



NET4GAS, s.r.o

COMPRESSOR STATION JIRKOV 73 BAR

Performance Guarantees for the EMCS

23.11.2017

**Annex 1
Attachment 1.9**

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REVISION HISTORY

001	23.11.2017	APPROVED	Fanaca	Foltin	Schorling
000	11.07.2017	APPROVED	Berger / Team	Foltin	Schorling
B01	19.05.2017	Issue for Review	Berger	Foltin	Schorling
A01	05.05.2017	Issue for IDC	Team	Foltin	Schorling
P01	28.04.2017	Start	Team		
Rev.	Date	Issue, Purpose	Prepared	Checked	Approved

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1 GENERAL

1.1 Scope of the Document

This document specifies the limits for noise emissions and the performance requirements for the compressor unit (CU) which shall be considered for the design of the Electric Motor Compressor Sets (EMCS).

1.2 Definitions

Term	Explanation
Project	Compressor Station Jirkov 73 bar
Employer	NET4GAS
Consultant	ILF Consulting Engineers
Supplier	Vendor of the Electric Motor Compressor Sets

1.3 Abbreviations

Term	Explanation
AC	Alternative Current
CU	Compressor Unit
EMCS or Unit	Electric Motor Compressor Set (CU, EM, EM cooling system, VSD, VSD transformer, VSD cooling system)
E&IC	Electrical and Controls & Instrumentation
EM	MV Electric Motor
EMD	Electric Motor Drive (VSD Transformer ,VSD, EM)
E-Motor	LV Electric Motor (general)
VSD	Variable Speed Drive

1.4 References

The SUPPLIER shall refer to doc. C4G-JI73-ILF-KS007-STR-SPC-800-Specification for Electro Motor & Compressor Set (EMCS) for all requirements which shall be considered for the design and selection of the EMCS.

The Annex 1 referred to in this document shall mean the annex to the CONTRACT signed between the Employer and the Supplier for engineering, construction, installation, commissioning and testing of the electric motor-compressor sets (EMCS). Annex 1 is the document C4G-JI73-ILF-KS007-STR-SPC-800-Specification for Electro Motor & Compressor Set (EMCS).

All attachments referred to in this document shall mean attachments to Annex 1. All attachments to Annex 1 are listed in Annex 1, Attachment 1.1 - List of Attachments.

2 GENERAL INFORMATION

2.1 Codes and Standards

The SUPPLIER shall refer to Annex 1, Attachment 1.2 for all standards and regulations applicable to the SCOPE OF SUPPLY.

The SUPPLIER shall apply the latest revision of all standards and regulations listed in Annex 1, Attachment 1.2 during the execution of the SCOPE OF SUPPLY.

2.2 Composition of the process gas

The Supplier shall refer to Annex 1, Attachment 1.6 for the applicable process gas composition.

The gas composition and range specified within this document shall be used for design and selection of the EMCS.

3 SITE PERFORMANCE GUARANTEES FOR THE PIPELINE CENTRIFUGAL COMPRESSOR UNIT (CU)

The compressor performance guarantees are outlined in below. They shall be proven at Site during the site performance tests.

		Design Point 1	Point 3	Point 4
Gas composition		see chapter 2.2		
Suction gas pressure	bar (abs) ¹⁾	47.3	49.3	48.1
Discharge gas pressure	bar (abs) ¹⁾	61.3	61.3	61.3
Suction gas temperature	°C	15	15	15
Delivered flow – Minimum Parameter	Sm ³ /h ²⁾	939,584	1,020,833	776,250
Electric power requirements – Guaranteed Parameter ^{3), 5)}	kWe			
Electric power requirements – Minimum Parameter ^{3), 4), 5), 7)}	kWe			

Table 1: Performance guarantees for one (1) pipeline compressor unit

NOTES to Table 1:

- 1) Pressures are absolute.
- 2) Throughput in Sm³/h at reference conditions - Pressure: 101 325 Pa, Temperature: 20 °C
- 3) Shall be specified by the EMCS Supplier directly in the table. Electricity consumption of the Electric Motor Drive (EMD) for the specified guarantee point measured at the main circuit breaker (station),
- 4) Electric power requirements -Minimum Parameter represents the limitation of maximum acceptable electricity consumption.
- 5) Applicable tolerance for increased electric power requirements is 0%; additional site measuring tolerances according to the Final Test Procedures (ASME PTC 10, ISO 5167 and ISO 5389) shall apply
- 6) Location of the measurement points for the process parameters temperature and pressure as specified in Annex 1.
- 7) Guaranteed parameters with additional 3%

Moreover the recycling mode when starting the second EMCS shall be proven. The recycling point is defined below at figure 2. Supplier shall define the minimum recycle flow close to the surge line and fill in the missing data.

		Recycling Point
Gas composition		see chapter 2.2
Suction gas	bar (abs) ¹⁾	49.3
Discharge gas pressure	bar (abs) ¹⁾	61.3
Suction gas temperature	°C	40
Discharge gas temperature	°C	
Delivered flow min. – Minimum Parameter	Sm ³ /h ²⁾	
Electric power requirements Guaranteed Parameter ^{3), 5)}	kWe	
Electric power requirements – Minimum Parameter ^{3), 4), 5), 7)}	kWe	

Table 2: Performance guarantees for one (1) pipeline compressor unit under recycling conditions

NOTES to Table 2:

- 1) Pressures are absolute.
- 2) Throughput in Sm³/h at reference conditions - Pressure: 101 325 Pa, Temperature: 20 °C
- 3) Shall be specified by the EMCS Supplier directly in the table. Electricity consumption of the Electric Motor Drive (EMD) for the specified guarantee point measured at the main circuit breaker (station),
- 4) Electric power requirements Minimum Parameter represents the limitation of maximum acceptable electricity consumption.
- 5) Applicable tolerance for increased electric power requirements is 0%; additional site measuring tolerances according to the Final Test Procedures (ASME PTC 10, ISO 5167 and ISO 5389) shall apply
- 6) Location of the measurement points for the process parameters temperature and pressure as specified in Annex 1.
- 7) Guaranteed parameters with additional 3%

4 FAT PERFORMANCE GUARANTEES FOR THE PIPELINE CENTRIFUGAL COMPRESSOR UNIT (CU)

The compressor performance guarantees are outlined in Figure 1 below. They shall be proven at supplier's test bench during the FAT.

At supplier's test bench (FAT)		Design Point 1	Point 3	Point 4
Gas composition		see chapter 2.2		
Suction gas pressure	bar (abs) ¹⁾	47.3	49.3	48.1
Discharge gas pressure	bar (abs) ¹⁾	61.3	61.3	61.3
Suction gas temperature	°C	15	15	15
Delivered flow	Sm ³ /h ²⁾	939,584	1,020,833	776,250
Power at Compressor coupling ^{3), 5)}	kW			
API 617 Tolerance ⁴⁾	%	0	0	0

Table 3: Performance guarantees for one (1) pipeline compressor unit

NOTES to Table 3:

- 1) Pressures are absolute.
- 2) Throughput in Sm³/h at reference conditions - Pressure: 101 325 Pa, Temperature: 20 °C
- 3) Shall be specified by the EMCS Supplier directly in the table.
- 4) Applicable tolerance for increased compressor coupling power requirements is 0%, no additional measuring tolerances apply;
- 5) Location of the measurement points for the process parameters temperature and pressure as specified in ASME PTC 10, Type 2.

Moreover the recycling mode when starting the second EMCS shall be proven. The recycling point is defined below at figure 2. Supplier shall define the minimum recycle flow close to the surge line and fill in the missing data.

At supplier's test bench (FAT)		Recycling Point
Gas composition		see chapter 2.2
Suction gas pressure	bar (abs) ¹⁾	49.3
Discharge gas pressure	bar (abs) ¹⁾	61.3
Suction gas temperature	°C	40
Discharge gas temperature	°C	
Delivered flow min.	Sm ³ /h ²⁾	
Power at Compressor coupling ^{3), 5)}	kW	
API 617 Tolerance ⁴⁾	%	0

Table 4: Performance guarantees for one (1) pipeline compressor unit under recycling conditions

NOTES to Table 4

- 1) Pressures are absolute.
- 2) Throughput in Sm³/h at reference conditions - Pressure: 101 325 Pa, Temperature: 20 °C
- 3) Shall be specified by the EMCS Supplier directly in the table.
- 4) Applicable tolerance for increased compressor coupling power requirements is 0%, no additional measuring tolerances apply;
- 5) Location of the measurement points for the process parameters temperature and pressure as specified in ASME PTC 10, Type 2.

5 PERFORMANCE GUARANTEES FOR NOISE EMISSIONS

5.1 Inside the EMCS Compressor Buildings and Electrical Building

Sound pressure level L_p (dB reference level 20 μPa or 2×10^{-5} Pa)

At 1 m from all parts of the EMCS compressor skid (within the EMCS Scope of Supply) and all electrical equipment inside Electric Building and 1,5 m above the floor level of the Compressor Building and of the Electric Building (free field) limit level $L_{pA,1m} < 87$ dB.

Requirements of EN ISO 11204

Acoustics - Noise emitted by machinery and equipment. Determination of emission pressure levels at a work station and at other specified positions. Method requiring environmental corrections: This national standard is identical with EN ISO 11204.

Requirements of EN ISO 1996-2

Acoustics – Description and measurement of environmental noise Part 2: Acquisition of data pertinent to land use. This national standard is identical with ISO 1996.

5.2 Outside the EMCS Compressor Buildings and Electrical Building

Requirements of EN ISO 3746

Acoustics-Determination of sound power levels of noise sources using sound pressure. Survey method use an enveloping measurements surface over reflecting plane

This national standard is identical with EN ISO 3746 Outside the Compressor Building and Electric Building the sound level shall be in line with Czech legislation: Narizení vlády č. 272/2011 Z. z.

- Average of daily sound exposure: $L_{EX,8h} \leq 85$ dB
- Peak sound pressure $L_{CPk} \leq 140$ dB

Requirements of EN ISO 1996-2

Acoustics – Description and measurement of environmental noise Part 2: Acquisition of data pertinent to land use. This national standard is identical with ISO 1996.

5.3 VSD outdoor cooler

The noise emissions of the VSD cooler installed outdoors shall not exceed 55 dB sound pressure at 1 meter from equipment with N fans running.