NET4GAS, s.r.o

LINE VALVE STATION MLADOTICE MODIFICATION

Noise Study

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TABLE OF CONTENTS

1 GENERAL

1.1 Scope of the Document

The aim of this noise study is to investigate the noise emissions of the modification of the LVS Mladotice. The study will support the decision making process for noise protection measure of the Stations.

1.2 Definitions

Term	Explanation
Project	Modification of LVS Mladotice
Employer	NET4GAS
Consultant	ILF Consulting Engineers

1.3 Abbreviations

Term	Explanation
LVS	Line Valve Station
dB	decibel
dB(A)	A-weighted decibel
FCV	Flow control valve

1.4 References

No.	Number	Title
1	C4G-MLAD-CHE-TU40S-STR-PID-101-DVZ	Piping & Instrumentation Diagram
2	C4G-MLAD-CHE-TU40S-STR-PFD-090-DVZ	Process Flow Diagram
3	C4G-MLAD-CHE-TU40S-GEN-SIT-014-DVZ	C.3-Coordination Layout Plan

1.5 Codes and Standards

No.	Number	Title
1	ISO 9613	Acoustics -- Attenuation of sound during propagation outdoors
2	VDI 3760	Berechnung und Messung der Schallausbreitung in Arbeitsräumen
3	VDI 3733	Geräusche bei Rohrleitungen
4	272/2011	GOVERNMENT REGULATION of 24 August 2011 on the protection of health from the adverse effects of noise and vibrations
5	TA Lärm	Technische Anleitung zum Schutz gegen Lärm

2 CALCULATION METHODE AND SOFTWARE

The calculations are based on ISO 9613 to determine resultant environmental noise levels from source sound power levels.

The propagation of noise is calculated by using the software “IMMI 2017”, released by the company “Wölfel Measuring Systems”. The software takes into account physical influences such as reflection on barriers and their screening effect.

The local meteorological influence C0 was set to 0 dB. The sound absorption in air was calculated by taking into account an ambient temperature of 10 °C and a relative humidity of 70 %.

Damping properties of soil components have been adopted for the surrounding countryside with a conservative value of 0.5 (slightly acoustically porous soil, arable land, meadows).

A noise map was generated based on a raster mesh size of 3 m x 3 m at a height of 4 m above ground level.

Reflections on walls and surfaces of 1st order with a reflection coefficient of 0.8 are taken into account.

3 INPUT DATA

3.1 Applicable Noise Limits

The acceptable sound pressure levels outside at residential areas in Czech Republic according to GOVERNMENT REGULATION of 24 August 2011 on the protection of health from the adverse effects of noise and vibrations are:

- Noise Levels at fence: 85 dB(A)
- Noise Levels at nearest neighbour:
  - Day time* 50 dB(A)
  - Night-time* 40 dB(A)

* Day is defined as the 16 hours between 06:00 to 22:00. Night is defined as the 8 hours between 22:00 and 06:00.

For comparison, 0 dB is the threshold of hearing, 140 dB is the threshold of pain. A change of 1 dB is detectable only under laboratory conditions. A change of 10 dB corresponds approximately to halving or doubling the human sensed loudness of sound.

3.2 Noise Emission Data

The only noise source at the LVS Mladotice is the flow control valve (FCV 60.1) installed above ground. The noise generated by the control valve and emitted by the upstream and downstream piping is also considered.

The emitted noise of the flow control valve is depending on the differential pressure and the flow rate. Four (4) flow cases are defined in the control valve datasheet (see Attachment 2). The cases have been assessed regarding noise at the control valve and the piping.

Based on vendor data for low noise trim valves (see Attachment 2) Case 2 and 3 are not considered, because they have a lower sound emission level than Case 1 and 4. Hence, Case 1 is defined as the worst case sound emission scenario, because according to VDI 3733 (equation 5) the higher flow in Case 1 compared to Case 4 causes higher sound emissions in the piping.

Consequently, the scenario with the highest noise emission is Case 1, which has the highest pressure drop, and the highest flow rate. Only Case 1 is considered in the following.

The emission data of the flow control valve with low noise trim (see Attachment 2) are based on vendor data. In order to get a more detailed analysis, the sound power level of the valve is considered within an octave spectrum from 63 to 8000 Hz.

Table 1 Sound power level of FCV 60.1 at LVS Mladotice

	Unit	Frequency spectrum								
	Hz	63	125	250	500	1000	2000	4000	8000	**Sum**
FCV 60.1	dB(A)	53,5	69,6	83,1	94,5	99,7	98,9	92,7	84,6	**103,5**

The sound sources are modelled as point sources in the software IMMI.

Furthermore, it is considered that the sound power which is emitted from FCV 60.1 to the environment, is also induced to the inside of the pipes. Therefore the sound power level emitted by the above-ground pipes (see Figure 1) is taken into regard for the modelling in IMMI. The data from the Piping Class CS-100-0 (see Attachment 4) is being used for this calculation in accordance with the procedure given by VDI 3733. Further noise insulation up- or downstream of the control valve is not considered.

For the four pipe segments the frequency spectrums of the sound power level are shown in Table 3.

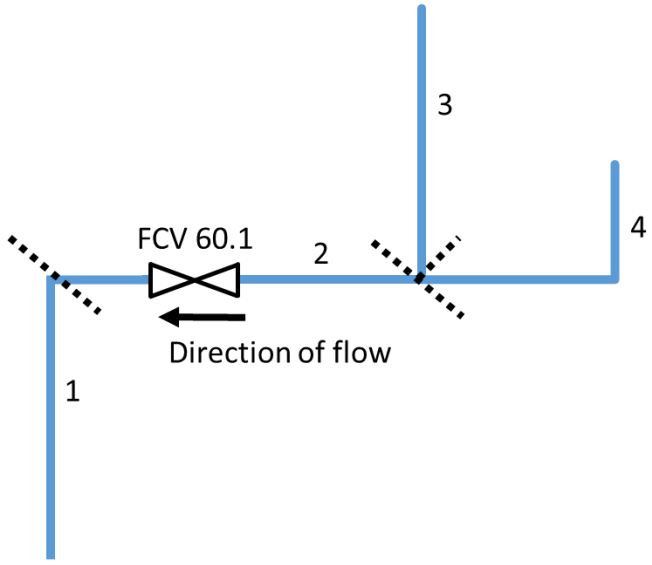


Figure 1 Piping sections in Mladotice

The values for the flow and pressure (according to C4G-MLAD-CHE-TU40S-STR-PFD-090-DVZ) used in the simulation are summarized in Table 2 and represent the scenario with the highest noise emissions at LVS Mladotice (Case 1).

Table 2 Maximum pressure and flow for each piping section

Piping Section	Max. pressure [bar_g]	Max. flow [mmc/d 20°C]
1	58,5	26,5
2	85	26,5
3	85	26,5
4	85	26,5

Table 3 Total Sound power level of piping segments at LVS Mladotice

Piping Section	Unit	**Frequency spectrum**								
	Hz	63	125	250	500	1000	2000	4000	8000	**Sum**
1	dB(A)	15,4	36,0	55,0	72,3	83,5	88,6	77,5	60,4	**90,1**
2	dB(A)	9,6	33,8	52,3	69,5	80,6	85,3	74,5	57,5	**86,9**
3	dB(A)	14,4	36,7	54,8	71,5	81,9	85,9	75,3	58,4	**87,7**
4	dB(A)	11,3	33,6	51,7	68,3	78,9	82,9	72,2	55,3	**84,8**

This noise emission data for the piping is implemented as a line source in the model (ISO 9613-2).

It has to be assured that the various sound emitters shall not show tonal components.

No upset cases are considered which would lead to additional emission sources like running of diesel generator, as these are expected to occur only in emergency and not during normal operation.

No difference in day and night time noise emission is expected, which is why only the night time (stricter noise immission levels) is considered in the following.

There are only minor roads in the area. These are small and do not regularly serve heavy traffic. There are no official statistics available to calculate the road noise. This is why the background noise is not determined in the study but covered by the safety margin.

3.3 Approach of the study

The expected noise at the immission points at worst case conditions is calculated based on the sources in chapter 3.2. As the existing and background noise could not be quantified, a safety margin of 6 dB(A) (TA Lärm) should be deducted from the limits stated in chapter 3.1, which means that 34 dB(A) at the immission points would be acceptable.

If the immission limits are exceeded, measures to reduce noise emissions have to be taken. In this case, measures are proposed and the necessary reduction will be quantified.

3.4 Plant Layout

For the calculation, the elevation profile is considered (source: https://opentopomap.org)

An overview of the LVS Mladotice is given in Figure 2 and the exact location of the one flow control valve (FCV 60.1) in Figure 3.

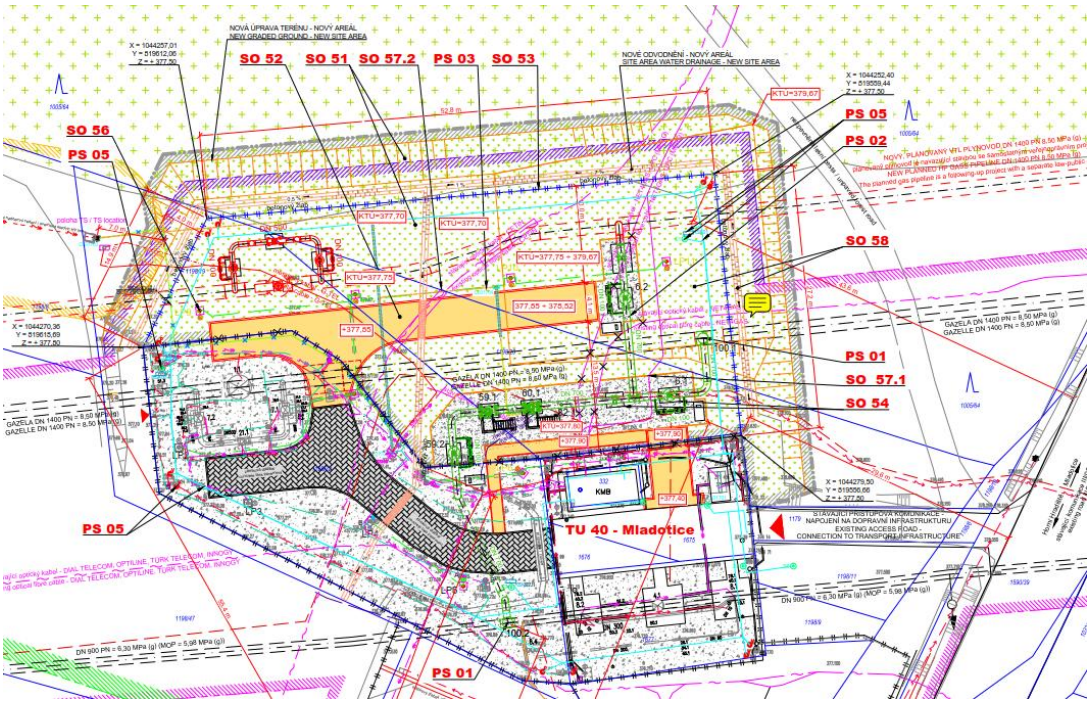


Figure 2 LVS Mladotice Layout

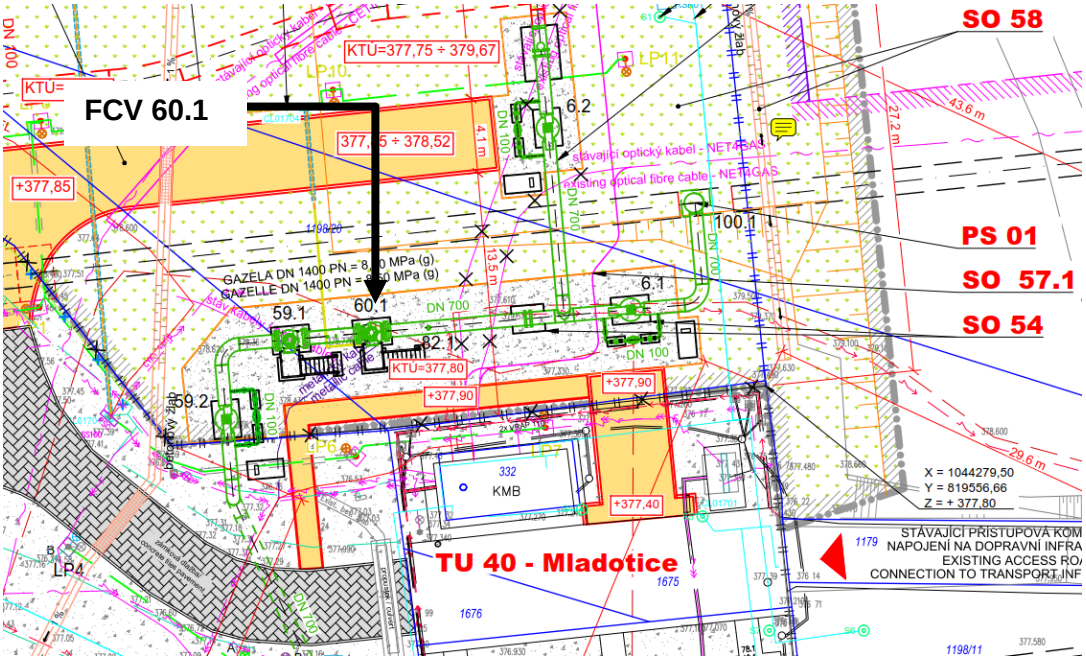


Figure 3 Location of FCV 60.1 in LVS Mladotice

3.5 IMMI Model

The following screenshots show the IMMI model. It contains the topography and existing buildings. The nearest neighbouring buildings are modelled with an assumed building height of 4 m. The heights of the buildings, which belong to the LVS are:

- Building 1 4,3 m
- Building 2 3 m
- Building 3 5 m
- Building 4 2,7 m

The colourations of the elements are depending on their function:

- Red areas: Noise emission sources
- Blue areas: Buildings
- Gray lines: Contour lines

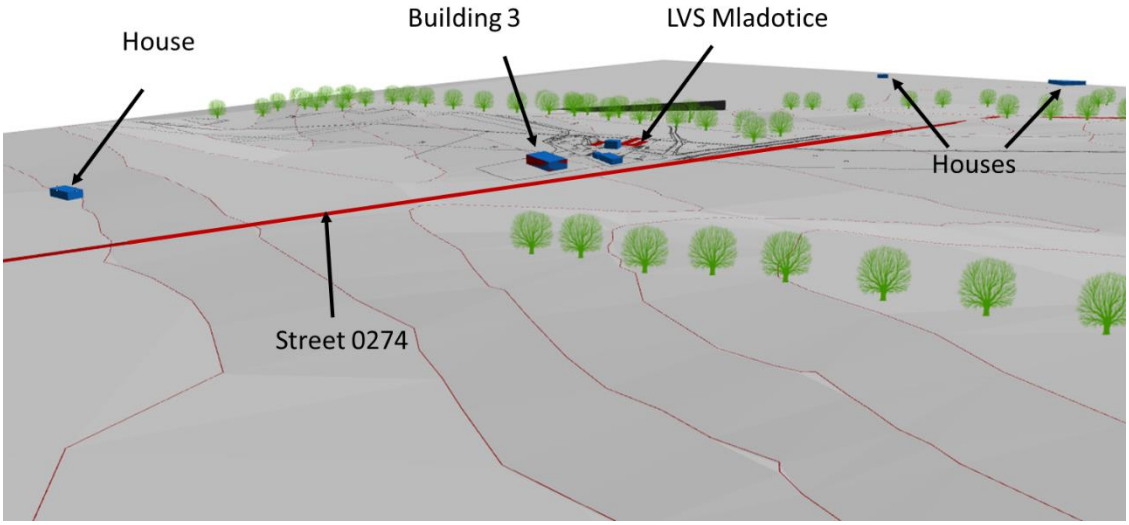


Figure 4 IMMI model overview

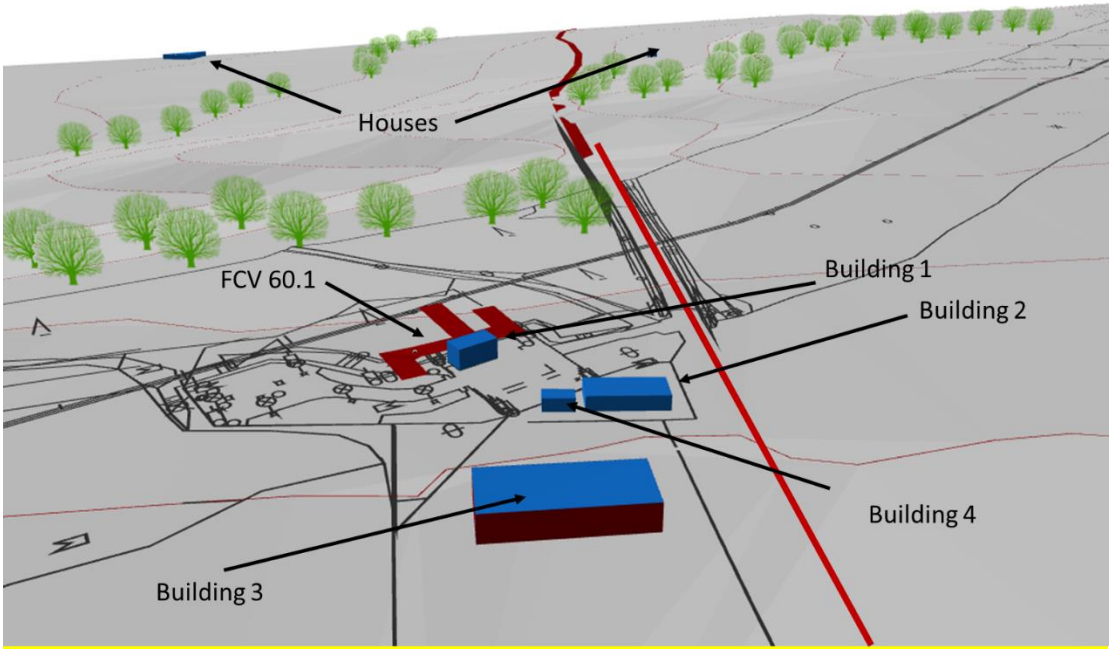


Figure 5 IMMI model of LVS Mladotice

The IMMI input data is listed in Attachment 1.

3.6 Immission Points

The location of the nearest neighbours has been identified via areal image and immission points have been placed at 4 m height at 0.5 m in front of the building facade. The following figures show the placement of the emission points:

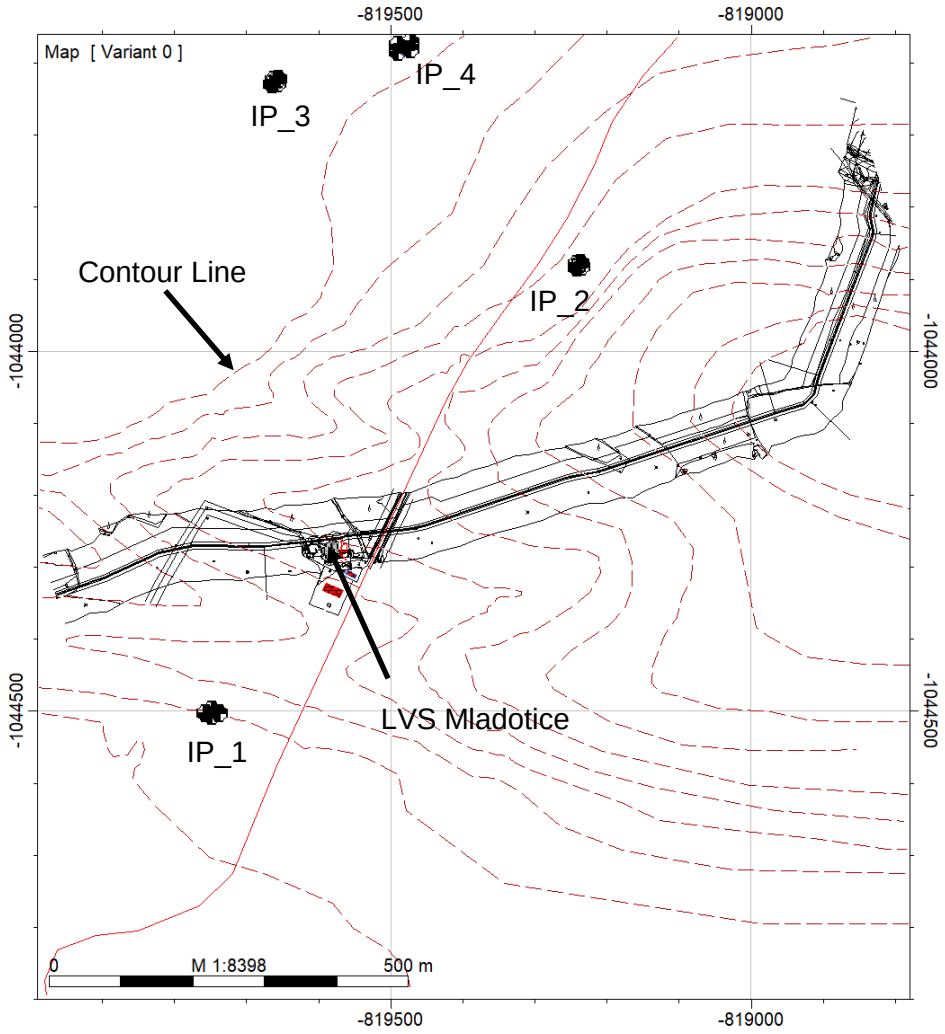


Figure 6 Immission points at LVS Mladotice

The distances from the LVS Mladotice noise sources to the immission points are approximately

- IP_1 280 m
- IP_2 530 m
- IP_3 660 m
- IP_4 710 m

4 RESULTS

The calculated sound pressure levels at the immission points are given in the following table. The emission level map is shown in Figure 7.

Table 4 Calculated sound pressure level at the immission points

Immission Point	Sound pressure level in dB(A)
IP_1	39.87
IP_2	19.71
IP_3	29.26
IP_4	23.12

The noise limit of 34 dB(A) is exceeded by 5.87 dB(A) at IP_1. The applicable noise limit at IP_2, IP_3 and IP_4 is kept.

If the preliminary vendor data is confirmed, noise reduction measures have to be taken to lower the sound pressure level at the immission points by 6 dB(A).

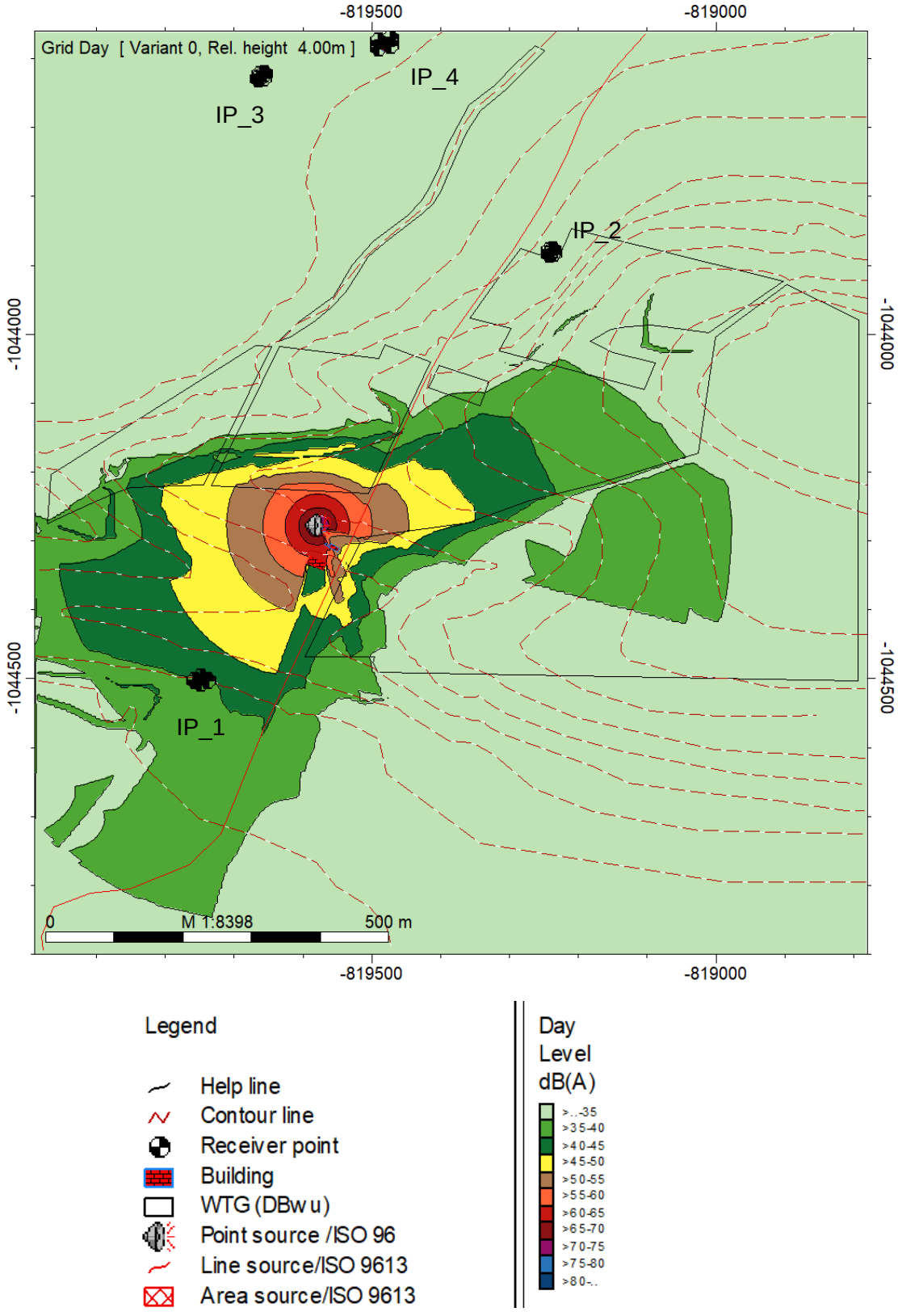


Figure 7: Noise map area

5 CONCLUSION

Please note that the calculations in this report are based on preliminary vendor data at worst case conditions. The considered valves use a low noise trim. If a different type of valve construction with even lower noise is available, this type could be used to lower noise emissions.

To safely comply within the applicable noise limits, a safety margin of 6 dB(A) was deducted from the applicable (272/2011) noise immission limits, as information on background and existing noise is available. Background noise measurements can be made to allow for calculation without safety margin. This results in a limit of 34 dB(A) at the relevant immission points.

This limit is exceeded by 6 dB(A), which means that noise reduction measures have to be applied at the flow control valves, if the vendor cannot reduce the noise at the valves itself.

If noise reduction at the FCVs is necessary, one or a combination of the following measures shall be used:

- Noise insulation directly applied on the valves (see Attachment 3).
- Noise insulation hoods around the valves (see Attachment 4 for requirements and typical),
- sound barriers or
- earth walls.
- Station piping upstream and downstream of the flow control valves to be equipped with noise insulation

The calculated necessary noise reduction of 6 dB(A), will be reviewed if new vendor data is available.

The noise estimation for such a control valve and adjacent piping are very hard to predict since the calculation is based on theoretical input data. Therefore, the EPC Contractor shall perform noise measurements after commissioning of each station to prove that the actual noise values are in line with the allowable limits. In case that the actual noise values exceed the allowable limits, the EPC Contractor is obliged to perform suitable noise protection measures to comply with the allowed limits. Such noise measures are part of EPC Contractor scope of work.

6 ATTACHMENT

Attachment 1 List of IMMI Input Data

Project | Properties				
Topic:	Noise			
Type of prediction:	Noise (national methods)			
Rating following::	No rating	No.	Period	Duration/h
		1	Day	16.00
		2	Night	8.00
Project notes				

Work area				
	from ...	to ...	Dimensions	Area
x /m	-819990.00	-818780.00	1210.00	1.62 km²
y /m	-1044900.00	-1043560.00	1340.00	
z /m	-10.00	500.00	510.00	
Terrain height in the corners				
xmin / ymax (z4)	360.00	xmax / ymax (z3)	370.00	
xmin / ymin (z1)	360.00	xmax / ymin (z2)	380.00	

Available calculation areas											
Name	x min /m	x max /m	y min /m	y max /m	dx /m	dy /m	nx	ny	Reference	Height/m	Range
Grid 0	-819990.00	-818780.00	-1044900.00	-1043560.00	20.00	20.00	61	68	relative	4.00	Work area
Grid 1	-819990.00	-818780.00	-1044900.00	-1043560.00	3.00	3.00	404	447	relative	4.00	Work area

Calculation parameters	**Copy from "Reference Setting"**			
Calculation model: General	**Point calculation**	**Grid calculation**		
Adapt assessment area seamlessly to the receiver position				
L /m				
Terrain ridges as obstacles	Yes	Yes		
Improved interpolation in boundary areas	Yes	Yes		
Free field in front of refl. surfaces/m				
acc. to sources	1.0	1.0		
acc. to immission points	1.0	1.0		
House: white border in grid	No	No		
Intermediate messages:	No	No		
Calculation model: Parameters	"reference settings"	"reference settings"		
Limiting range of sound sources:				
* Limit the search radius (distance source-IP):	No	No		
* minimum level difference /dB:	No	No		
Projection of line sound sources	Yes	Yes		
Projection of area sound sources	Yes	Yes		
Limit projection	No	No		
* Radius /m around source:				
* Radius /m around IP:				
Minimum length for sections /m	1.0	1.0		
Variable min. length for sections:				
* in percent of the distance from the IP source	No	No		
Add. factor for distance criterion	1.0	1.0		
Barrier attenuation differing from guideline:	No	No		
* Cut-off limit for insertion loss:				
* Limit /dB for single screens:				
* Limit /dB for multiple screens:				
Calculate attenuation for VDI 2720, ISO9613				
* Lateral pathway	Yes	Yes		
* Lateral pathway for image sources	No	No		
Reflection				

Reflection (max. order)	1	1		
Limit the search radius (distance source-IP):	No	No		
* Search radius /m				
Limiting range of reflecting surfaces /m:				
* Radius around source or IP /m:	No	No		
* minimum level difference /dB:	No	No		
Image source from projection	Yes	Yes		
No refl. if entirely screened	Yes	Yes		
Save rays as help lines	No	No		
section control				
Section control acc. Schall 03 [2012]:	Yes	Yes		
Section control for other calculation methods, too:	No	No		
accelerated iteration (approximation):	No	No		
requested accuracy /dB:	0.1	0.1		
show intermediate results:	No	No		

Global parameters	**Copy from "Reference Setting"**					
Default for G outside DBOD-elements	0.50					
Temperature /°C	10					
Relative humidity /%	70					
Living area per inhab-/m² (=0.8*gross)	40.00					
Average storey height /m	2.80					
Simplified meteorology (Guideline Int. Comp. Methods):	Day	Evening	Night			
Simplified meteorology (Guideline Int. Comp. Methods):	0.00	0.00	0.00			

Parameters of library: ISO 9613-2	**Copy from "Reference Setting"**	
Downwind conditions	Yes	
Simplified equation (Nr. 7.3.2) for ground effect		
for frequency-dependent calculation	No	
for frequency-independent calculation	Yes	
Evaluating the mean height hm	according to ISO 9613-2 unmodified	
Simplified calculation using free propagation conditions (release 7/2002)(obsolete)	No	
Attenuation due to screening - subtract negative ground effect	No	
Deduction no more than to -Dz	No	
"Additional recommendations" - ISO TR 17534-3	Yes	
ABar acc. "Erlass Thüringen" (2015-01-10)	No	
Accounts for vegetation	Yes	
Accounts for housing	Yes	
Accounts for ground effect	Yes	

Contour line (15)					Variant 0
HOEL023	HoeL	Group 0	Length /m	602.39	
			Constant abs. height /m	405.00	
			Take into account as diffracting edge	Yes	
HOEL024	HoeL	Group 0	Length /m	739.52	
			Constant abs. height /m	403.00	
			Take into account as diffracting edge	Yes	
HOEL025	HoeL	Group 0	Length /m	1090.22	
			Constant abs. height /m	400.00	
			Take into account as diffracting edge	Yes	
HOEL026	HoeL	Group 0	Length /m	1478.09	
			Constant abs. height /m	395.00	
			Take into account as diffracting edge	Yes	
HOEL027	HoeL	Group 0	Length /m	1685.05	
			Constant abs. height /m	390.00	
			Take into account as diffracting edge	Yes	
HOEL028	HoeL	Group 0	Length /m	2096.24	
			Constant abs. height /m	385.00	
			Take into account as diffracting edge	Yes	
HOEL029	HoeL	Group 0	Length /m	2475.54	

			Constant abs. height /m	380.00	
			Take into account as diffracting edge	Yes	
HOEL030	HoeL	Group 0	Length /m	2772.36	
			Constant abs. height /m	375.00	
			Take into account as diffracting edge	Yes	
HOEL032	HoeL	Group 0	Length /m	3334.23	
			Constant abs. height /m	370.00	
			Take into account as diffracting edge	Yes	
HOEL033	HoeL	Group 0	Length /m	1046.56	
			Constant abs. height /m	365.00	
			Take into account as diffracting edge	Yes	
HOEL034	HoeL	Group 0	Length /m	921.40	
			Constant abs. height /m	360.00	
			Take into account as diffracting edge	Yes	
HOEL036	HoeL	Group 0	Length /m	1308.32	
			Constant abs. height /m	365.00	
			Take into account as diffracting edge	Yes	
HOEL037	HoeL	Group 0	Length /m	750.73	
			Constant abs. height /m	360.00	
			Take into account as diffracting edge	Yes	
HOEL038	HoeL	Group 0	Length /m	505.53	
			Constant abs. height /m	365.00	
			Take into account as diffracting edge	Yes	
HOEL039	HoeL	Group 0	Length /m	210.55	
			Constant abs. height /m	360.00	
			Take into account as diffracting edge	Yes	

Receiver point (16)								Variant 0
	Label	Group	Limit /dB(A)	Use	T1	T2		
IPkt046	ImmissionPoint_3 1 H 1S/W	Group 0	Limit /dB(A)	---	-99.00	-99.00		
IPkt047	ImmissionPoint_3 2 H 1S/E	Group 0	Limit /dB(A)	---	-99.00	-99.00		
IPkt048	ImmissionPoint_3 3 H 1N/E	Group 0	Limit /dB(A)	---	-99.00	-99.00		
IPkt049	ImmissionPoint_3 4 H 1N/W	Group 0	Limit /dB(A)	---	-99.00	-99.00		
IPkt050	ImmissionPoint_1 1 H 1S/W	Group 0	Limit /dB(A)	---	-99.00	-99.00		
IPkt051	ImmissionPoint_1 2 H 1East	Group 0	Limit /dB(A)	---	-99.00	-99.00		
IPkt052	ImmissionPoint_1 3 H 1N/E	Group 0	Limit /dB(A)	---	-99.00	-99.00		
IPkt053	ImmissionPoint_1 4 H 1N/W	Group 0	Limit /dB(A)	---	-99.00	-99.00		
IPkt054	ImmissionPoint_2 1 H 1S/W	Group 0	Limit /dB(A)	---	-99.00	-99.00		
IPkt055	ImmissionPoint_2 2 H 1S/E	Group 0	Limit /dB(A)	---	-99.00	-99.00		
IPkt056	ImmissionPoint_2 3 H 1N/E	Group 0	Limit /dB(A)	---	-99.00	-99.00		
IPkt057	ImmissionPoint_2 4 H 1N/W	Group 0	Limit /dB(A)	---	-99.00	-99.00		
IPkt058	ImmissionPoint_4 1 H 1West	Group 0	Limit /dB(A)	---	-99.00	-99.00		
IPkt059	ImmissionPoint_4 2 H 1South	Group 0	Limit /dB(A)	---	-99.00	-99.00		
IPkt060	ImmissionPoint_4 3 H 1East	Group 0	Limit /dB(A)	---	-99.00	-99.00		
IPkt061	ImmissionPoint_4 4 H 1North	Group 0	Limit /dB(A)	---	-99.00	-99.00		

Building (8)					Variant 0
HAUS001	ImmissionPoint_4	Group 0	Reflection	--- No reflection	
			Building use	Resid. building	
			With special insulation	No	
			Residential use /%	100	
			No. of inhabitants	3.86	
			Number of dwellings	1.84	
			Number of storeys	1.43	
HAUS002	ImmissionPoint_3	Group 0	Reflection	--- No reflection	
			Building use	Resid. building	
			With special insulation	No	
			Residential use /%	100	
			No. of inhabitants	1.24	
			Number of dwellings	0.59	
			Number of storeys	1.43	
HAUS004	ImmissionPoint_1	Group 0	Reflection	--- No reflection	
			Building use	Resid. building	
			With special insulation	No	
			Residential use /%	100	
			No. of inhabitants	8.89	
			Number of dwellings	4.23	
			Number of storeys	1.43	
HAUS005	ImmissionPoint_2	Group 0	Reflection	--- No reflection	
			Building use	Resid. building	
			With special insulation	No	
			Residential use /%	100	
			No. of inhabitants	1.71	
			Number of dwellings	0.81	
			Number of storeys	1.43	
HAUS006	Buliding No. 2	Group 0	Reflection	--- No reflection	
			Building use	Resid. building	
			With special insulation	No	
			Residential use /%	100	
			No. of inhabitants	1.98	
			Number of dwellings	0.94	
			Number of storeys	1.07	
HAUS007	Haus	Group 0	Reflection	--- No reflection	
			Building use	Resid. building	
			With special insulation	No	
			Residential use /%	100	
			No. of inhabitants	1.06	
			Number of dwellings	0.50	
			Number of storeys	1.54	
HAUS008	Transformator	Group 0	Reflection	--- No reflection	
			Building use	Resid. building	
			With special insulation	No	
			Residential use /%	100	
			No. of inhabitants	9.95	
			Number of dwellings	4.74	
			Number of storeys	1.79	
HAUS009	Haus	Group 0	Reflection	--- No reflection	
			Building use	Resid. building	
			With special insulation	No	
			Residential use /%	100	
			No. of inhabitants	0.34	
			Number of dwellings	0.16	
			Number of storeys	0.96	

Vegetation (6)					Variant 0
DBwu001	DBwu	Group 0	D in dB/100m	5.00	
			transparent during winter (OE-Norm)	Yes	
			Pollutants (Gauss):	D in %/100m	10.00
DBwu002	DBwu	Group 0	D in dB/100m	5.00	

			transparent during winter (OE-Norm)	Yes	
			Pollutants (Gauss):	D in %/100m	10.00
DBwu004	DBwu	Group 0	D in dB/100m	5.00	
			transparent during winter (OE-Norm)	Yes	
			Pollutants (Gauss):	D in %/100m	10.00
DBwu005	DBwu	Group 0	D in dB/100m	5.00	
			transparent during winter (OE-Norm)	Yes	
			Pollutants (Gauss):	D in %/100m	10.00
DBwu006	DBwu	Group 0	D in dB/100m	5.00	
			transparent during winter (OE-Norm)	Yes	
			Pollutants (Gauss):	D in %/100m	10.00
DBwu007	DBwu	Group 0	D in dB/100m	5.00	
			transparent during winter (OE-Norm)	Yes	
			Pollutants (Gauss):	D in %/100m	10.00

Point source /ISO 96 (1)														Variant 0
EZQi001	**Label**		FCV 60.1				**Action radius/m**							99999.00
	Group		Group 0				**Lw (Day) /dB(A)**							103.48
	Number of nodes		1				**Lw (Night) /dB(A)**							103.48
	Length/ m		---				**D0**							0.00
	Length/ m (2D)		---				**High building/high noise source**							No
	Area /m²		---				**Emission is**							Sound power level (Lw)
	Emiss. variant		**Sum**	**16 Hz**	**31.5 Hz**	**63 Hz**	**125 Hz**	**250 Hz**	**500 Hz**	**1000 Hz**	**2000 Hz**	**4000 Hz**	**8000 Hz**	
	Day	Lw /dB (A)	103.5	0.0	0.0	53.5	69.6	83.1	94.5	99.7	98.9	92.7	84.6	
	Night	Lw /dB (A)	103.5	0.0	0.0	53.5	69.6	83.1	94.5	99.7	98.9	92.7	84.6	

Line source/ISO 9613 (5)														Variant 0
LIQi001	**Label**		Sound source				**Action radius/m**							99999.00
	Group		Group 0				**D0**							0.00
	Number of nodes		17				**High building/high noise source**							No
	Length/ m		1660.53				**Emission is**							SPL per unit length (Lw/m)
	Length/ m (2D)		1659.75				**Emi. variant**	Emission	Sound insul.		Correction		Lw	Lw'
	Area /m²		---					dB(A)	dB		dB		dB(A)	dB(A)
							Day	0.00	-		-		32.20	0.00
							Night	0.00	-		-		32.20	0.00
LIQi004	**Label**		Pipe 60.1_2				**Action radius/m**							99999.00
	Group		Group 0				**Lw (Day) /dB(A)**							87.73
	Number of nodes		2				**Lw (Night) /dB(A)**							87.73
	Length/ m		17.97				**Lw' (Day) /dB(A)**							75.18
	Length/ m (2D)		17.93				**Lw' (Night) /dB(A)**							75.18
	Area /m²		---				**D0**							0.00
							High building/high noise source							No
							Emission is							Sound power level (Lw)
	Emiss. variant		**Sum**	**16 Hz**	**31.5 Hz**	**63 Hz**	**125 Hz**	**250 Hz**	**500 Hz**	**1000 Hz**	**2000 Hz**	**4000 Hz**	**8000 Hz**	
	Day	Lw' /dB (A)	75.2	-12.5	-12.5	1.9	24.2	42.3	59.0	69.4	73.4	62.8	45.9	
	Night	Lw' /dB (A)	75.2	-12.5	-12.5	1.9	24.2	42.3	59.0	69.4	73.4	62.8	45.9	
LIQi008	**Label**		Pipe 60.1				**Action radius/m**							99999.00
	Group		Group 0				**Lw (Day) /dB(A)**							90.10
	Number of nodes		3				**Lw (Night) /dB(A)**							90.10
	Length/ m		12.23				**Lw' (Day) /dB(A)**							79.22
	Length/ m (2D)		12.19				**Lw' (Night) /dB(A)**							79.22
	Area /m²		---				**D0**							0.00
							High building/high noise source							No
							Emission is							Sound power level (Lw)
	Emiss. variant		**Sum**	**16 Hz**	**31.5 Hz**	**63 Hz**	**125 Hz**	**250 Hz**	**500 Hz**	**1000 Hz**	**2000 Hz**	**4000 Hz**	**8000 Hz**	
	Day	Lw' /dB (A)	79.2	-10.9	-10.9	4.5	25.1	44.1	61.4	72.6	77.7	66.6	49.5	
	Night	Lw' /dB (A)	79.2	-10.9	-10.9	4.5	25.1	44.1	61.4	72.6	77.7	66.6	49.5	
LIQi009	**Label**		Sound source				**Action radius/m**							99999.00
	Group		Group 0				**Lw (Day) /dB(A)**							84.72
	Number of nodes		3				**Lw (Night) /dB(A)**							84.09
	Length/ m		19.48				**Lw' (Day) /dB(A)**							71.82
	Length/ m (2D)		19.43				**Lw' (Night) /dB(A)**							71.20
	Area /m²		---				**D0**							0.00

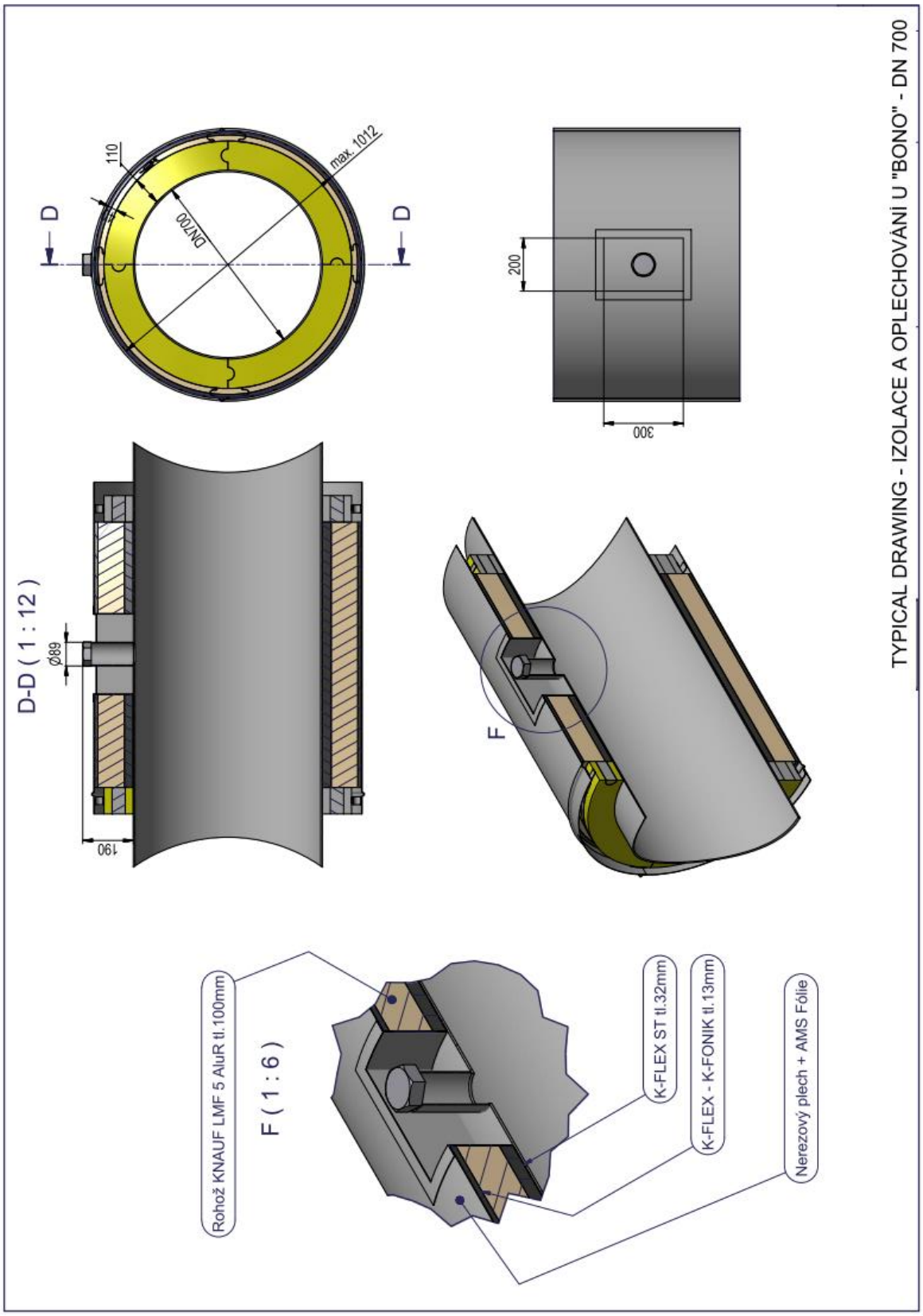
							High building/high noise source							No
							Emission is							Sound power level (Lw)
	Emiss. variant		**Sum**	**16 Hz**	**31.5 Hz**	**63 Hz**	**125 Hz**	**250 Hz**	**500 Hz**	**1000 Hz**	**2000 Hz**	**4000 Hz**	**8000 Hz**	
	Day	Lw' /dB (A)	71.8	-12.9	-12.9	-1.6	20.7	38.8	55.4	66.0	70.0	59.3	42.4	
	Night	Lw' /dB (A)	71.2	-12.9	-12.9	-0.7	19.3	37.4	54.2	64.8	69.6	58.7	41.7	
LIQi011	**Label**		Sound source				**Action radius/m**							99999.00
	Group		Group 0				**Lw (Day) /dB(A)**							86.92
	Number of nodes		2				**Lw (Night) /dB(A)**							86.92
	Length/ m		11.00				**Lw' (Day) /dB(A)**							76.50
	Length/ m (2D)		11.00				**Lw' (Night) /dB(A)**							76.50
	Area /m²		---				**D0**							0.00
							High building/high noise source							No
							Emission is							Sound power level (Lw)
	Emiss. variant		**Sum**	**16 Hz**	**31.5 Hz**	**63 Hz**	**125 Hz**	**250 Hz**	**500 Hz**	**1000 Hz**	**2000 Hz**	**4000 Hz**	**8000 Hz**	
	Day	Lw' /dB (A)	76.5	-10.4	-10.4	-0.8	23.4	41.9	59.1	70.2	74.9	64.1	47.1	
	Night	Lw' /dB (A)	76.5	-10.4	-10.4	-0.8	23.4	41.9	59.1	70.2	74.9	64.1	47.1	

Attachment 2 Preliminary Vendor Data

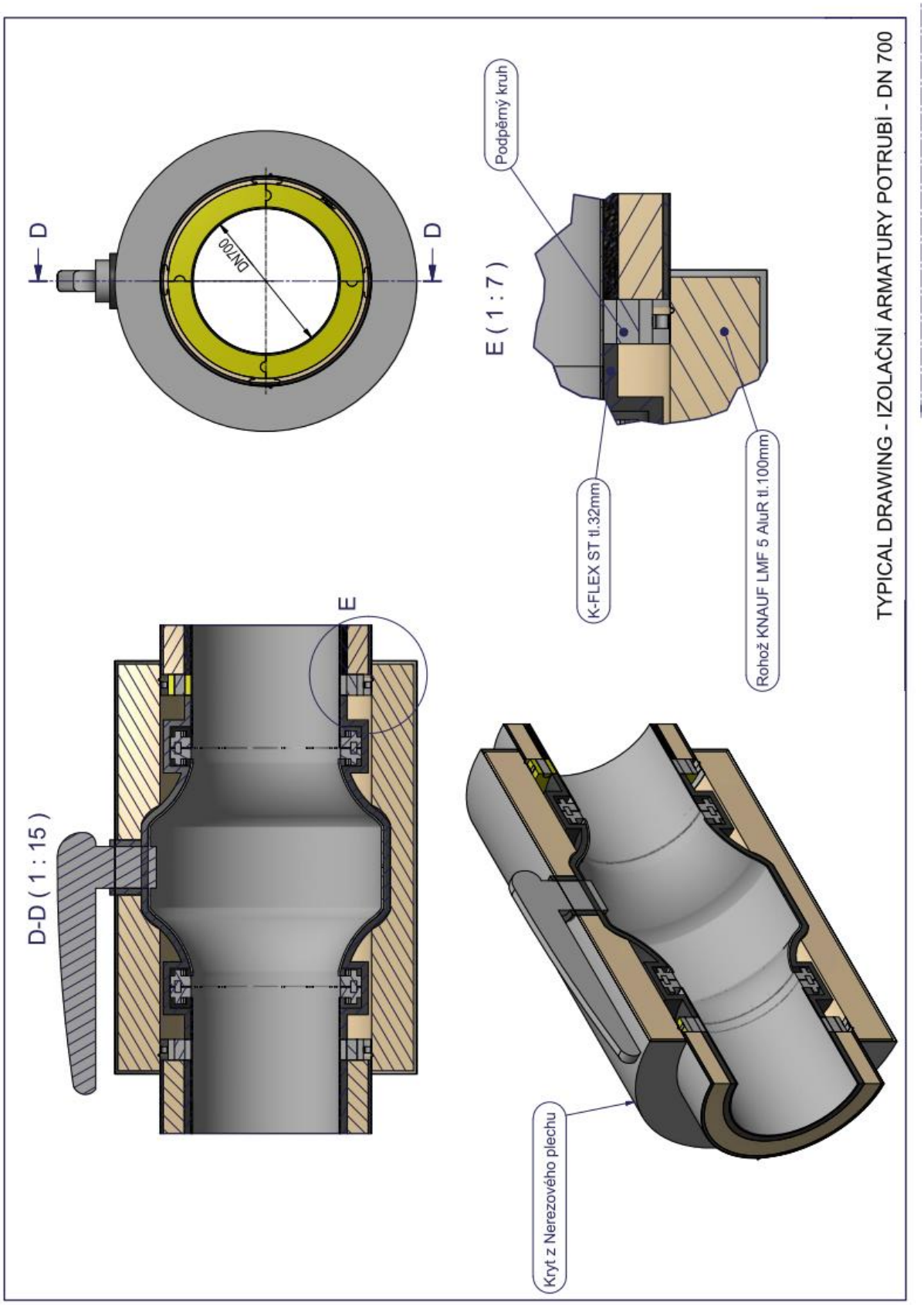
NODE MLADOTICE MODIFICATION
PRESSURE CONTROL AND SAFETY SHUTOFF VALVES ≥ DN300

TU40_STR_SPC_506_03_DDL

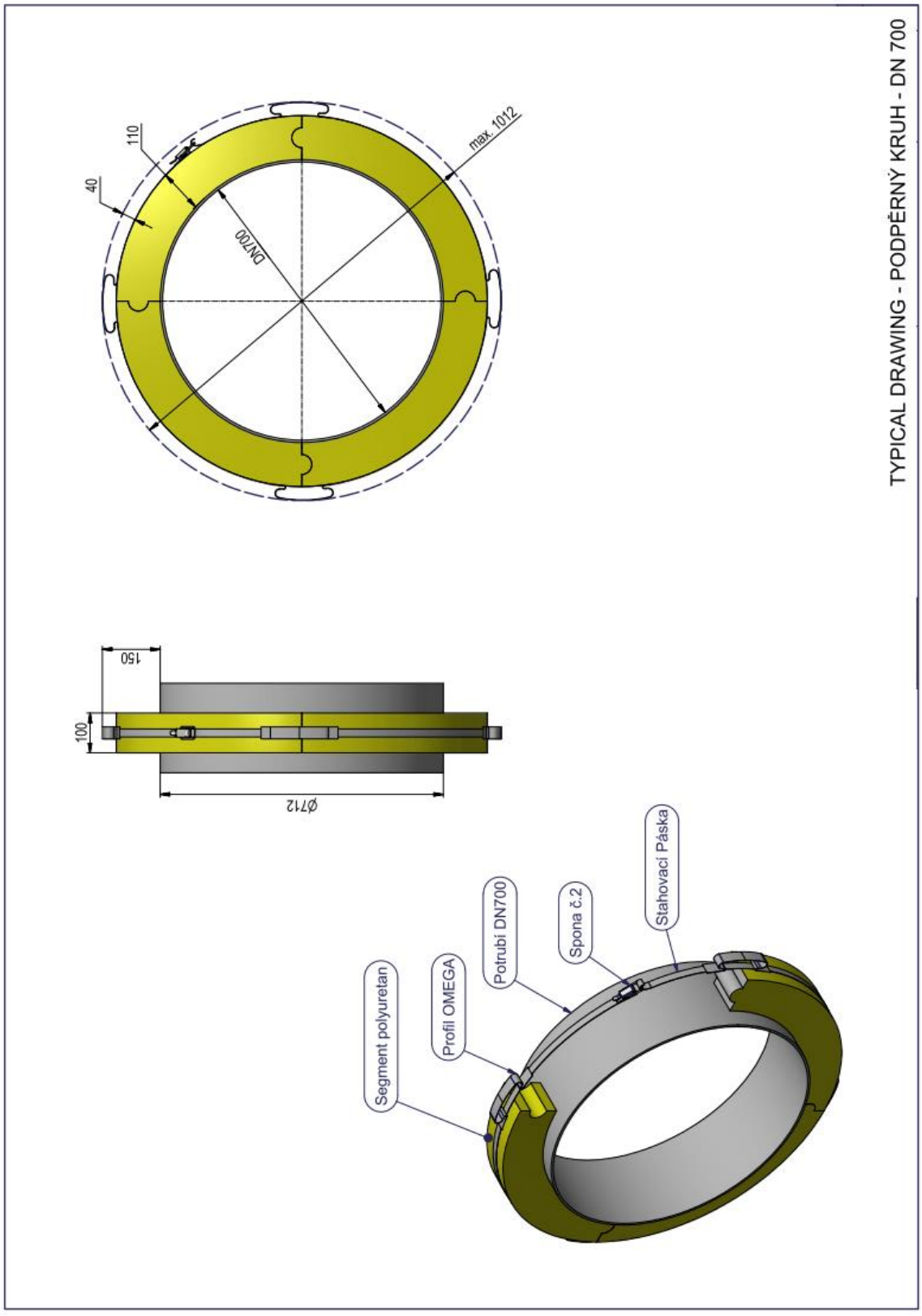
CONTROL VALVE - DN 700 - DATA SHEET								
GENERAL INFORMATION								
LOCATION	MLADOTICE - TU 40			QUANTITY	1			
EQUIPMENT	PRESSURE / FLOW CONTROL VALVE			P&ID-No.	C4G-MLAD-CHE-TU40S-STR-PID-			
TAG No.	60.1			TECHNICAL SPECIFICATION	TU40_STR_SPC_505_03_DDL			
OPERATION AND DESIGN DATA								
AMBIENT CONDITIONS	TU40_STR_SPC_505_03_DDL			OUTLET SETTING PRESSURE				
FLUID	NATURAL GAS			ΔP @ FULL OPEN	Max. 0.5 bar			
GAS COMPOSITION	TU40_STR_SPC_505_03_DDL			DESIGN PRESSURE	85.0 barg			
PIPING CLASS	#600			DESIGN TEMPERATURE	-20°C / +50°C			
INSTALLATION	ABOVEGROUND							
DESIGN CODE / STANDARD	ČSN EN 1349							
MINIMUM SAFETY FACTOR	2,15							
FLANGE STANDARD / RATING	ASME B16.47 - RF / #600							
OPERATING / SERVICE CONDITIONS								
	UNITS	CONDITION 1	CONDITION 2	CONDITION 3	CONDITION 4	SHUT-OFF	NOTE	
FLOW RATE	Nm^3/h	1 104 167	1 104 167	1 104 167	916 667			
INLET PRESSURE P1	barg	85,0	85,0	58,5	85,0			
OUTLET PRESSURE P2	barg	58,5	59,8		58,5			
DIFFERENTIAL PRESSURE ΔP = P1 - P2	barg	26,5	25,2	-	26,5			
INLET TEMPERATURE	°C	25	25	25	25,0			
MOLAR WEIGHT	Kg/Kmol	16,3	16,3	16,3	16,3			
VISCOSITY / SPECIFIC HEATS RATIO								
VAPOR PRESS. Pv / CRITICAL PRESS. Pc								
REQUIRED Cv		883	1126	6350	733			
TRAVEL	%							
CALCULATED NOISE	dB(A)	86	81	<65	86		Max.85dB(A)	
COMPRESSIBILITY (Z)		0.78	0.87	0.90	0.87			
SOLIDS CONC. / PARTICLE SIZE								
VALVE DATA								
VALVE TYPE	RZD-REM1QX			SUPPORT LEGS	YES			
VALVE BODY TYPE / DIMENSION	* PISTON			FLOW DIRECTION	BI-DIRECTIONAL			
NOMINAL PIPE SIZE	DN 700			MAX. ALLOWABLE NOISE	< 85 dB(A) @ 1 m			
PIPELINE CONNECTION TYPE/ SIZE	FLANGE / FLANGE			MAX. VALVE LIFT	286 mm			
MAIN SEALS				STEM DIAMETER				
SECONDARY SEALS				ADJUSTABLE LIMIT STOP				
VALVE CHARACTERISTIC	EQUAL PERCENTAGE			LEAKAGE CLASS	EN 1349 - CLASS V			
TRIM TYPE	AXIAL CONTROL VALVE							
SOUND ABSORPTION								
POSITION INDICATOR	YES							
ACTUATOR AND ACCESSORIES								
ACTUATOR TYPE	Pneum. - Nat. Gas (proc. med.)			POWER SUPPLY FOR SOLENOID VALVE	N/A			
MANUFACTURER/ MODEL	N/A			EXP. PROOF-LIMIT SWITCHES				
AIR SUPPLY PRESSURE	85,0 barg (Natural Gas)			EXP. PROOF-HOUSING	EEx d			
MIN.SUPPLY AIR PRESS. FOR OPPERAT.	38,0 barg (Natural Gas)			STROKING TIME TO OPEN	(max. 100 s)			
POSITIONER SIGNAL	4 - 20 mA			STROKING TIME TO CLOSE	(max. 100 s)			
DESIGN TORQUE FOR ACTUATOR	YES, WITH LIMT SWITCH			TEMPERATURE CLASS	T3			
ELECTRICAL POWER SUPPLY	N/A			POSITIONER MANUFACT./ MODEL	Siemens Sipart PS2			
SIGNALLING AND CONTROL CONTACTS	4 - 20 mA			SOLENOID VALVE MANUFACT./ MODEL				
HAZARDOUS AREA	ZONE 2			HANDWHEEL	YES (DISCONNECTING)			
IP-CODE	IP 65 (IEC 60529)			INSULATING CLASS	I			
AIR QUALITY	N/A (Natural Gas DVGW G260)			CORROSION PROTECTION	CATAGORIE KN			
DIMENSIONS, WEIGHT, MECHANICAL AND ELECTRICAL INTERFACES								
FITTING LENGTH	1549 F to F			WEIGHT (VALVE)	3590 kg			
FITTING HEIGHT				WEIGHT (VALVE + ACTUATOR)	1950			
AIR SUPPLY CONNECTION	N/A			CABLE CONNECTION TYPE	Exd CABLE GROMMET			
				CABLE CONNECTION SIZE	2x M25x1.5, 1x M20x1.5			
MATERIALS, TESTING AND DOCUMENTATION								
MATERIAL VALVE BODY	ASTM A351 Gr. LCC			TIGHTNESS TEST	ČSN EN 12266-1, 2			
MATERIAL INTERNALS	CARBON STEEL			PRESSURE TESTING STANDARD	ČSN 12266-1			
MATERIAL END CONNECTIONS				SAFETY INTEGRITY LEVEL	IEC 61508/61511 SIL 2			
MATERIAL STEM	1.7218 - A322 G41300			FIRE SAFE TESTING	API SPEC 6FA/ ISO 10497			
MATERIAL BOLTS / NUTS				ATEX CERTIFICATION	ACC. TO ATEX 2014/34/EU			
MATERIAL SEAT / SEAL				TEST OF MATERIAL	ITE-GENER-STR-SPC-815			
VALVE CORROSION PROTECTION	3 layer system total 240 Mu			FINAL ACCEPTANCE TEST	ACC. TO EN 10204 3.2			
	Top color RAL 1023			CE-CONFORMITY	PED 2014/68/EU Module G			
NOTES								
◆ To be filled in/confirmed by Vendor								
This data sheet shall be read with document "TU40_STR_SPC_505_03_DDL Pressure Control and Safety Shutoff Valves ≥ DN 300 Specification"								
To be supplied with couterflanges, seals and joining material.								


TYPICAL DRAWING - IZOLACE A OPLECHOVÁNÍ U "BONO" - DN 700
D
D
110
max. 1012
DN700
200
300
D-D (1 : 12)
Ø89
190
F
F (1 : 6)
Rohož KNAUF LMF 5 AluR tl.100mm
K-FLEX ST tl.32mm
K-FLEX - K-FONIK tl.13mm
Nerezový plech + AMS Fólie

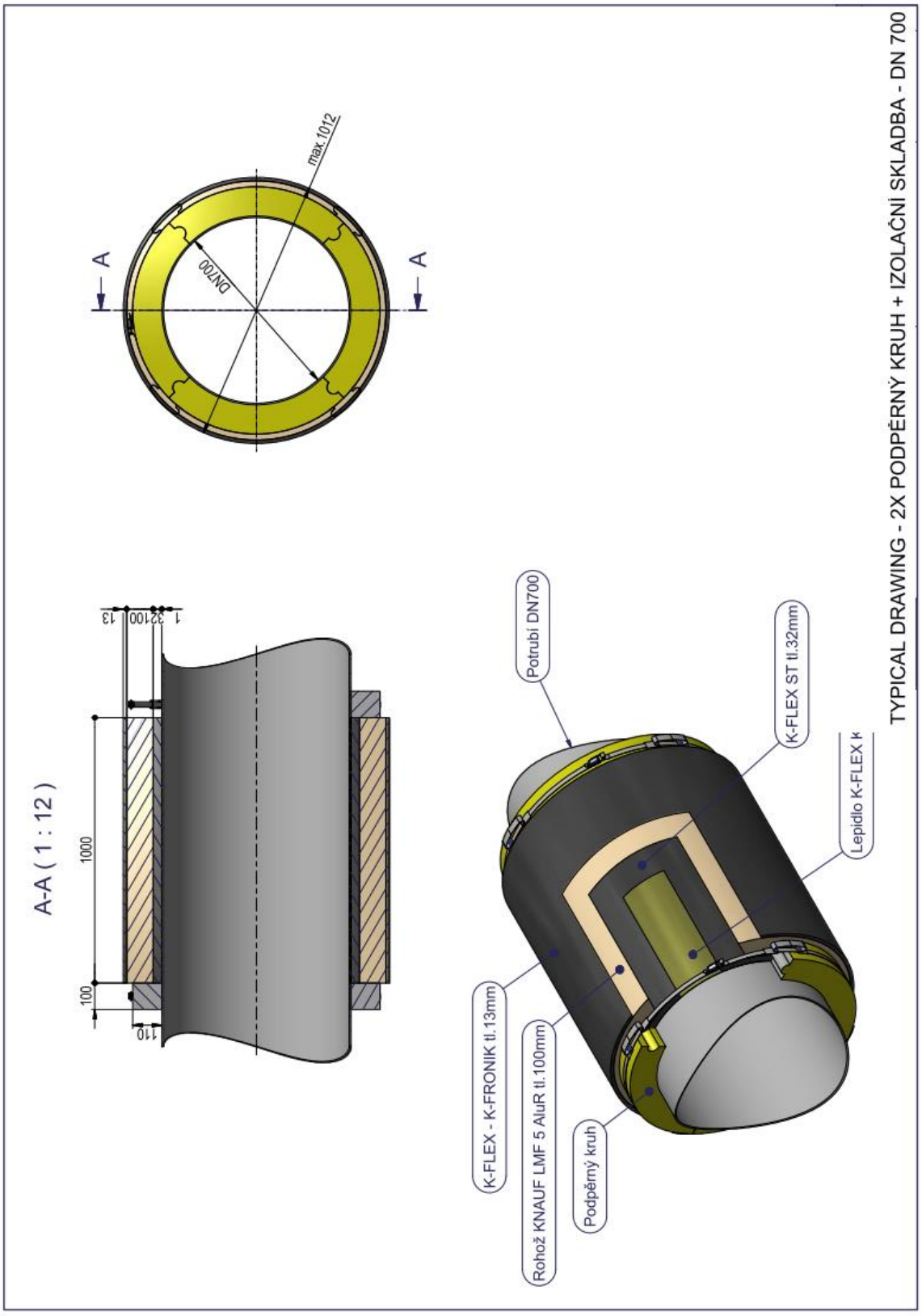
Attachment 3 insulation directly applied on the valves

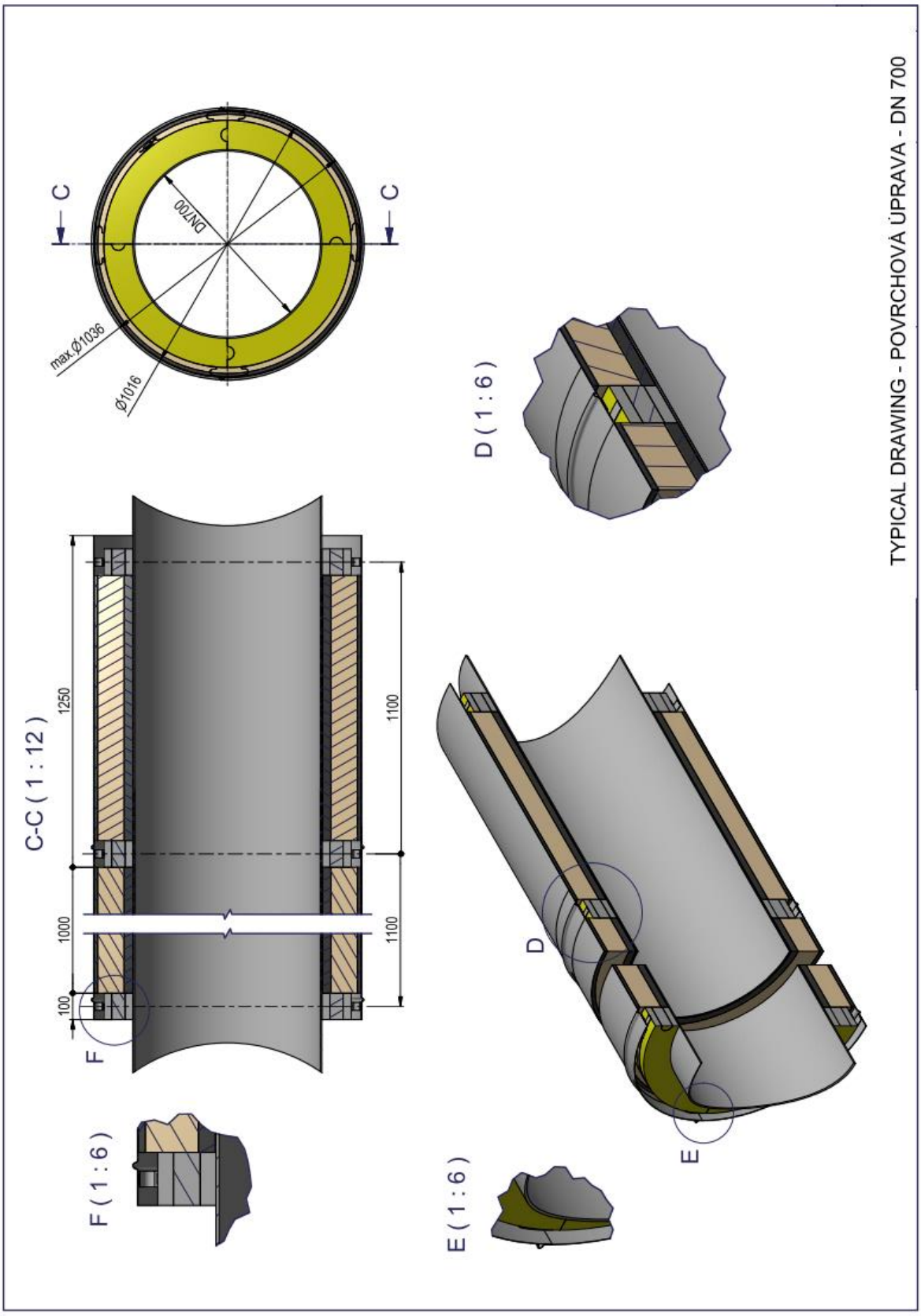


Attachment 3 insulation directly applied on the valves

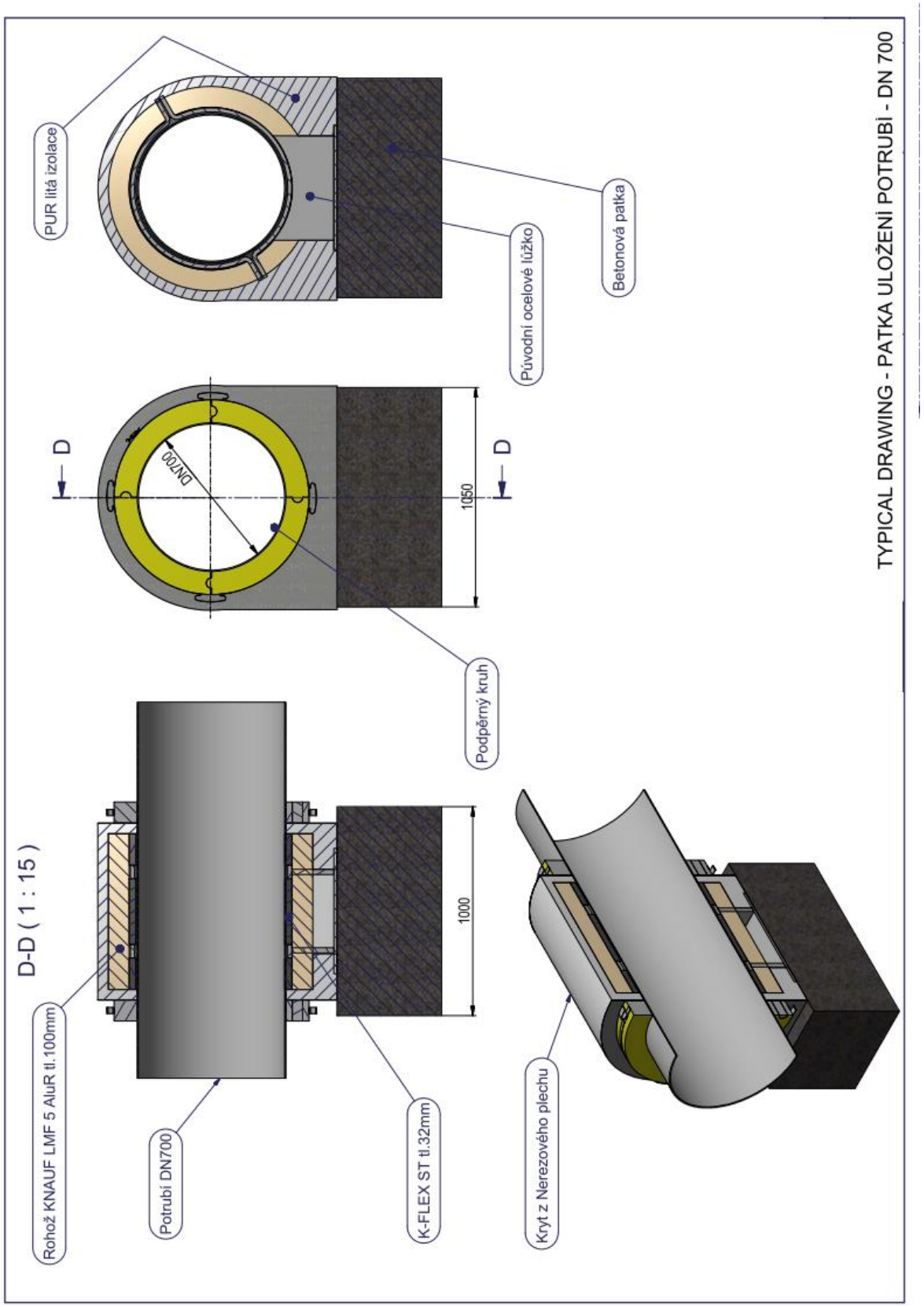


Attachment 3 insulation directly applied on the valves



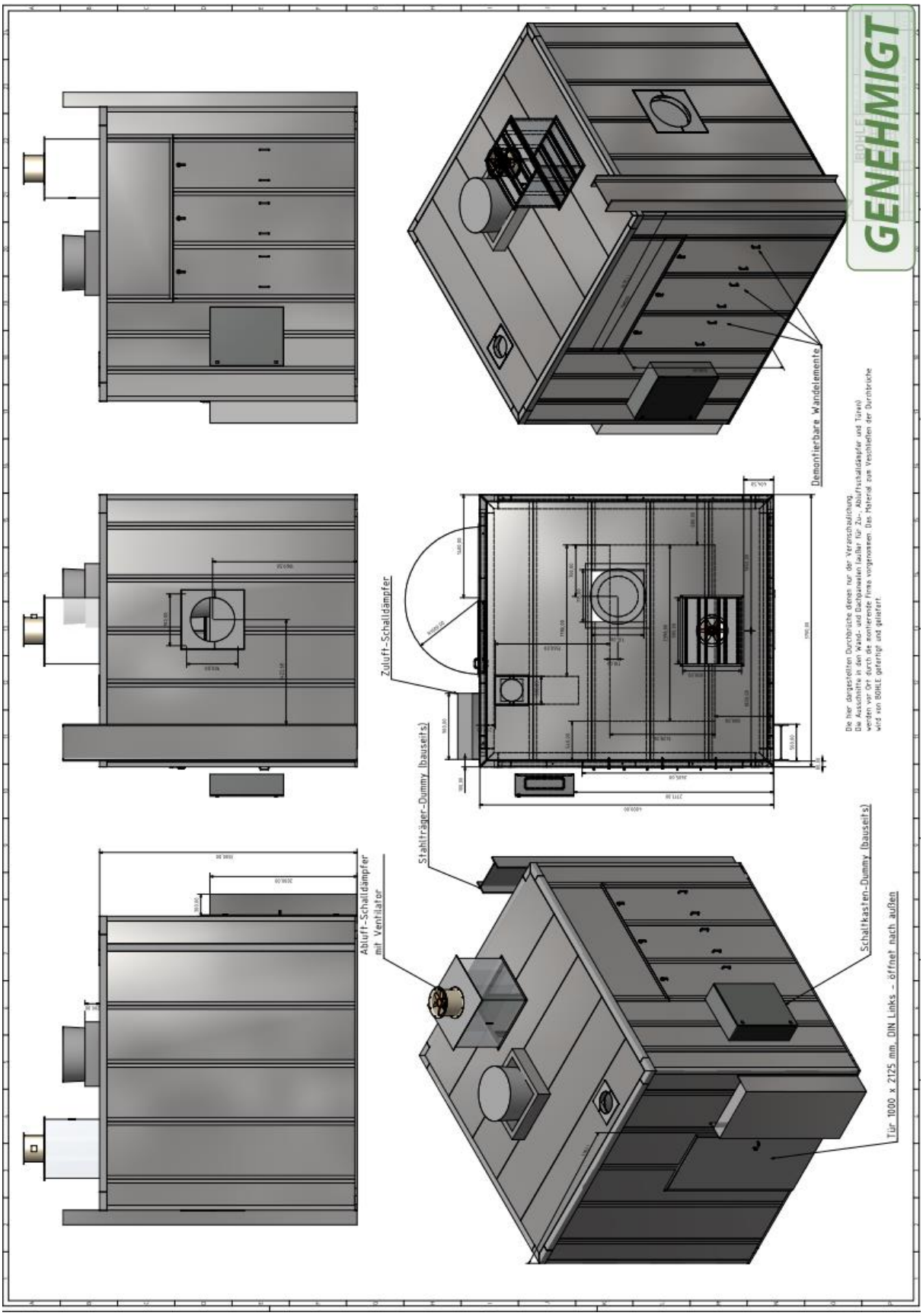

TYPICAL DRAWING - POVRCHOVÁ ÚPRAVA - DN 700
C
C
DN700
max.Ø1036
Ø1016
D (1 : 6)
C-C (1 : 12)
1250
1100
1000
1100
100
F
F (1 : 6)
D
E
E (1 : 6)

Attachment 3 insulation directly applied on the valves



Expected requirements for noise insulation hood (not concluding):

- Size to fit the valves (approx. 3 m x 3 m x 3 m)
- Noise reduction as specified
- Good accessibility (e.g. doors on both sides)
- Good ventilation to avoid ex zone or gas detectors if ex zone cannot be avoided
- Silencers for ventilation
- Inside lighting
- Foundation as plate or points (to be defined by static calculation)
- Steel frame to hold insulation plates


GENEHMIGT
Demontierbare Wandelemente
Zuluft-Schalldämpfer
Stahlträger-Dummy (bauseits)
Abluft-Schalldämpfer mit Ventilator
Schaltkasten-Dummy (bauseits)
Tür 1000 x 2125 mm, DIN Links - öffnet nach außen

	PIPING CLASS										Designation					CS100-0	
	Base Material	Carbon Steel			Service: Natural Gas Piping												
	Facing	RF	ASME CLASS	600	Color Coding												
					Design Code						ČSN EN 1594, TPG 702 04						
	Corrosion Allow.	0 mm															
Design Conditions	Design Pressure (barg)	100															
	Design Temperature (°C)	-20 to +50						Pressure/ Temperature limits:			-20°C 100 barg	38°C 100 barg	50°C 100 barg				
Pipe Dimensions	Nominal Pipe Size [DN]	25	40	50	80	100	150	200	250	300	350	400	450	500	600	700	800
	Nominal Pipe Size [inch]	1	1½	2	3	4	6	8	10	12	14	16	18	20	24	28	32
	Outer Diameter [mm]	33.4	48.3	60.3	88.9	114.3	168.3	219.1	273.0	323.8	355.6	406.4	457.0	508.0	610.0	711.0	813.0
	Wall Thickness [mm]	4.00	4.00	4.00	4.00	4.50	7.10	8.80	11.00	8.80	10.00	11.00	12.50	12.50	16.00	17.50	17.50
	Nominal Pipe Size [DN]	900	1000	1100	1200	1400											
	Nominal Pipe Size [inch]	36	40	44	48	56											
	Outer Diameter [mm]	914.0	1016.0	1118.0	1219.0	1422.0											
	Wall Thickness [mm]	20.00	20.00	22.20	22.20	28.00											

Description		NPS from	NPS to	Code	Manufacturing/ Pressure Rating	Material & Standard		Design		NOTES
Pipes	Pipe	1"	2"		seamless	L290NE	ČSN EN ISO 3183	ČSN EN ISO 3183		
		3"	10"		seamless	L290NE	ČSN EN ISO 3183	ČSN EN ISO 3183		
		12"	28"		long.welded	L360NE	ČSN EN ISO 3183	ČSN EN ISO 3183		
		32"	36"		long.welded	L415NE	ČSN EN ISO 3183	ČSN EN ISO 3183		
		40"	56"		long.welded	L485ME	ČSN EN ISO 3183	ČSN EN ISO 3183		
Flanges	Welding Neck Flanges	1"	10"		Forged / 600# RF	ASTM A350 LF2	ASTM A350	ASME B16.5		
		12"	24"		Forged / 600# RF	ASTM A350 LF2	ASTM A350	ASME B16.5		
		28"	36"		Forged / 600# RF	A694 Gr. F60	ASTM A694	ASME 16.47		
		40"	56"		Forged / 600# RF	A694 Gr. F70	ASTM A694	ASME 16.47		
	Blinds	1"	10"		Forged / 600# RF	ASTM A350 LF2	ASTM A350	ASME B16.5		
		12"	24"		Forged / 600# RF	ASTM A350 LF2	ASTM A350	ASME B16.5		
		28"	36"		Forged / 600# RF	A694 Gr. F60	ASTM A694	ASME 16.47		
		40"	56"		Forged / 600# RF	A694 Gr. F70	ASTM A694	ASME 16.47		