Duty Type of motors

AS 1359.30

S_1 – Continuous Running Duty Type

S_2 – Short Time Duty Type

S_3 – Intermittent Periodic Duty Type

S_4 – Intermittent Periodic Duty Type with Starting

S_5 – Intermittent Periodic Duty Type with Electric Braking

S_6 – Continuous operation Duty Type

S_7 – Continuous operation Duty Type with Electric Braking

S_8 – Continuous operation Duty Type with Load | Speed Change

MCR – MAXIMUM CONTINUOUS RATING

STR – SHORT TIME RATING

IPR – INTERNATIONAL PERIODIC RATING

TORQUE

N – NORMAL TORQUE

NR – NORMAL TORQUE | REDUCED - LOCKED ROTOR CURRENT

NS – NORMAL TORQUE | SPECIALLY LOCKED ROTOR CURRENT

NY – NORMAL TORQUE | ARRANGED FOR λ | Δ CONNECTION

H – HIGH TORQUE

HR – HIGH TORQUE | REDUCED LOCKED ROTOR CURRENT

HS – HIGH TORQUE | SPECIALLY LOCKED ROTOR CURRENT

HY – HIGH TORQUE | ARRANGED FOR λ | Δ CONNECTION

Q1

3φ 15 KW, 415 V, 50 HZ, 1440 RPM SQUIRREL CAGE INDUCTION MOTOR HAS THE DESIGNATION H.S . WHAT DOES THIS DESIGNATION INDICATE?

Q2 DEFINE THE TERM "STARTING TORQUE" AS APPLIED TO AN ELECTRIC MOTOR

Q3 INTERPRET MOTOR CLASSIFICATION S_2 AND S_6

Q1 HIGH TORQUE SPECIALLY LOCKED ROTOR CURRENT

Q2 TORQUE REQUIRED AT STARTING TO OVERCOME MOTOR ROTOR INERTIA

Q3 S_2 – SHORT TIME DUTY TYPE
S_6 – CONTINUOUS OPERATION DUTY TYPE.

CLASSIFICATION AND TYPES OF ENCLOSURE

0 — NON PROTECTED

1 — PROTECTED AGAINST SOLID OBJECTS ≥ 50 mm

2 ——— ≥ 12 mm

3 ——— ≥ 2.5 mm

4 ——— ≥ 1 mm

} AS 1359.20

5 — DUST PROTECTED

6 — DUST TIGHT

WATER PROTECTION

0 — NON PROTECTED

1 — PROTECTED AGAINST DRIPPING WATER

2 — PROTECTED AGAINST DRIPPING WATER WHEN TILED TO 15

3 — ——— SPRAYING WATER

4 ——— SPLASHING WATER

5 ——— WATER JET

IP CLASSIFICATION (FOR ENCLOSURE)

OPEN TYPE	IPX
PROTECTED	IP22
DRIP PROOF	IP11
SPLASH PROOF	IP24
HOSE PROOF	IP35
SEMI / SINGLE PIPE VENTILATED	IP22
PIPE VENTILATED	IP43
TOTALLY ENCLOSED WITH FAN	IP44
TOTALLY ENCLOSED WITH HEAT EXCHANGER	IP44
FLAME PROOF	AS 2480-1986

AS 1359.21 COOLING

GAS

AIR — A
HYDROGEN — H
NITROGEN — N

LIQUID

CARBON DIOXIDE - C
HELIUM - L
WATER - W
OIL - U

AS 1359.21 COOLING

GAS

AIR — A
HYDROGEN — H
NITROGEN — N

LIQUID

CARBON DIOXIDE - C
HELIUM - L
WATER - W
OIL - U

COOLING CHARACTERISTICS

0- FREE CIRCULATION
1- INLET PIPE / DUCT CIRCULATED
2- OUTLET PIPE / DUCT CIRCULATED
3- INLET / OUTLET PIPE + DUCT CIRCULATED
4 - FRAME SURFACE COOLED
6→9 - MACHINES WITH HEAT EXCHANGERS.

CIRCULATION

0 - FREE CONVECTION (NO FAN)
1 — SELF CIRCULATION (FAN ON MOTOR SHAFT)
3 — CIRCULATION BY DEPENDENT COMPONENTS MOUNTED ON SHAFT
7 ——— INDEPENDENT COMPONENTS.

MOUNTING AND BEARING

FOOT MOUNTING

FLANGE MOUNTING

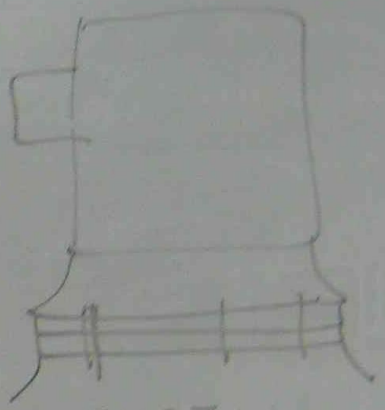
FACE FLANGE MOUNTING

COMBINED FOOT AND FLANGE MOUNTING

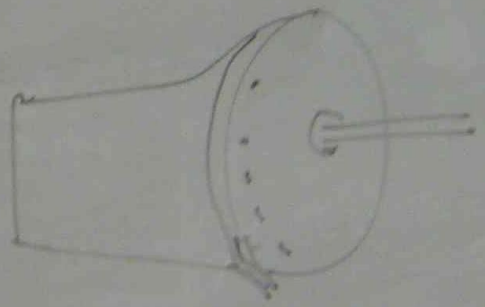
SKIRT MOUNTING

PAD MOUNTING

ROD MOUNTING



SKIRT



FLANGE MOUNTING

BEARING

BALL, ROLLER, SLEEVE, THRUST, COMBINATION THRUST & JOURNAL BEARING

Q. INTERPRET THE FOLLOWING MOTOR CLASSIFICATION SYMBOL.

IP 22, IP 44, IC 01,

IP 22 - PROTECTED | S.EMI - PIPE VENTILATED

IP 44 - TOTALLY ENCLOSED WITH HEAT EXCHANGER

IC01 - IPX, IP22, IP11,

IPX — IC01

IP22 — IC01

IP11 — IC01

IP24 — IC01-41

IP35 — IC01-41

IP22 - IC11

IP43 - IC37

IP44 - IC01-41

CALCULATION OF MOTOR ACCELERATION TIME

$$\Delta t = \frac{J_T}{9.55} \times \frac{\Delta N}{T_{AV}}$$

Δt = ACCELERATION TIME (S)

ΔN = CHANGE IN SHAFT SPEED (RPM)

T_{AV} = MEAN DYNAMIC TORQUE (N-m)

J_T = MOMENT OF INERTIA

$kg-m^2$

(b).

A 15 kW, 4 pole, 50 Hz, SQUIRREL CAGE INDUCTION MOTOR IS USED TO DRIVE A MACHINE HAVING CONSIDERABLE INERTIA.

MOTOR ROTOR HAS MOMENT OF INERTIA 0.15 kg-m^2.

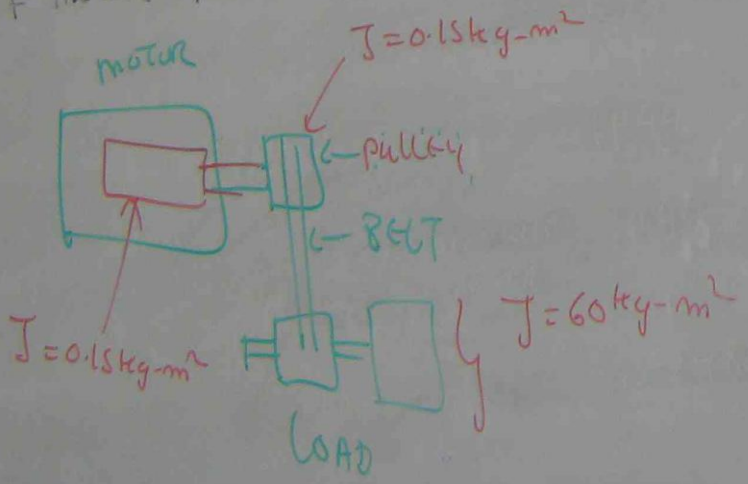
PULLEY HAS MOMENT OF INERTIA 0.15 kg-m^2

LOAD HAS MOMENT OF INERTIA 60 kg-m^2.

LOAD IS DRIVEN BY A BELT DRIVE AT HALF THE SPEED OF MOTOR.

CALCULATE (a) TOTAL MOMENT OF INERTIA

(b) IF MOTOR FULL LOAD SPEED IS 1425 RPM, CALCULATE FULL LOAD TORQUE.



LOAD MOMENT OF INERTIA IMPACT ON MOTOR = LOAD MOMENT OF INERTIA $\times \left(\frac{\text{BELT SPEED}}{\text{MOTOR SPEED}}\right)^2$

$$J_1 = 60 \times \left(\frac{1}{2}\right)^2 = 15 \text{ kg-m}^2$$

J_T = LOAD IMPACT + ROTOR INERTIA + PULLEY INERTIA

$= 15 + 0.15 + 0.15 = 15.3$ kg-m^2

(b)

$$P = \frac{2\pi N T}{60}$$

P = POWER
T = TORQUE
N = SPEED (RPM)

$$15 \times 10^3 = \frac{2 \times 3.1416 \times 1425 \times T}{60}$$

$$T = \frac{15 \times 10^3 \times 60}{2 \times 3.1416 \times 1425}$$

$$= 100.52 \text{ N-m}$$