Screw Compressor Standard Inspection Procedures
Document No. SCSD-010-13
Performance Test, Mechanical Running Test, Noise and Vibration Test

13	2023/01/17	Sakaguchi	Iisaka	Muta	Review and revised
12	2022/08/01	Sakaguchi	Iisaka	Muta	Review and revised
11	2022/05/23	Sakaguchi	Iisaka	Muta	Review and revised i series add
10	2020/06/16	Sakaguchi	Kato	Koizumi	400XXL added
09	2020/04/28	Saka Sakaguchi	Koizumi	Kato	Review and revised [6.2.3 Noise item]
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03	2014/03/01	Suzukawa	Sasaki	Sakaguchi	Review and revised
02	2012/05/01	Suzukawa	Sasaki	Shozu	J series added
01	2011/07/01	Sasaki	Ikehara	Shozu	Review and revised
00	06/06/09	Ikehara	Amada	Koizumi	Newly created
Revision	Date	Created by	confirmed by	Approved by	Description

1.Scope

These procedures apply to the performance test, mechanical running test, vibration and noise tests of MYCOM screw compressors at the compressor manufacturing division of Mayekawa's Moriya plant, using air test equipment. The test fluid should be air. For equipment required for these tests such as couplings, motors, oil separators, cooler and measurement equipment, the test benches at the plant are used.

2.Applicable Models

	Model	Type	Manufactured from	Remarks
1	UD/G series	125*UD/*G~320*UD/*U	1970	Single stage compressor (side discharge, downward discharge)
2	SCV series	160V** ~ 250V**	1991	Single stage compressor (side discharge, downward discharge)
3	SCV series	320V**	1998	Single stage compressor (side discharge, downward discharge)
4	VR series	160V*R	1996	Single stage compressor (with gear box)
5	Compound type two-stage compressor series	1610**C ~ 3225**C	1975	
6	Compound type two-stage compressor series	4032**C	2001	
7	UD series	400*UD	2002	Single stage compressor (side discharge)
8	J series	170J*,220J*280J*	2011	Single stage compressor
9	i series	i125*,i160*	2002	Single stage compressor

3.Tests

1) Performance test
   - capcacity
   - brake horse power
2) Mechanical running test
3) Vibration and noise tests

4.Performance Test

[Capacity]

4.1 Purpose

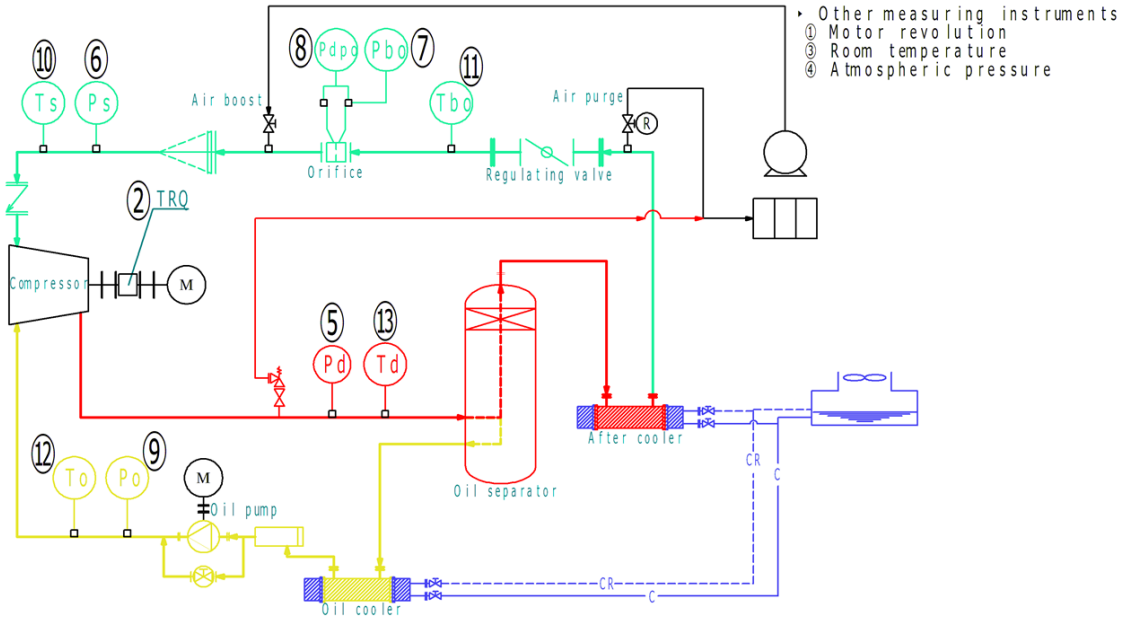
This test is carried out to determine that the volume flow rate of suction gas at the inlet of the compressor and the brake horse power meet the criteria.

4.2 Measuring Method/Equipment and Test Conditions

In accordance with the JIS standard Measurement of Fluid Flow by Means of Orifice Plates, Nozzles And Venturi Tubes(JIS Z 8762:2007), we measure pressures and temperatures required for calculating the volume rate of flows from ① to ⑬ or ①to ⑮ shown in the Figure-1 or 2:Test Equipment and Measurement Points using pressure gauge, manometer and thermometers. Performance measurement will be done during the mechanical running test.

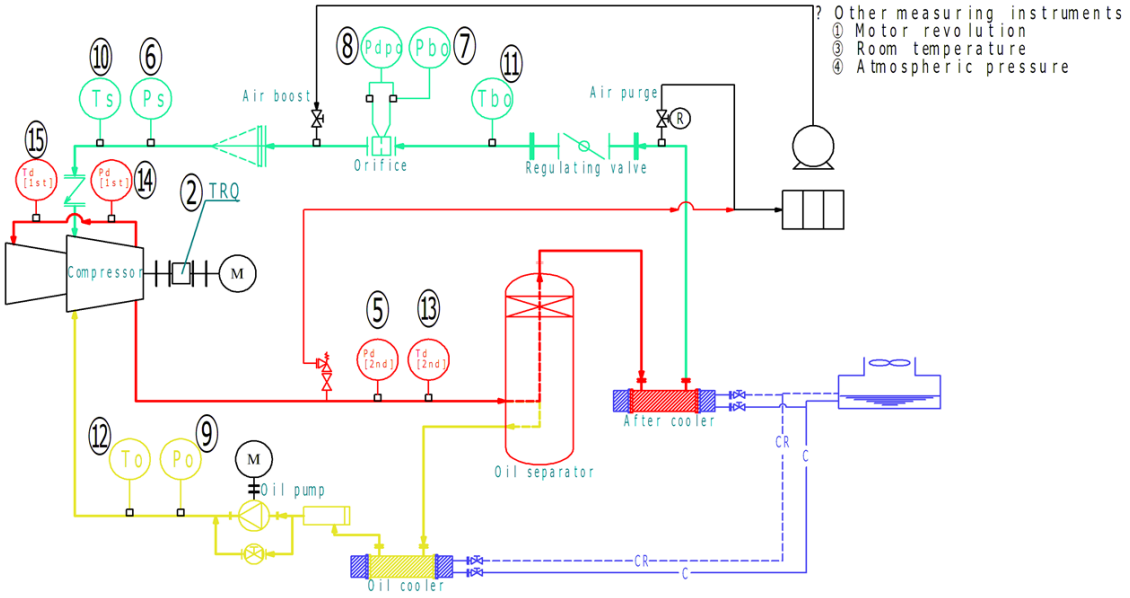
The test fluid used for performance test and mechanical running test should be air.
Testing is conducted under standard testing conditions (refer to Table-1).
Motor revolution is controlled by 2950-3000 rpm (2P) or 1450-1500rpm (4P). Gears and the like are not used to increase the speed of the compressor.
The load operating conditions should be 100%, that is, the slide valve opening should be 100%.
The standard temperature of compressor lubrication oil should be 30°C to 50°C.
The standard pressure of compressor lubrication oil on the discharge side is 0.2 to 0.3MPaG higher than the discharge pressure. When discharge pressure is 0.7 MPaG, then (with a tolerance of between 0.2 to 0.3) the standard pressure should be 0.9 to 1.0 MPaG.
Measurement equipment differs according to the test bench required for each compressor type. Refer to Appendix Table-2: Measurement Equipment List for details as reference.

Figure-1 : Test Equipment and Measurement Points [Single stage compressor]



① Motor revolution	(min-1)	⑧ Pressure differential at orifice	(kPa.G)
② Torque	(Nm)	⑨ Oil pressure	(MPa.G)
③ Room temperature	(℃)	⑩ Suction temperature	(℃)
④ Atmospheric pressure	(hPa)	⑪ Temperature before orifice	(℃)
⑤ Discharge pressure	(MPa.G)	⑫ Oil temperature	(℃)
⑥ Suction pressure	(MPa.G)	⑬ Discharge temperature	(℃)
⑦ Pressure before orifice	(kPa.G)		

Figure-2 : Test Equipment and Measurement Points [Compound type compressor]



① Motor revolution	(min-1)	⑨ Oil pressure	(MPa.G)
② Torque	(Nm)	⑩ Suction temperature	(℃)
③ Room temperature	(℃)	⑪ Temperature before orifice	(℃)
④ Atmospheric pressure	(hPa)	⑫ Oil temperature	(℃)
⑤ Discharge pressure[2nd]	(MPa.G)	⑬ Discharge temperature[2nd]	(℃)
⑥ Suction pressure	(MPa.G)	⑭ Discharge pressure[1st]	(MPa.G)
⑦ Pressure before orifice	(kPa.G)	⑮ Discharge temperature[1st]	(℃)
⑧ Pressure differential at orifice	(kPa.G)		

Unit : MPaG

Code	Classification		Suction pressure	Discharge pressure
F	Single stage type	Vi:1.8	0.00	0.30
J		Vi:2.0	0.00	0.30
K		Vi:2.2	0.00	0.30
L		Vi:2.6 [2.5]*	0.00	0.30
M		Vi:3.6 [3.5]*	0.00	0.50
H		Vi:5.8 [5.0]*	0.00	0.70
C	Compound type		0.00	0.70
B	Booster type		0.00	0.30
DD	Slide Valve with groove		0.00	0.30

Note) Vi : design volume ratio,* J series

[Table-1:Standard pressure conditions]

4.3. Calculation of the Volume Flow Rate of Suction Gas

Calculate the volume ratio of suction gas flow before orifice (Qa) from formula (1) below using orifice differential pressure, pressure before orifice and temperature.

$$Qa = \varepsilon \cdot \alpha \cdot \pi / 4 \, (dt \times 10^{-3})^2 \sqrt{2 \cdot \triangle H \times 10^6 \times VO} \times 3600 \cdots (1)$$

Qa	the volume flow rate of suction gas before orifice	(m^3/h)
ε	expansibility factor	(-)
α	flow coefficient	(-)
dt	Diameter of orifice	(mm)
ΔH	Differential pressure around orifice plate	(MPa)
VO	Gas specific volume before orifice	(m^3/kg)

Calculate the volume ratio of flow of suction gas at compressor inlet (Qs) from formula (2) using gas volume ratio before the orifice and at the suction inlet.

$$Qs = Qa \times \frac{VS}{VO} \quad \cdots\cdots (2)$$

Qs	the volume flow rate of suction gas at the compressor inlet	(m^3/h)
Qa	the volume flow rate of suction gas before orifice	(m^3/h)
VS	Gas specific volume at compressor inlet	(m^3/kg)
VO	Gas specific volume before orifice	(m^3/kg)

4.3.1 Acceptance Criteria

As mentioned above, the measured value of the suction gas volume flow rate obtained from the preceding 4.3 shall be acceptable at least 95% of the standard suction gas volume flow rate. The suction gas standard volume flow rate is calculated by an approximate formula based on the past experiences and measured values. The suction gas standard volume flow rate shall be corrected by the measured value (rotational speed, atmospheric pressure, etc.) on the day of the test.

4.3.2 Records

The test results are recorded in Appendix-1: Screw Compressor Test Records.

[Break Horse Power]

4.4 Measuring Break Horse Power

4.4.1 Purpose

Torque and motor revolutions are measured to calculate the break horse power.

4.4.2. Measurement Method/Equipment and Conditions

Measurement conditions are the same as for the capacity test.
Torque is measured using the torque meter mounted on the rotational axis.
Motor revolutions are measured using a tachometer.

4.4.3. Break horse power is calculated from the formula (3) below using the reading value of the torque meter.

$$kW = \frac{1}{1000} \times \frac{2\pi}{60} \times RPM \times TRQ \quad \cdots\cdots (3)$$

kW	break horse power	(kW)
RPM	motor revolution	(min^{-1})
TRQ	torque	(Nm)

4.4.4. Acceptance Criteria

The actual values of brake horse power obtained from the above clause 4.4.3 shall be acceptable if they are 105% or less of the power standard value. The power standard value is calculated by an approximate formula based on the past experienced and measured values. The power standard value shall be corrected by the measured value (rotational speed, atmospheric pressure, etc.) on the day of the test.

4.4.5. Records

The test results are recorded in Appendix-1: Screw Compressor Test Records.

5. Mechanical Running Test

5.1 Purpose

After compressor operation stabilizes*, perform a two hour/four hour running test to check for faults by measuring the surface temperature of the compressor.

*Stable operation state means the change of lubrication oil temperature is within 3 degrees in 30minutes while meeting the test conditions stipulated in paragraph 4.2 and Table-1, 30minutes after start-up.

5.2 Measurement Method/Equipment and Conditions

In 30minutes after start-up when the compressor operation reaches stable state while maintaining the test conditions stipulated in paragraph 4.2 and Table-1, measure the surface temperature at each point shown in Figure-3 and Figure-4 and check the lubrication, vibration, noise and for other abnormalities.

The surface temperature measurement locations are shown in Figures-3 and 4. Refer to the Annex 1 for API 682 compliant mechanical seals.

Figure-3: Single Stage Compressor

P1. Rotor casing
P2. Bearing head
P3. Shaft seal
P4. Oil header (lubrication oil supply temperature)

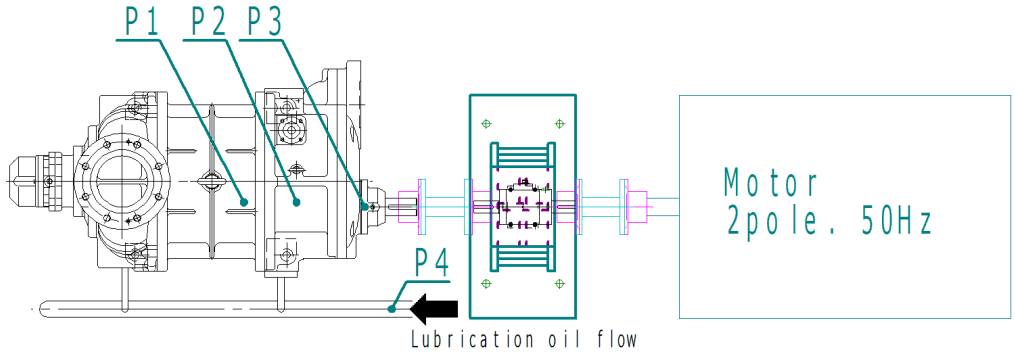
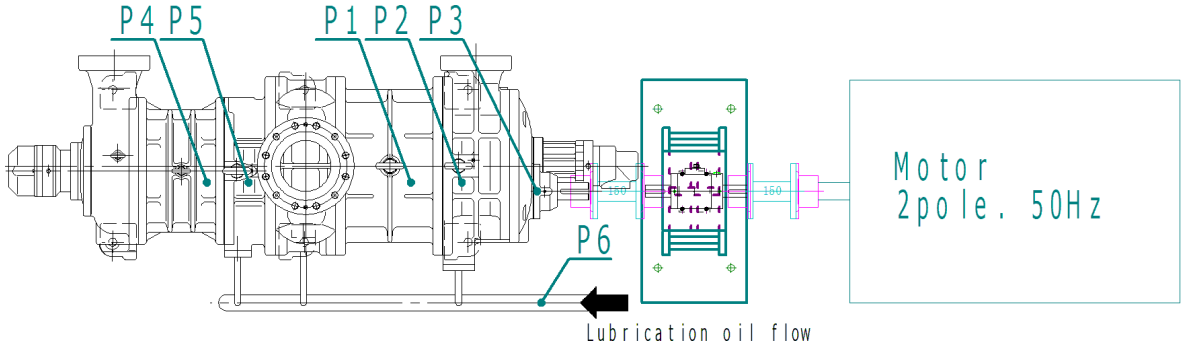


Figure-4: Compound Type Compressor

P1. Low side rotor casing
P2. Low side bearing head
P3. Shaft seal
P4. High side rotor casing
P5. High side bearing head
P6. Oil header (lubrication oil supply temperature)



5.3 Acceptance Criteria

Measurement values that do not exceed the values indicated in Table-2 are accepted.

Single stage compressor		Compound type two stage compressor		Allowable value
P1	Rotor casing	P1	Low side rotor casing	Lubrication oil temperature +35℃
P2	Bearing head	P2	Low side bearing head	Lubrication oil temperature +35℃
P3	Shaft seal	P3	Shaft seal	Lubrication oil temperature +20℃
		P4	High side rotor casing	Lubrication oil temperature +35℃
		P5	High side bearing head	Lubrication oil temperature +35℃

Table-2 Surface Temperature Criteria

5.4 Records

The test results are recorded in Appendix 1: Screw Compressor Test Records.

6. Vibration and Noise Tests

6.1 Purpose

Noise and vibration tests are carried out during mechanical running test to check whether the compressor’s noise and vibration are within the standard shipping values or not.

6.2 Measurement Method

6.2.1 Vibration

The amplitude of vibration is measured with a general purpose vibrometer (frequency analysis of the vibration is not performed.)

6.2.2 Measurement Method

Measurement points are shown in Figures-5 and Figure-6. Using a magnetic pickup, amplitudes are measured at each point (V, H, A for single stage compressors and VL, HL, AL, VH, HH, AH for compound type compressors).

6.2.3 Noise

Noise is measured using a sound level meter as specified in the standard JIS C 1509(2017) Electroacoustics-Sound level meters- in accordance with JIS B 8346 (1991) Fans, blowers and compressors - Determination of A-weighted sound pressure level.

When the difference between the actual measurement and the background noise value is less than 10 dB, the actual measurement value should be corrected according to JIS Z 8731 (2019) Acoustics -- Description and measurement of environmental noise.

6.2.4 Measurement Method

Noise measurement points are shown as P-point in Figures-5 and 6.

Figure-5 : Single Stage Compressor

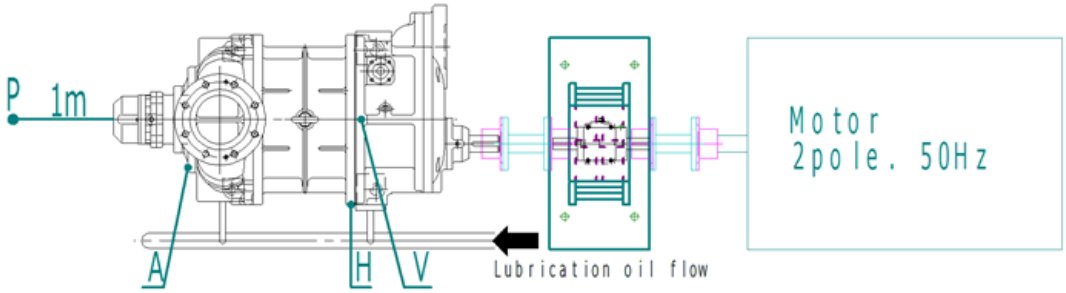
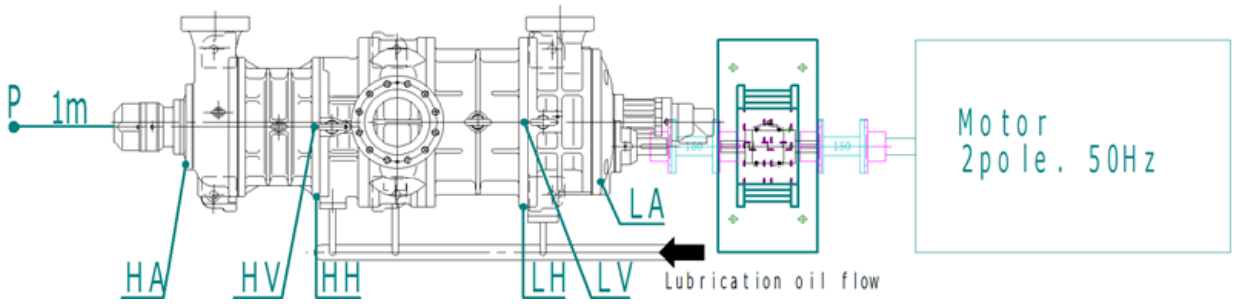


Figure-6 : Compound Type Compressor



6.3 Acceptance Criteria

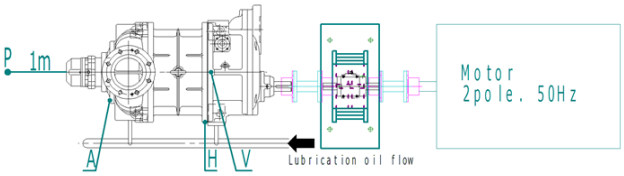
Compressors with results not exceeding the values shown in Table 1 *Noise and Vibration Shipment Standards for Screw Compressors* are accepted.

6.4 Records

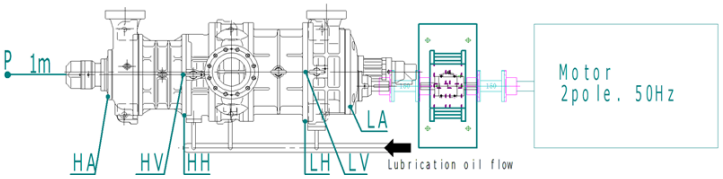
The test results are recorded in Appendix-1: Screw Compressor Test Records.

Appendix Table 1

Noise and Vibration Shipment Standards for Screw Compressors



Single stage compressor



Compound type compressor

〔Noise〕

Compressor type	Acceptance value dB(A)
125SUD, i125S	84
125LUD, i125L	84
160SUD, 160VSD, i160S	84
160MUD, 160VMD, i160M	84
160LUD, 160VLD, i160L	85
200SUD, 200VSD	86
200MUD, 200VMD	87
200LUD, 200VLD	88
250SUD, 250VSD	88
250MUD, 250VMD	90
250LUD, 250VLD	90
250VLLD	92
320SUD, 320VSD	95
320MUD, 320VMD	97
320LUD, 320VLD	98
320LLUD	103
400SUD	103
400MUD	104
400LUD	105
400LLUD	106
400XLUD	107
400XXLUD	108
170JS	81
170JM	84
170JL	86
220JS	86
220JM	86
220JL	89
280JS	88
280JM	90
280JL	92

Compressor type	Acceptance value dB(A)
1610C	84
1612C	86
1612C 2P増速	90
1612C 4P増速	88
2016C	87
2520C	92
3225C	98
4025C	105
4032C	108
160VSR	87
160VLR	88
200VSR	89
200VLR	91
250VSR	91
250VLR	93

Vibration(Frequency range:10-1000 Hz)

Values in gray column are applicable only when API619 is compliant

Type	Measurement points	Allowance value for amplitude μm (harf amplitude peak value)	Allowance value for velocity mm/s (RMS)
Single stage Compressors	V	20	8
	H	20	8
	A	20	8
Compound type two stage compressors	VH	20	8
	HH	20	8
	AH	20	8
	VL	20	8
	HL	20	8
	AL	20	8
	V	20	8
	H	20	8

* This criteria is acceptable for the downward discharge type compressors

Appendix Table 2

MYCOM

Measuring instrument list

* General information ;

Item No.	:	-
Report No.	:	
Type of compressor	:	
Date of test	:	
Model	:	
Serial No.	:	
Inspection items	:	Internal test
Tested at	:	MAYEKAWA MFG. CO.,LTD. MORIYA PLANT 2000, Tatsuzawa Moriya-city, Ibaraki-pref., 302-0118, Japan

SURVEYOR

Name	Used place	Registration No.	Type	Term of validity
U tube manometer	7.Pressure Before Orifice	AA-MM007	PM12-243	September,2023
	6.Suction Pressure	AA-MM008	PM12-231	September,2023
	8.Differential Pressure Across Orifice	AA-MM009	PM12-231	September,2023
Bourdon tube pressure gauge	5.Discharge Pressure	AA-16808	DU1/2 x 150mm x 1.6MPa	July,2023
	9.Oil Pressure	AA-16814	DU1/2 x 150mm x 1.6MPa	July,2023
Strain gauge type torque meter	2.Running Torque	AA-TQ015	TMNR-10KNM	July,2025
Aneroid atmospheric meter	3-4.Atmospheric Pressure	AA-AK003	930～1070hPa	January,2023
Rotating meter	1.Rotational speed	AA-RP006	HT-4200	August,2025
Noise meter		AA-SN008	NL-27	March,2023
Vibration meter		AA-SD004	VM-83	June,2025
Bar type thermometer	10.Suction Temperature	AA-On349	Alcohol temperature gauge	March,2023
	13.Discharge Temperature	AA-On324		April,2023
	11.Temperature Before Orifice	AA-On358		April,2023
	12.Oil Temperature	AA-On021		April,2023
	P5.Oil Temperature (Seal)	AA-On315		April,2023
Bar type thermometer	Rotor Casing [P1]	AA-On033	Alcohol temperature gauge	April,2023
	Bearing Head [P2]	AA-On040		June,2023
	Shaft Seal[Inner machine side] [P3]	AA-On321		December,2022
	Shaft Seal [Atmosphere side][P4]	AA-On041		June,2023
Test equipment	No.7		6300V x 2100KW x 2P x 4000rpm	-

SAMPLE

[**Appendix 1** : Screw Compressor Test Records 1/2]

MYCOM

Screw compressor test record

* General information ;	
Item No.	: -
Report No.	:
Type of compressor	: Screw compressor
Date of test	:
Model	:
Serial No.	:
Test fluid	: Air
Orifice No.	:
Time	:
Inspection items	: Internal test

SURVEYOR

1. Revolution		[min-1]
2. Running torque	Measured value	[V]
	Converted value	[N・m]
3. Room temperature		[℃]
4. Atmospheric pressure		[hPa]
5. Discharge pressure		[MPa]
6. Suction pressure	L ( ) [kPa] R ( ) [kPa]	[kPa]
7. Pressure before orifice	L ( ) [kPa] R ( ) [kPa]	[kPa]
8. Pressure difference at orifice	L ( ) [kPa] R ( ) [kPa]	[kPa]
9. Oil pressure		[MPa]
10. Suction temperature		[℃]
11. Temperature before orifice		[℃]
12. Oil temperature		[℃]
13. Discharge temperature		[℃]

Noise	[dB](A)
Background Noise	[dB](A)

* Test results;

Temp. of rotor casing	P 1		[℃]
Temp. of bearing head	P 2		[℃]
Temp. of shaft seal [Inner machine side]	P 3		[℃]
Temp. of shaft seal [Atmosphere side]	P 4		[℃]
Temp. of seal lubrication	P 5		[℃]
Test of vibration		V	[μm]
		H	[μm]
		A	[μm]

Approved by : _____ Checked by : _____

SAMPLE

Appendix 1 : Screw Compressor Test Records 2/2]

MYCOM

Screw Compressor test results

* General information ;

Item No.	: -
Report No.	:
Type of compressor	:
Date of test	:
Model	:
Serial No.	:
Test fluid	: Air
Orifice No.	:
Time	:
Inspection items	: Internal test

SURVEYOR

* Performance test ;

			Standard	Actual		Judgment	Criteria
Capacity	[m3/h]	:		(%)		Accepted	95% and more
Kilowatts	[kW]	:		(%)		Accepted	105% or less

* Mechanical running test ;

			Allowable Maximum		Actual	Judgment
Temp. of rotor casing	P 1	[℃] :		≧		Accepted
Temp. of bearing head	P 2	[℃] :		≧		Accepted
Temp. of shaft seal [Inner machine side]	P 3	[℃] :		≧		Accepted
Temp. of shaft seal [Atmosphere side]	P 4	[℃] :		≧		Accepted
Temp. of seal lubrication	P 5	[℃] :	30～50			Accepted

* Vibration and Noise tests ;

			Allowable Maximum		Actual	Judgment
Noise	[dB](A)	:		≧		Accepted
(Frequency range : 10 - 1000Hz)						Judgment
Vibration	[μm]	V :	20	≧		Accepted
		H :	20	≧		Accepted
		A :	20	≧		Accepted

Approved by : _____ Checked by : _____