AMENDMENT NO. 2 MARCH 2023

TO

IS 8034 : 2018 SUBMERSIBLE PUMPSETS — SPECIFICATION

(*Page* 8, *Table* 1, *Notes*, *Sl No*. 6) — Substitute the following *for* existing:

'**6** Motor efficiency factors shall be applied to the pump efficiency calculated as per **11.4.1** (a) to arrive at the minimum-overall efficiency of the pumpset.'

(*Page* 8, *Table* 2, *Notes*, *Sl No*. 6) — Substitute the following *for* existing:

'**6** Motor efficiency factors shall be applied to the pump efficiency calculated as per **11.4.1** (a) to arrive at the minimum-overall efficiency of the pumpset.'

(*Page* 9, *Table* 3, *Notes*, *Sl No*. 6) — Substitute the following *for* existing:

'**6** Motor efficiency factors shall be applied to the pump efficiency calculated as per **11.4.1** (b) to arrive at the minimum-overall efficiency of the pumpset.'

(*Page* 10, *Table* 4, *Notes*, *Sl No*. 4) — Substitute the following *for* existing:

'**4** Motor efficiency factors shall be applied to the pump efficiency calculated as per **11.4.1** (a) to arrive at the minimum-overall efficiency of the pumpset.'

(*Page* 10, *Table* 5, *Notes*, *Sl No*. 4) — Substitute the following *for* existing:

'**4** Motor efficiency factors shall be applied to the pump efficiency calculated as per **11.4.1** (a) to arrive at the minimum-overall efficiency of the pumpset.'

(*Page* 10, *Table* 5) — Add following new Table at the end:

'**Table 6 Values of Performance Characteristics for 2-Pole, 415 Volt, 50 Hz Three Phase, Oil Filled Submersible Motors for Bore Size Nominal 150 mm Shall Have Maximum OD of Motor 146 mm**
(*Clause* 11.3.1 *and* 11.4.3)

Sl No.	**Rated Output** kW	**Minimum Full Load Speed** rpm	**Maximum Full Load Current** A	**Permissible Limit of Maximum Current in the Operating Head Range for Checking the Non-overloading Requirements** A	**Motor Efficiency Factor**
(1)	(2)	(3)	(4)	(5)	(6)
i)	2.2	2 810	5.8	6.21	72
ii)	3.0	2 810	7.8	8.35	73
iii)	3.7	2 830	9.1	9.74	74
iv)	4.5	2 830	11.1	11.88	76
v)	5.5	2 850	13.8	14.77	79
vi)	7.5	2 850	18.0	19.26	81
vii)	9.3	2 870	23.4	25.04	81
viii)	11.0	2 870	27.3	29.21	82
ix)	13.0	2 870	32.0	34.24	83
x)	15.0	2 880	36.7	39.27	84

Price Group 2

NOTES

1 Maximum current limits specified are for 415 V rated voltage. For other voltages, it shall be in inverse proportion to rated voltage.

2 For three phase motors, the value of current shall be taken as average value of the current measured in three phases.

3 Values given in col (5) are 1.07 times of the values given in col (4).

4 Performance values of 4-pole three phase motors and 2-pole three phase motors of less than 1.1 kW and exceeding 15.0 kW rating shall be as declared by the manufacturer.

5 However, for three phase motors above 15.0 kW rating, the declared value of efficiency shall not be lesser than that of 15.0 kW efficiency value.

6 Motor efficiency factors shall be applied to the pump efficiency calculated as per **11.4.1** (a) to arrive at the minimum overall efficiency of the pumpset.'

(*Page* 11, *clause* **11.1.2**, *line* 4) — Delete 'However, after applying the tolerance, overall efficiency value shall not be less than that calculated from Fig. 4 and Fig. 5.' Add 'However, after applying the tolerance, overall efficiency value shall not be less than that derived as per **11.4.1** (a) and **11.4.1** (b).'

(*Page* 13, *Fig.* 4) — Delete.

(*Page* 14, *Fig.* 5) — Delete.

(*Page* 15, *clause* **11.3.1**, *line 2*) — Substitute 'tables 1, 2,3,4,5 and 6' *for* 'tables 1,2,3,4, and 5'

(*Page* 15, *clause* **11.4**) — Substitute the following *for* existing:

'**11.4 Pump Efficiency**

11.4.1

a) Pump efficiency for 100 mm borewell pumps and 150 mm borewell pumps, 2 pole speed:

$$\eta_P = 0.511\,8\,x + 0.841\,y - 0.001\,92\,x^2 + 0.010\,95\,y^2 - 0.018\,41\,xy + \mathrm{C} \quad \ldots\ldots\ldots\ldots(1)$$

where

$x = n_s$;

$y = Q$;

n_s = Specific speed;

Q = Discharge rate in m^3/h at BEP; and

η_P= Minimum pump efficiency.

Minimum Efficiency Level, MEL	0.20	0.30	0.40	0.50	0.60	0.70
C - Values for different pump efficiency levels and 2 pole speed	38	40	42	44.1	46.3	48.6

NOTES

1 Efficiency corresponding to MEL 0.2 is taken as the minimum pump efficiency and other MEL values are for the guidance of the manufacturer and to upgrade to higher values of pump efficiency.

2 An illustrative example for calculating pump efficiency using above equation is given at Annex B.

b) Pump efficiency for 200 mm and above borewell pumps, 2 pole speed:

$$\eta_P = 0.657\,1\,x + 0.085\,1\,y - 0.005\,34\,x^2 - 0.000\,565\,y^2 + 0.001\,06\,xy + \mathrm{C} \quad \ldots\ldots\ldots(2)$$

where

$x = n_s$;

$y = Q$;

n_s = Specific speed;

Q = Discharge rate in m^3/h at BEP; and

η_P= Minimum pump efficiency.

Minimum Efficiency Level, MEL	0.20	0.30	0.40	0.50	0.60	0.70
C - Values for different pump efficiency levels	42.0	44.0	45.9	47.7	49.4	51.0

NOTES

1 Efficiency corresponding to MEL 0.2 is taken as the minimum pump efficiency and other MEL values are for the guidance of the manufacturer and to upgrade to higher values of pump efficiency.

2 An illustrative example for calculating pump efficiency using above equation is given at Annex C.

$$n_s = n \cdot \frac{\sqrt{Q_{BEP}/3\,600}}{(H_{BEP})^{0.75}}$$

where

H_{BEP} = 'Head' per stage in meters (m) at best efficiency point;
Q_{BEP} = 'Discharge rate' at best efficiency point in m^3/h;
n = 'Rotational Speed' in revolutions per minute (rpm); and
BEP = Best efficiency point.

11.4.2 The efficiency calculated as per **11.4.1** (a) and **11.4.1** (b) represents three or more stages.

a) For two stage pump, multiply efficiency calculated by a factor 0.98; and
b) For single stage pump, multiply efficiency calculated by a factor 0.97.

11.4.3 The motor efficiency factor of motor ratings not given in the Table 1, 2, 3, 4, 5 and 6 shall be declared by the manufacturer. The motor efficiency factor of motors used with pumpsets suitable for bore sizes more than 200 mm shall be as declared by the manufacturer, but it shall be not less than the motor efficiency factor of motors of same rating for 200 mm bore size.

11.4.4 For overall efficiency of the pumpset, multiply pump efficiency calculated as per **11.4.1** (a) or **11.4.1** (b) by corresponding motor efficiency factor as given in Table 1, 2, 3, 4, 5 and 6.

11.4.5 The efficiency equations include non-return valve losses.'

(*Page* 15, *clause* **11.5.1**) — Substitute the following *for* existing:

'**11.5.1** For arriving at minimum overall efficiency of the pumpset, multiply minimum pump efficiency calculated as per **11.4.1** (a) or **11.4.1** (b) by corresponding motor efficiency factor as per Table 1 to 6.'

(*Page* 18, Annex A) — Insert the following at the end:

'**ANNEX B**
(*Clause* 11.4.1)

EXAMPLE OF MINIMUM PUMP EFFICIENCY CALCULATION FOR 150 MM BOREWELL PUMPS

B-1 INPUT DATA

Head = 35 m
Discharge = 6.5 lps
Speed = 2 800 rpm
Stages = 05

B-2 CALCULATIONS

Head per stage = 35/5 = 7 m

B-2.1 To Find out Discharge Rate, Q_{BEP} in m^3/h

Discharge = 6.5 lps × 3.6 = 23.4 m^3/h

$$n_s = n \cdot \frac{\sqrt{Q_{BEP}/3\,600}}{(H_{BEP})^{0.75}}$$

$$n_s = 2\,800 \times \frac{\sqrt{23.4/3\,600}}{(7)^{0.75}} = 52.45$$

NOTE — For specific speed calculation we have to use discharge (Q) in m^3/h and head per stage (H) in m.

$$\eta_P = 0.511\,8\,x + 0.841\,y - 0.001\,92\,x^2 + 0.010\,95\,y^2 - 0.018\,41\,xy + \mathrm{C} \quad \ldots\ldots\ldots\ldots\ldots\ldots(1)$$

$x = n_s = 52.45$

$y = Q = 23.40$

NOTE — For minimum pump efficiency calculation we have to use discharge (Q) in m^3/h.

C = 38 (C - value for BIS-MEL 0.2 to be taken from the table for minimum pump efficiency calculation)

$$\eta_P = 0.511\,8 \times 52.45 + 0.841 \times 23.4 - 0.001\,92 \times 52.45^2 + 0.010\,95 \times 23.4^2 - 0.018\,41 \times 52.45 \times 23.4 + 38$$

η_P= 62.60 % (minimum pump efficiency)

ANNEX C

(*Clause* 11.4.1)

EXAMPLE OF MINIMUM PUMP EFFICIENCY CALCULATION FOR 200 MM AND ABOVE BOREWELL PUMPS, IS 8034

C-1 INPUT DATA

Head = 32 m
Discharge = 6.5 lps
Speed = 2 900 rpm
Stages = 02

C-2 CALCULATIONS

Head per Stage = 32/2 = 16 m

C-2.1 To Find out Discharge Rate, Q in m^3/h

Discharge = 6.5 lps × 3.6 = 23.4 m^3/h

$$n_s = n\,.\frac{\sqrt{Q_{BEP}/3\,600}}{(H_{BEP})^{0.75}}$$

$n_s = 2\,900 \times \frac{\sqrt{23.4/3\,600}}{(16)^{0.75}} = 29.22$

NOTE — For specific speed calculation we have to use discharge (Q) in m^3/h and head per stage (H) in m.

$$\eta_P = 0.657\,1\,x + 0.085\,1\,y - 0.005\,34\,x^2 - 0.000\,565\,y^2 + 0.001\,06\,xy + \mathrm{C} \quad \ldots\ldots\ldots(2)$$

$x = n_s = 29.22$

$y = Q = 23.40$

NOTE — For minimum pump efficiency calculation we have to use discharge (Q) in m^3/h.

C = 42 (C - value for BIS-MEL 0.2 to be taken from the table for minimum pump efficiency calculation)

$$\eta_P = 0.657\,1 \times 29.22 + 0.085\,1 \times 23.4 - 0.005\,34 \times 29.22^2 - 0.000\,565 \times 23.4^2 + 0.001\,06 \times 29.22 \times 23.4 + 42$$

η_P= 59.05 % × 0.98 (factor for 2 stage)

η_P= 57.86 % (minimum pump efficiency)'.

(MED 20)

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