

 INTEGRATED CARBON OBSERVATION SYSTEM	ICOS ATC NETWORK SUPPORT		Ref.	<i>ATC-NS-CL-NO-001</i>	
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Standard air mixture for ICOS stations

The calibration scale, made of 3 to 4 standards calibrated at CAL, must span the range of atmospheric variations in the atmosphere. We have also to consider the long lifetime of the calibration standards at the station (10 to 20 years) depending on the gas consumption by one or several analyzers, and the observed atmospheric range. Based on the analysis of existing time series in Europe we differentiate two types of stations: background and regional/peri-urban sites. The two types of sites do not differ significantly for the low values, but the maximum mole fractions are much higher at regional/peri-urban sites. Consequently two ranges are recommended depending on the site environment.

We recommend having a long-term target (LTT) with a high mole fraction, whereas the short-term target (STT) mole fraction lies around the current mean value. Considering the lifetime of the short-term target (6 months to 2 years) it will be possible to follow the atmospheric trends. This will not be possible for the LTT whose lifetime will be from 10 to 20 years. The LTT mole fractions will be initially at the high range of the observed values, but will progressively be closer to the mean values for gases showing a positive trend.

Regarding the calibration scale it will be important to maintain its range compatible with the atmospheric range. The need for a change of the standards will depend on their lifetime and on the growth rate of the species measured. All the calibration standards must be changed once they reach the minimum pressure of 30 bar as recommended in the ICOS AS Specifications document (cf. 4.1.1). If the calibration standards become out of range with the ambient air due to the increase of the concentrations, then we recommend changing the lowest standard. So, in case of a set of 3 calibration standards, the mid values become the low one, the highest becomes the mid one, and a new high concentration is introduced.

The recommended mole fraction for the different gas cylinders are represented in the table 1. These values must be re-evaluated every year at the MSA taking into account the current mean value, range of atmospheric variations and the trend in the atmosphere. The values given in table 1 are standard recommendations which can be adapted by the station PI on the basis of good knowledge of the signal observed on his site, especially for peri-urban site. The CAL will use the table 1 to prepare the different tanks if no specific values have been expressed by the station PI.

2015		CO ₂		CH ₄		CO		N ₂ O	
Trend		≈ +2.5 ppm/yr		≈ +5 ppb/yr		≈ 0 ppb/yr		≈ +1 ppb/yr	
Site		<i>Bckgnd</i>	<i>Regional</i>	<i>Bckgnd</i>	<i>Regional</i>	<i>Bckgnd</i>	<i>Regional</i>	<i>Bckgnd</i>	<i>Regional</i>
3 CAL set	CAL 3	450	470	2100	2200	250	400	340	345
	CAL 2	415	420	1950	1970	150	200	330	333
	CAL 1	380	380	1800	1800	60	60	320	320
4 CAL set	CAL 4	450	470	2100	2200	250	400	340	345
	CAL 3	420	430	2000	2060	175	200	335	337
	CAL 2	400	410	1900	1930	100	100	330	330
	CAL 1	380	380	1800	1800	60	60	320	320
LTT		450	470	2100	2200	250	400	340	345
STT		400		1900		100		330	

Table 1: Values of the mole fractions recommended for the gas cylinders.

Note:

This document has been drafted by the ICOS ATC in collaboration with the ICOS CAL and the ICOS MSA representatives. This document will be the temporary recommendations to determine the air mixture of the different gas tanks. It will be used by the ICOS CAL and the station PIs until it is included in the ICOS AS Specifications document after discussion at the next MSA in Brno (March 2016).