CONTRACTOR:	300 KT POLYETHYLENE PLANT ARYA SASOL POLYMER COMPANY (ASPC)	OWNER:
VENDOR LOGO:	BALANCE TEST PROCEDURE FOR COMPRESSOR & FAN	MC:

Owner Document Number :	OWNER Project No.	Vendor DOC.	MR No.	Vendor Code	Discipline	Unit	Type	Seq. No	Rev.:	Page
	3944	VD	0171	DYP	RE	400	PRC	0124	00	1 of 4

RED Comment:
1- Submitted document is not the procedure to carry out the balance test. Only preliminary data have been mention as one page which could not be nominated the procedure of test. Please submit the complete procedure of sub vendors to check and review.
2- Dynamic, static balancing and residual unbalance check to be considered and description to be added.
3- The manner of removing detected unbalance (weight increase, weight increase etc) to be specified.
4- Balance grade shall be clarified considering project requirement (For both Compressor/ Blower & Fan.
5- Acceptance criteria of tests to be mentioned as a topic.
6- log sheet shall be added.

BALANCE TEST PROCEDURE FOR COMPRESSOR & FAN

RED:
- API 673 requirements in procedure for fan to be implemented.
- ISO 21940 requirements for rotating machine balancing to be followed.

P.O. No.:	SHAU23-006-DYPNF-ASS
MR. No.:	3944-SZP-RE-400-MRQ-0171
Item No. (Equipment No.):	Common
Vendor Job No.:	PC2312

RESULT CODE : ☐AP ☐AN ☒CO ☐RE
NEXT STATUS : ☐ IFI ☑ IFA ☐ AFC ☐ ASB or FIN
RESUBMISSION DATE :
Approval or review hereunder shall not be considered to relieve Vendor/ Subcontractor of his responsibilities and liability under the Contract.

M.Shakiba 03-Sep-2025

Rev.	Date	Purpose of Issue	Prepared	Checked	Approved	AC Code
00	22.Aug,2025	Issue for Approval	H.J Kim	S.M Han	C.K Choi	

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Balance Test Procedure for Fan & compressor / Blowers to be separate.

Project definitions

Project name : 300 KT POLYETHYLENE PLANT

Owner : Arya Sasol Polymer Company (ASPC)

MC : ISEDCO

Purchaser : SAZEH

Vendor : DYPNF

RED: fan and compressor/ blower

1. Scope

1.1 This standard will be applied to test method of the fan at shop and standard for judgment

RED: Please clarify this part is applicable for both fan & Compressor/Blower?

2. Balancing Procedure

2.1 Applicable code and balancing grade

This inspection shall be done according to ISO 21940-11(G2.5)

2.1.1 Balancing test

This inspection shall be done dynamically according to the followings.

(1) To meet permissible remain-unbalance of impeller, add a balancing weight by welding and reduce the weight by grinding.

2.1.2 Permissible remain-unbalance amount & Balancing grade

(1) Balancing grade is G2.5 ~~and constant.~~

(2) Permissible remain-unbalance amount of single side impeller shall be calculated by using equation ①

(3) Rotor radius “r” is radius of adjustment of rotor.

$2.5(\text{balancing grade}) = \varepsilon\times\omega=\varepsilon\times 2\pi N/60$

$= \varepsilon\times N/9.55$

$\therefore\ \varepsilon = 2.5\times 9.55/N$

$m=\varepsilon\times W/r$ …… ①

m : permissible remain-unbalance amount (g)

W : rotor weight (Kg)

N : revolution of rotor (rpm),

r : rotor radius (mm)

ω : angular velocity (rad/s),

ε: tolerance of moving distance of center gravity (mm)

Sazeh RED:
Part B: Balance Test Procedure for FAN

Sazeh RED: This standard format to be added as attach 1 which used during Fan Balancing Test:

Attachment 1: Residual Unbalance Worksheet for FAN

Customer: _____
Job / Project Number: _____
OEM Equipment S / N: _____
Rotor Identification Number: _____
Repair Purchase Order Number: _____
Vendor Job Number: _____
Correction Plane (Left or Right) - use sketch _____ (plane)

Balancing Speed _____ (rpm)
Maximum Rotor Operating Speed (N) _____ (rpm)
Static Journal Weight Closest to This Correction Plane (W) _____ (kg) _____ (lbs)
Trial Weight Radius (R) - the radius at which the trial weight will be placed _____ (mm) _____ (in)

Calculate Maximum Allowable Residual Unbalance (Umax):
Si Units:
Umax = (6350) X (W) / (N) = (6350) X _____ / _____ = _____ (g-mm)
Customary Units:
Umax = (113.4) X (W) / (N) = (113.4) X _____ / _____ = _____ (g-in)
Calculate the trial unbalance (TU):
Trial Unbalance (TU) is between (1 X Umax) and (2 X Umax) (1 X) to (2 X) (Selected Multiplier is) _____
SI Units: _____ to _____ = _____ (g-mm)
Customary units: _____ to _____ = _____ (g-in)
Calculate the trial weight (TW):
Trial Weight (TW) = Umax / R = _____ g-mm / _____ mm or _____ g-in / _____ in = _____ (g)

Conversion Information:
1kg = 2.2046 lbs 1 ounce = 28.345 grams
1 lb = 453.6 grams
Obtain the test data and complete the table:

Sketch the rotor configuration:

Rotor Sketch

Test Data

Position	Trial Weight Angular Location on Rotor (degrees)	Balancing Mach Readout Amplitude (grams)	Balancing Mach Readout Phase Angle (degrees)
1	0		
2	60		
3	120		
4	180		
5	240		
6	300		
Repeat 1	0		

PROCEDURE:

Step 1: Plot the balancing machine amplitude versus trial weight angular location on the polar chart (Figure E.2) such that the largest and smallest values will fit.

Step 2: The points located on the Polar Chart should closely approximate a circle. If it does not, then it is probabloy that the recorded data it is in error and the test should be repeated.

Step 3: Determine the maximum and minimum balancing machine amplitude readings .

Step 4: Using the worksheet (Figure E.2), determine the Y and Z values required for the residual unbalance calculation.

Step 5: Using the worksheet (Figure E.2), calculate the residual unbalance remaining in the rotor.

Step 6: Verify that the determined residual unbalance is equal to or less than the maximum allowable residual unbalance (Umax).

HALF KEYS USED FOR ROTOR BALANCING
(add sketch for clarification if necessary)

Location		Weight	

NOTES:

1) The trial weight angular location should be referenced to a keyway or some other permanent marking on the rotor. The preferred location is the location of the once-per-revolution mark (for the phase reference transducer).
2) The balancing machine amplitude readout for the Repeat of 1 should be the same as Position 1, indicating repeatability.
3) A primary source for error is not maintaining the same radius for each trial weight location.

Balanced By: _____ Date: _____
Approved By: _____ Date: _____

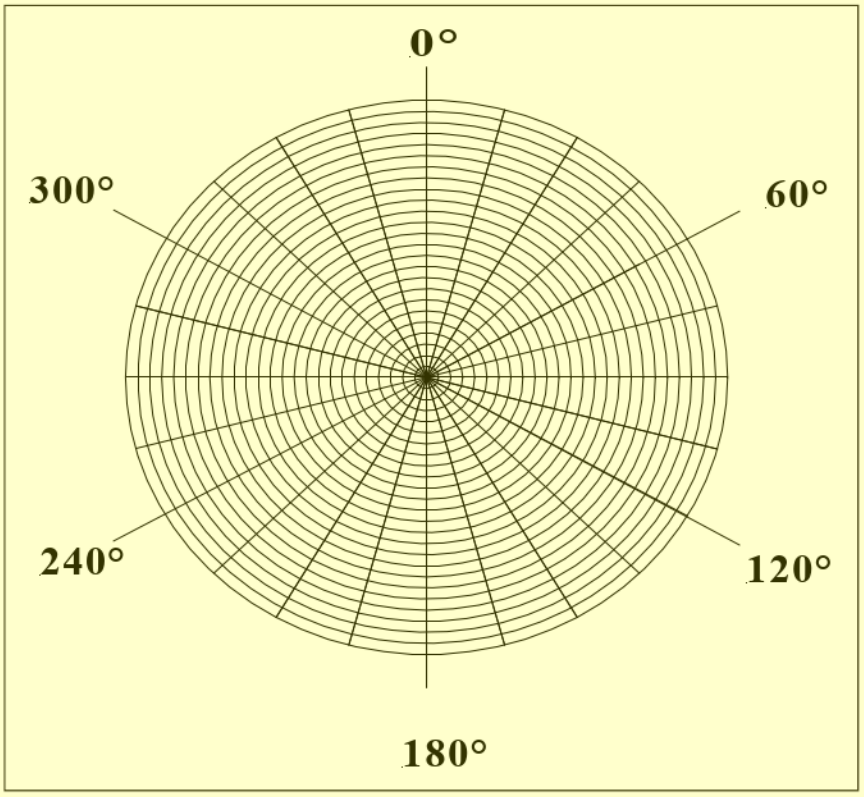
Figure E.1—(Blank) Residual Unbalance Worksheet

RED: Sazeh RED: This standard format to be added as attach 2 which used during Fan Balancing Test:

Attach-2: Residual Unbalance Polar Plot Worksheet for Fan

Customer: _____
Job / Project Number: _____
OEM Equipment S / N: _____
Rotor Identification Number: _____
Repair Purchase Order Number: _____
Vendor Job Number: _____
Correction Plane (Left or Right) - use sketch _____

RESIDUAL UNBALANCE POLAR PLOT



Rotor Rotation: ☐ CCW ☐ CW **Phase is layed out:** ☐ CCW ☐ CW

Calculate Y and Z values:

Maximum amplitude value is:		**grams**		**Minimum amplitude value is:**				
Y = (Maximum - Minimum) / 2 (		-			)	/ 2	=	
Z = (Maximum + Minimum) / 2 (		+			)	/ 2	=	

Residual Unbalance

Left in Rotor =	**(TU)**	**X**	**(Y)**	**/**	**(Z)**		
SI Units:		**X**		**/**		**=**	
Customary Units:		**X**	**S**	**/**		**=**	

Allowable Unbalance Tolerance = Umax = _____ **gm-mm** _____ **gm-in**

RESULT: Residual unbalance left in the rotor is equal to or less than the allowable unbalance tolerance?

☐ **PASS** ☐ **FAIL**

☐ **As Received** ☐ **Final** ☐ **Other:** _____

Balanced By: _____ **Date:** _____
Approved By: _____ **Date:** _____

Figure E.2—(Blank) Residual Unbalance Polar Plot Worksheet

Sazeh RED:
Part B: Balance Test Procedure for compressor & Blowers

Sazeh RED:

AREZEN manufacture Standard for balancing shall be added to this part.
As a sample please see bellow file:

AERZEN

Reherweg 28
31855 Aerzen
Telefon: +495154/8190

Testprozedur
Test Procedure

Short description

Balancing is a procedure during which the mass distribution of a rotor is checked and, if necessary corrected to ensure that the residual imbalance or the vibrations of the bearing journals caused by the rotational frequency and/or the bearing forces are within the limit at operating speed. The balancing quality is set according to DIN ISO 21940

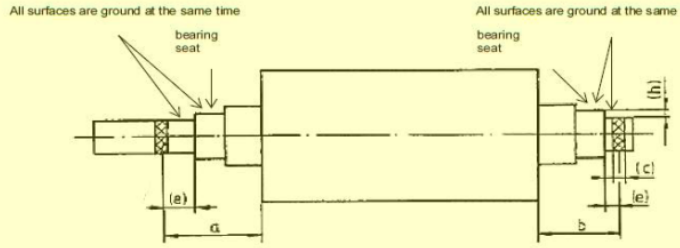
Preparation

Balancing causes wear marks at the shaft seats in the running surfaces of the support rollers due to the smoothing process of the surface. Although this smoothing is minimal, seats important for the functionality (anti-friction bearing seats, seal seats) can be affected in their functional safety. Therefore, the running surfaces of the support rollers are specified and dimensioned at suitable positions in the drawing (see example).

The determination of the running surfaces considers the following:

- the minimum distance annex of the rotor drawings.
- the ideal case where the running surfaces are placed into the seats of the radial bearings. The bearing seats shall be designed somewhat longer, if possible, so that the support rollers can be installed outside of the bearing range. If this cannot be realised for design reasons, the seats for the support rollers will be provided in close proximity to the seats of the radial bearings.

Example: (compressor rotor) characterisation of the running surfaces for the support rollers.

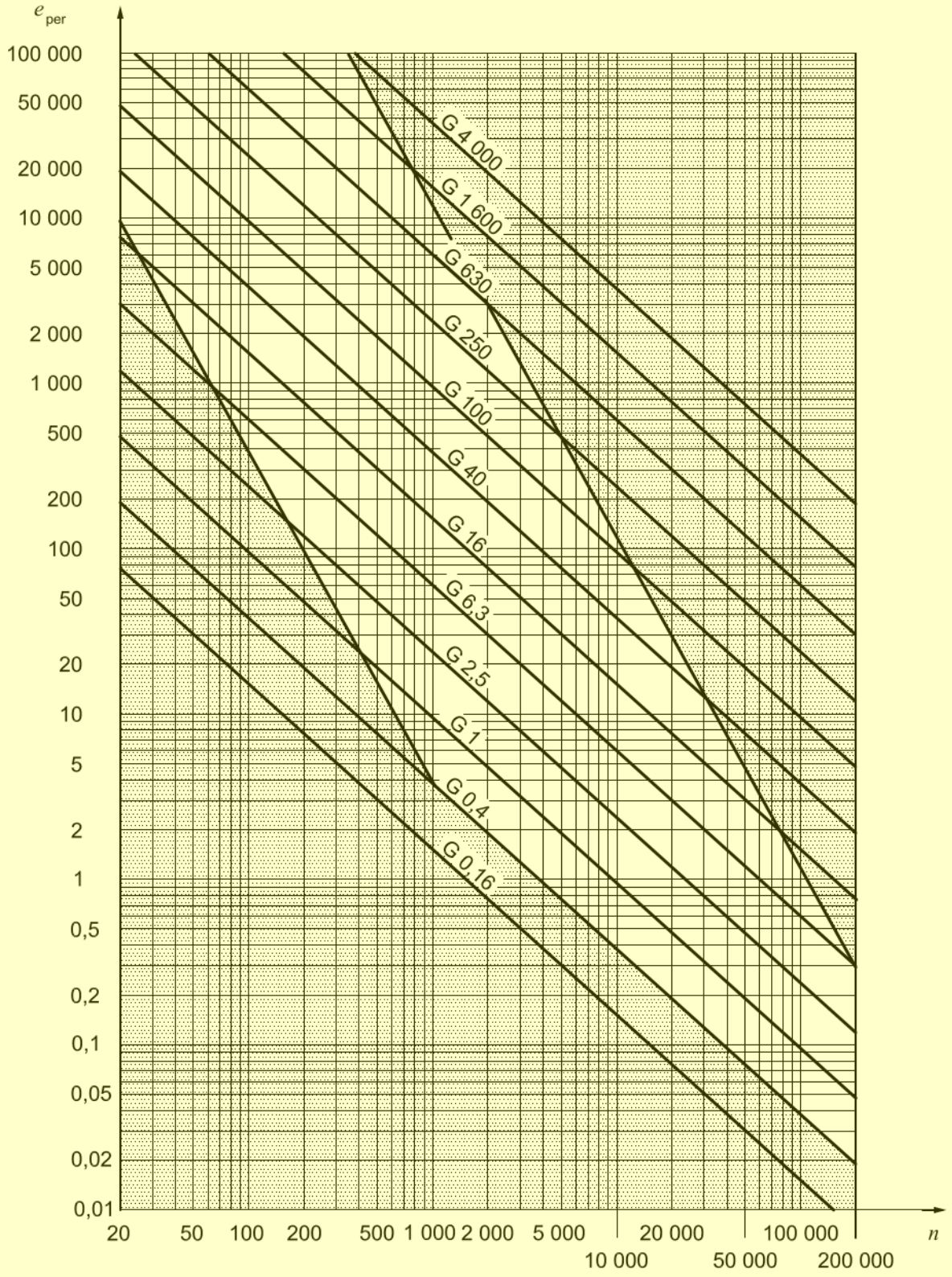


Performance

The measuring run can be executed when the rotor has been installed and the required parameters for the measuring run are set. The required parameters for the measuring run are taken from the balancing instruction of the individual rotor.

Measuring results

Based on the measured imbalance, the measuring results will be compared with the specified tolerances. If the rotors are not within the specified tolerances after the measuring run, the required weight will be taken off by bores at the end faces. The measuring run will be repeated after material has been removed. This procedure will be repeated so often until the item to be tested reaches the required tolerance.



Key

e_{per} permissible residual specific unbalance, in g·mm/kg

n service speed, in r/min

NOTE The white area marks the field of common experience.

Figure 2 — Permissible residual specific unbalance based on balance quality grade G and service speed, n, (see 6.3)