0.8 $_{LAG}$	18.4	20.9	18.3	18	17.3
%	Transient ΔU (on-load 4/4) AREP+ - P.F.: 0.8 $_{LAG}$	16.4	18.5	16.3	16	15.4
W	No-load losses	643	643	755	825	904
W	Heat dissipation	1866	2464	2447	2654	2763

* P.F. = 0.6

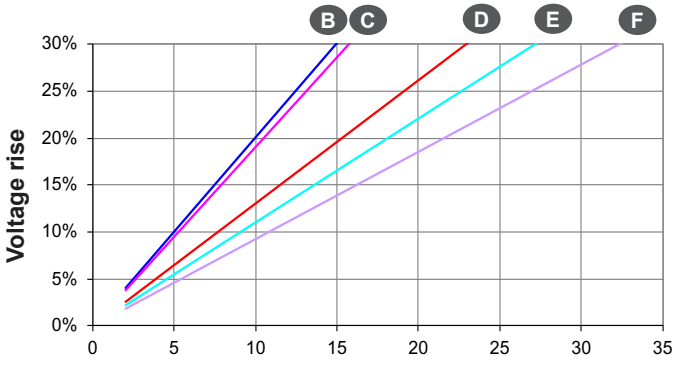
Transient voltage variation 480V - 60 Hz



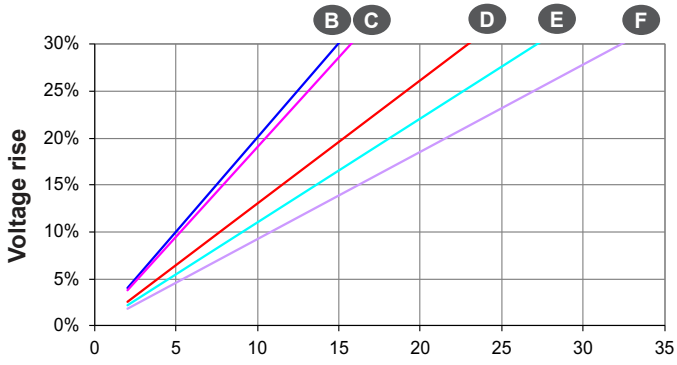
Phase loading (SHUNT) - kVA at P.F. = 0.8



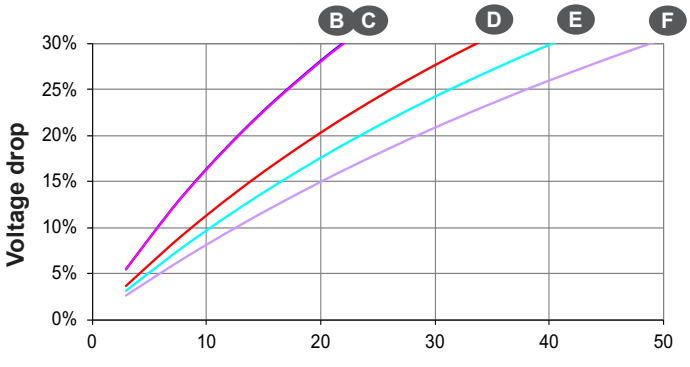
Phase loading (AREP+) - kVA at P.F. = 0.8



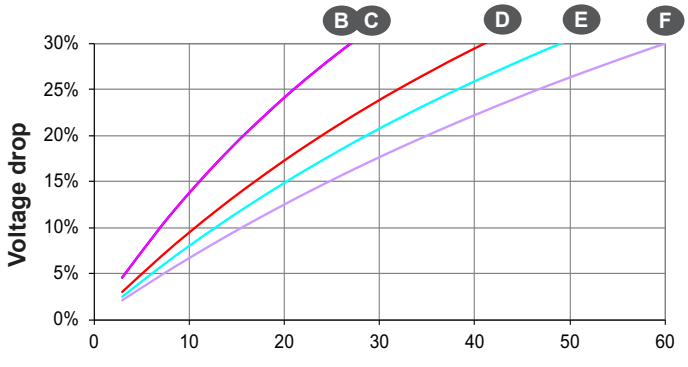
Load shedding (SHUNT) - kVA at P.F. = 0.8



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



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



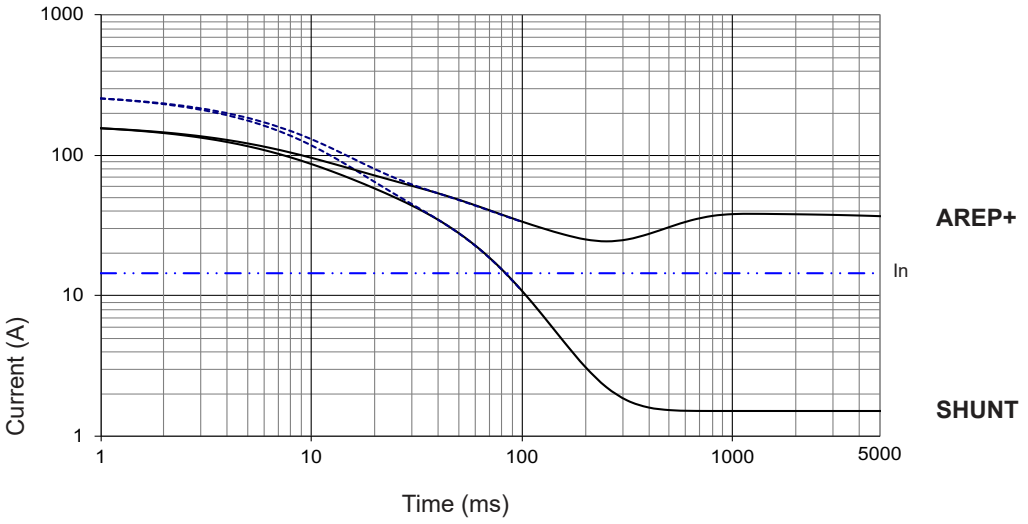
Motor starting (AREP+)
Locked rotor kVA at P.F. = 0.6

- For a starting P.F. other than 0.6, the starting kVA must be multiplied by K = Sine P.F. / 0.8
- For voltages other than 480V (Y), 277V (Δ), 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)

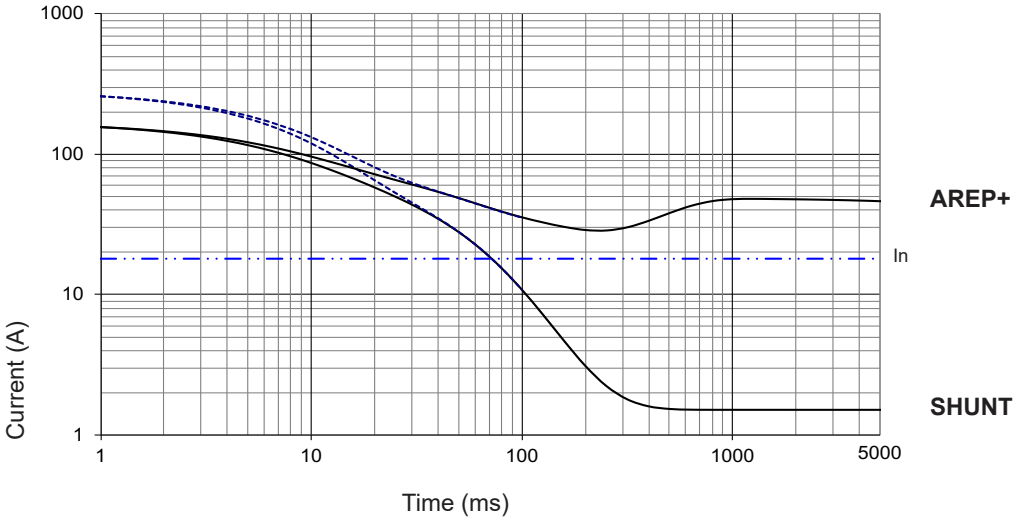
TAL 040 B

Symmetrical ——
Asymmetrical - - -



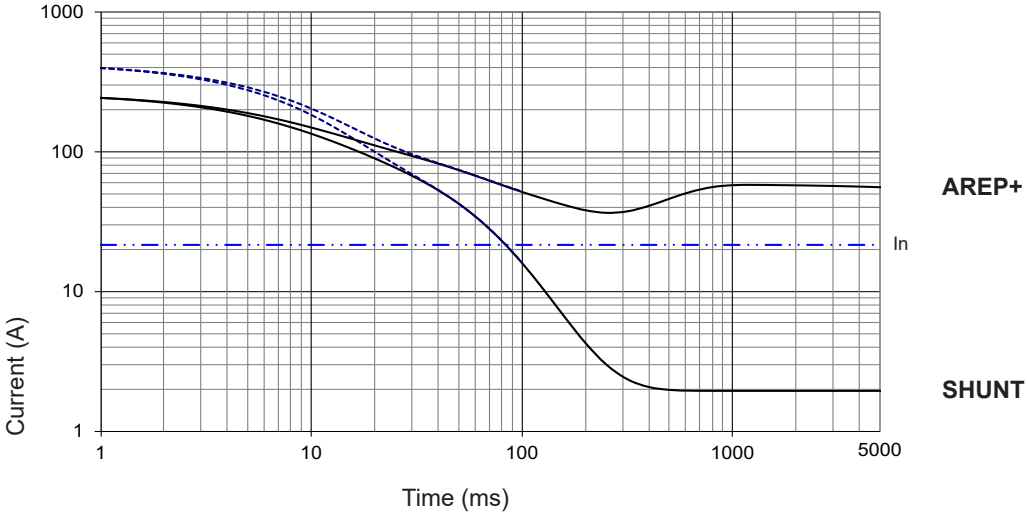
TAL 040 C

Symmetrical ——
Asymmetrical - - -



TAL 040 D

Symmetrical ——
Asymmetrical - - -

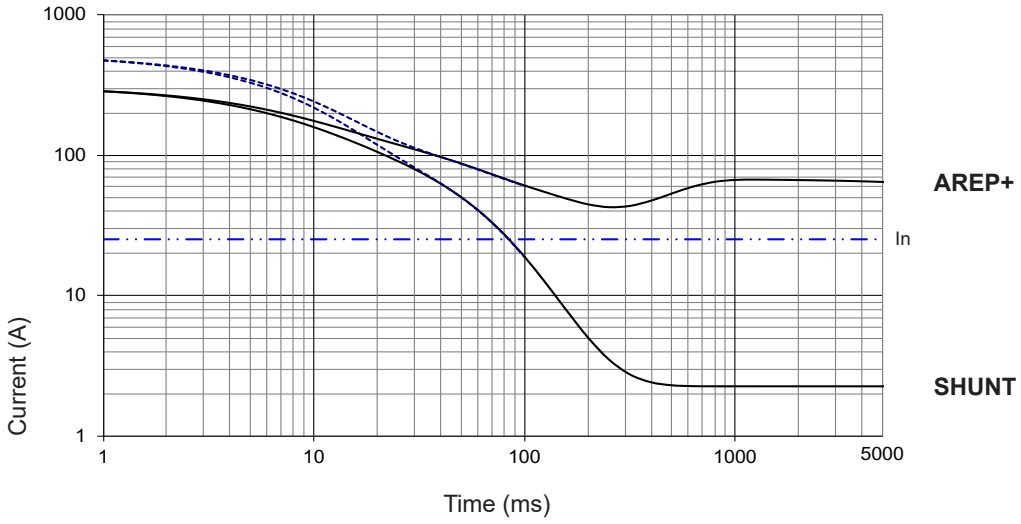


Influence due to connection
For (Δ) connection, use the following multiplication factor:
- Current value x 1.732.

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

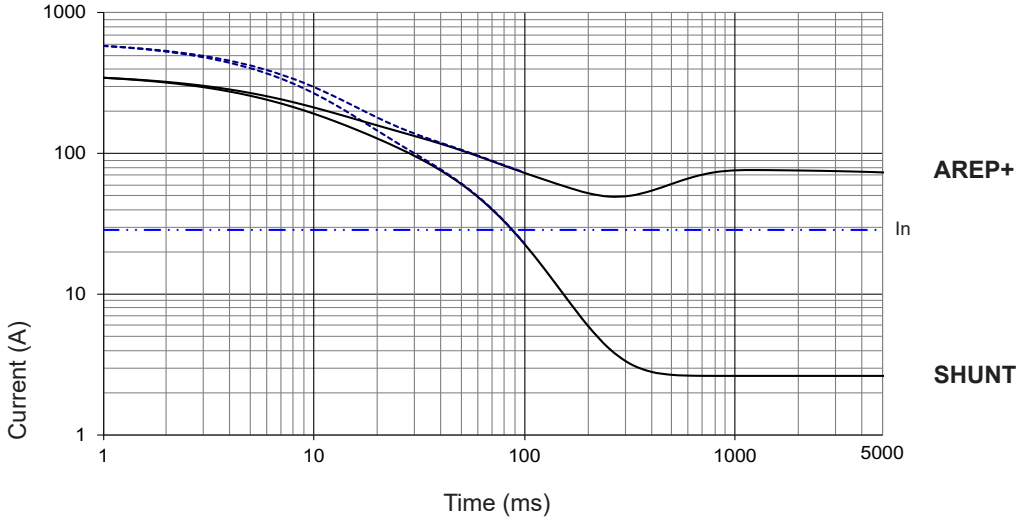
TAL 040 E

Symmetrical ——
Asymmetrical - - -



TAL 040 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+)	1	1.5	

General characteristics

Insulation class	H	Excitation system	SHUNT
Winding pitch	2/3 (wind. M)	AVR type	R121
Number of wires	4	Voltage regulation (*)	± 1 %
Protection	IP 23	Total Harmonic Distortion THD (**) in no-load	< 3.5 %
Altitude	≤ 1000 m	Total Harmonic Distortion THD (**) in linear load	< 5 %
Overspeed	2250 R.P.M.	Waveform: NEMA = TIF (**)	< 100
Air flow	0.06 m³/s (50 Hz) / 0.07 m³/s (60 Hz)	Waveform: I.E.C. = FHT (**)	< 2 %

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

Ratings / Efficiencies 50 Hz - 1500 R.P.M.

kVA / kW - P.F. = 1(*)

Duty / T° 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	
Serie (SE)	**230 V**	**η %**	230 V	230 V	230V	η %
Parallel (PA)	**115 V**	**η %**	115 V	115 V	115 V	η %
TAL 040 C	**10.5**	**82.4**	9.5	11	11.5	81.2
TAL 040 C1	**12**	**84.5**	11	12.5	13	83.7
TAL 040 D	**13**	**85.4**	12	14	14.5	84.7
TAL 040 E	**14.5**	**86.3**	13	15.5	16	85.6
TAL 040 F	**16**	**87.3**	14.5	17	17.5	86.7

(*) For P.F. 0.8: derating 15%

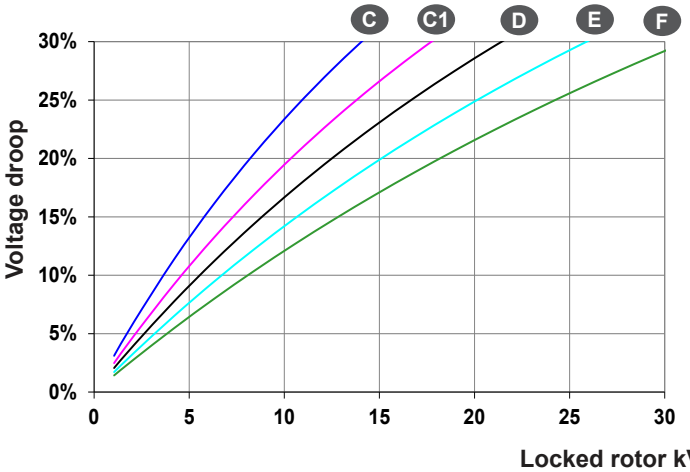
Ratings / Efficiencies 60 Hz - 1800 R.P.M.

kVA / kW - P.F. = 1(*)

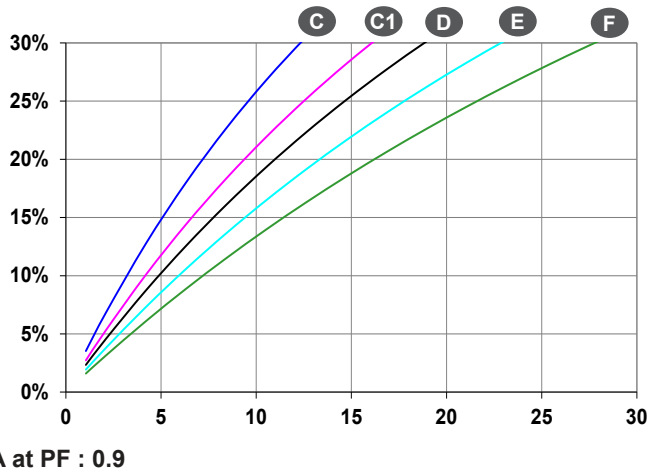
Duty / T° C	Continuous / 40 °C			Stand-by / 40 °C	Stand-by / 27 °C	
Class / T° K	H / 125° K		F / 105° K	H / 150° K	H / 163° K	
Serie (SE)	**240 V**	**η %**	240 V	240 V	240V	η %
Parallel (PA)	**120 V**	**η %**	120 V	120 V	120 V	η %
TAL 040 C	**11.5**	**82.6**	10.5	12	12.5	81.7
TAL 040 C1	**13.5**	**84.2**	12.5	14.5	15	83.4
TAL 040 D	**14.5**	**85**	13	15.5	16	84.3
TAL 040 E	**16**	**85.9**	14.5	17	17.5	85.3
TAL 040 F	**17.5**	**86.9**	16	18.5	19.5	86.3

(*) For P.F. 0.8: derating 15%

Starting motor 230V - 50Hz

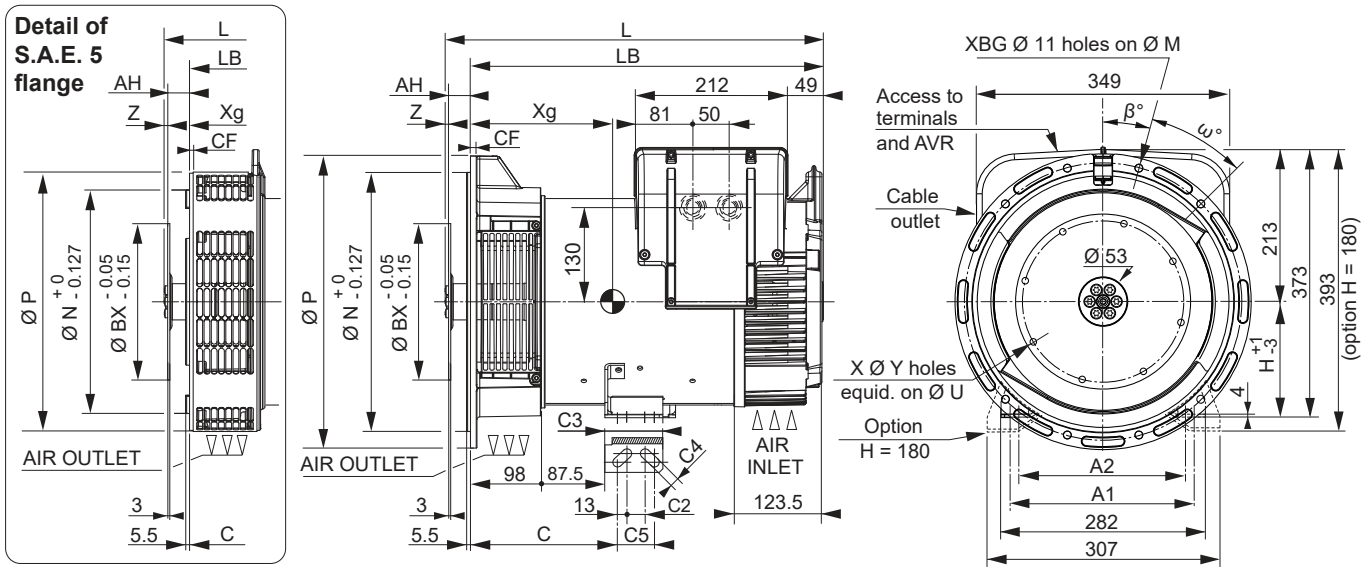


Starting motor 240V - 60Hz



Locked rotor kVA at PF : 0.9

Single-bearing dimensions



Dimensions (mm) and weight				
Type	L maxi*	LB	Xg	Weight (kg)
TAL 040 B/C	469	407	186	73
TAL 040 C1	469	407	196	80
TAL 040 D	499	437	204	87
TAL 040 E	499	437	221	92
TAL 040 F	519	457	221	102

* L maxi = LB + AH maxi + Z

Shaft height (mm)		
	Standard	*Option*
H	**160**	*180*
	Feet length	
C	203	*238*
C2	25	*22*
C3	80	*60*
C4	13	*12*
C5	51	*22*
A1	254	*279*
A2	230	-

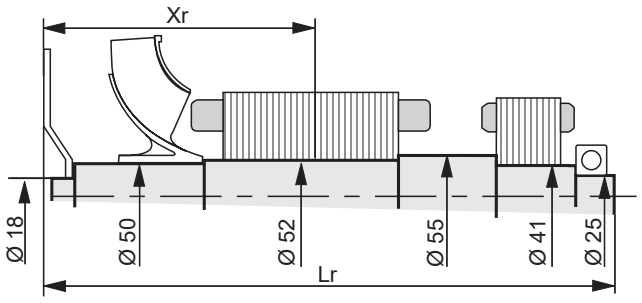
Coupling			
Flange	**3**	**4**	**5**
Flex plate			
11 ½	x	-	-
10	x	x	-
8	x	x	-
7 ½	-	x	x
6 ½	-	x	x

Flange (mm)							
S.A.E.	P	N	M	XBG	β°	ω°	CF
5	358	314.32	333.38	8	22°30	45°	11
4	408	361.95	381	8*	15°	30°	9
3	460	409.58	428.62	8*	15°	30°	12

* Four lateral holes removal on S.A.E. 3 and 4

Flex plate (mm)						
S.A.E.	BX	U	X	Y	AH	Z
11 ½	352.42	333.38	8	11	39.6	0
10	314.32	295.28	8	11	53.8	0
8	263.52	244.48	6	11	62	0
7 ½	241.3	222.25	8	9	30.2	6
6 ½	215.9	200.02	6	9	30.2	6

Torsional analysis 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. 6 ½				S.A.E. 7 ½				S.A.E. 8				S.A.E. 10				S.A.E. 11 ½			
Type	Xr	Lr	M	J	Xr	Lr	M	J	Xr	Lr	M	J	Xr	Lr	M	J	Xr	Lr	M	J
TAL 040 B/C	234.1	425.2	27.53	0.0825	232.76	425.2	27.69	0.0852	260.42	457	28.04	0.0899	251.48	451.8	28.49	0.1003	231.25	434.6	28.99	0.1126
TAL 040 C1	237.87	425.2	29.98	0.0911	236.62	425.2	30.14	0.0938	264.57	457	30.49	0.0985	255.87	451.8	30.94	0.1089	235.8	434.6	31.44	0.1212
TAL 040 D	248.93	455.2	32.36	0.0976	247.71	455.2	32.52	0.1003	275.82	487	32.87	0.105	267.22	481.8	33.32	0.1154	247.19	464.6	33.82	0.1277
TAL 040 E	252.3	455.2	34.3	0.104	251.14	455.2	34.46	0.1067	279.42	487	34.81	0.1114	270.95	481.8	35.26	0.1218	251.03	464.6	35.76	0.1341
TAL 040 F	261.88	475.2	37.47	0.1141	260.77	475.2	37.63	0.1168	289.26	507	37.98	0.1215	280.95	501.8	38.43	0.1319	261.12	484.6	38.93	0.1442

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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